South Rogue-Gold Hill Watershed Analysis

Version 1.1

Bureau of Land Management, Medford District
Ashland Resource Area

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EXECUTIVE SUMMARY

Introduction

Watershed analysis is the primary tool for generating information to implement ecosystem management as directed in the Northwest Forest Plan and the Medford District Resource Management Plan. The South Rogue-Gold Hill Watershed Analysis describes conditions and interrelationships of ecosystem components for the South Rogue-Gold Hill Watershed Analysis Area. The analysis focuses on issues and key questions that are most relevant to the management questions, human values, and resource conditions within the analysis area. Management objectives and recommendations for Bureau of Land Management (BLM)-administered lands are prioritized based on conclusions reached through the analysis. The watershed analysis formulates an overall landscape plan for BLM-administered lands and recognizes the inventory, monitoring, and research needs for the analysis area.

The South Rogue-Gold Hill Watershed Analysis was prepared by an interdisciplinary team of resource professionals and specialists from the BLM Ashland Resource Area and Medford District Staff. The watershed analysis team followed the six-step process outlined in the *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis, version 2.2.* The six steps or sections included in the South Rogue-Gold Hill Watershed Analysis are: 1) characterization, 2) issues and key questions, 3) current conditions, 4) reference conditions, 5) syntheses and interpretation of information, and 6) recommendations.

The South Rogue-Gold Hill Watershed Analysis addresses the entire analysis area and is based on existing information and recent data collection. Where resource information is missing, a data gap is identified. The watershed analysis process is iterative and new information will be used to supplement future versions of the analysis.

Public participation for the West Bear Creek Watershed Analysis included a public meeting on March 13, 2001 and the opportunity to submit written and/or verbal comments. Approximately 400 notices regarding the open house were sent to residents within the analysis area, local agencies, local groups, and the Klamath Tribe, the Quartz Valley Indian Reservation, the Cow Creek Band of Umpqua Indians, the Shasta Nation, the Confederated Bands Shasta Upper Klamath Indians, the Confederated Tribes of Siletz and Grand Ronde, and the Confederated Tribes of the Rogue-Table Rock and Associated Tribes. The notice provided a map of the area, explained the watershed analysis process, and included a comment form for people to mail if they couldn't attend the open house. The open house was held at Patrick Elementary School in Gold Hill, Oregon. The purpose of the open house was to give the public the opportunity to share with the watershed analysis team their ideas, concerns, information regarding the historic or current conditions, and recommendations on how the analysis area should be managed. In addition to comments received at the open house, the BLM received 16 comment letters concerning the South Rogue-Gold Hill Watershed Analysis Area. BLM staff were also available to answer questions on this watershed analysis at the West Bear Creek watershed analysis meeting on March 14, 2001.

Watershed Characterization

The South Rogue-Gold Hill Watershed Analysis Area covers approximately 64-square miles (59,566 acres) in the Klamath Mountains in southwestern Oregon. The analysis area lies south of the Rogue River between Bear Creek and Evans Creek. The southern ridges form the divide between the Middle Rogue and Applegate River Subbasins. The South Rogue-Gold Hill Watershed Analysis Area is located in the Middle Rogue River Subbasin The major streams in the analysis area are Kane Creek, Galls Creek, Millers Gulch, Foots Creek, and Birdseye Creek.

Land ownership within the analysis area includes BLM-administered lands (15,495 acres) and private lands (25,534 acres). Federal land use allocations include: Matrix, Riparian Reserves, Late-Successional Reserve, and the John's Peak/Timber Mountain off-highway vehicle (OHV) area.

Regional public issues reflect the dominant uses of the analysis area. Recreational concerns include the loss of historically used trails due to encroaching woodland development and the widespread use of OHVs. Other issues include the loss of open areas due to development, the general degradation of the natural environment, poor water quality, and the lack of good fish habitat. In addition, there are a number of regional issues that are reflected in local concerns for this analysis area. Air quality, which has been a problem in the past, has improved in recent years. Urban interface issues include concerns about wildfire, fire protection, and smoke; concerns over low water flows in local streams due to irrigation withdrawals; the spread of noxious weeds; and timber harvest. Rapid population growth and the development associated with it has exacerbated many of these concerns.

The South Rogue-Gold Hill Watershed Analysis Area is characterized by mild, wet winters and hot, dry summers. Most of the analysis area is classified as having a low severity fire regime characterized by frequent, low intensity fires. The remainder has a moderate fire regime characterized by less frequent fires of varying intensity.

The analysis area straddles the contact between the eastern edge of the Klamath Mountains Geologic Province (also called the Siskiyou Mountains), and the Western Oregon Interior Valleys (physiographic) Province. The geology of the analysis area can be briefly described as eroding metamorphic and granitic uplands with minor amounts of sedimentary deposits draping the lower slopes.

The majority of the South Rogue-Gold Hill Watershed Analysis Area is predominately forest lands with patches of grassland, shrubland, and woodland interspersed. The southwest facing slopes tend to be dry and rocky; rock outcrops and rocky surfaces are common throughout the analysis area. Tree species in the forest lands include ponderosa pine, incense cedar, Douglas-fir, and white fir. There are 39 populations (four species) of special status vascular plants known to exist within the analysis area and 45 sites (four species) of Survey and Manage plants. Noxious weed species known to occur within the analysis area include yellow starthistle, bull thistle, purple loosestrife, St. Johnswort (Klamath weed), and medusahead. Other non-native species that have been seen in the analysis area are ripgut brome, cheatgrass, bulbous bluegrass, and orchard grass.

The northern spotted owl, federally listed as a threatened species under the auspices of the Endangered Species Act of 1973, as amended, is present in the analysis area. Approximately 4,220 acres of suitable northern spotted owl habitat are present on BLM managed land within the analysis area Twenty-four special status wildlife species are known or are likely to be present in the analysis area. Survey and Manage and Protection Buffer species designated in the Northwest Forest Plan known or suspected to be present in the analysis area include the great gray owl and several species of bats.

The tributaries within the analysis area support one of the largest runs of summer steelhead (*Oncorhynchus mykiss*) in Oregon. Coho (*Onchorhynchus kisutch*), a species listed as threatened under the ESA (May 1997), are also present in the analysis area. Other fish species in the watershed analysis area include cuttthroat trout (*Oncorhynchus clarki*), rainbow trout (*Oncorhynchus mykiss*), sculpin (*Cottus* sp.), and dace (*Rhinichthys sp.*).

Water quality limited streams identified by the Oregon Department of Environmental Quality in 1998 as not meeting the state temperature standard include the Birdseye Creek and Galls Creek. The only streams monitored for temperature in the analysis area are Kane, Galls, Right Fork Foots, and Birdseye Creeks.

Human Uses

Two radically different patterns have characterized land use in the South Rogue-Gold Hill Watershed Analysis Area. For thousands of years, indigenous people followed a hunting-fishing-gathering way of life, based on a small-scale, subsistence-oriented economy. Approximately 150 years ago, the advent of Euro-American settlement brought fundamentally different land use patterns based on complex technologies and an economic system connected to global markets.

The last 150 years have contributed to substantial changes in the landscape of the analysis area. In the nineteenth century, newcomers cleared land for ranches and for fuelwood; introduced a host of new plant (agricultural crops and weeds) and animal (farm and ranch animals) species; plowed under native meadows for farms; dammed, diverted, and channelized streams; and hunted unwanted predators (grizzly bears and wolves) and other species (antelope and bighorn sheep) to local extinction. In the twentieth century logging has expanded with the post-World War II explosion of roads and improvements in transportation; fire suppression has affected the local vegetation; and a host of state, federal, and local policies guide human operations on both public and private lands.

The effects of these actions are written on the land: the hydrology of the analysis area has been altered through irrigation, water withdrawals, dams, roads, channelization, and other actions; erosion is more severe in some places than in the past; soil productivity has been affected in some areas by compaction, hot fires, and changes in vegetation patterns; vegetation patterns have been altered through agriculture, fire suppression, grazing, and other actions; topography has changed in places through the construction of quarries and roads, and stream alterations; and native species (plants and animals) have disappeared or become reduced through a number of human actions or through competition with non-native species.

The twentieth century has witnessed changes in federal land management policies that affect a portion of the analysis area's lands. The advent of ecosystem management suggests a shift from an extractive perspective to one combining economic concerns with stewardship practices. Fire suppression policies have operated with timber harvest to change the character of the forests in the analysis area, and numerous laws and regulations now guide human actions on these federal lands.

Terrestrial Ecosystem
Fire suppression, plant succession, logging, road building, vegetation conversion for agricultural uses, livestock grazing, and the introduction of non-native plants are the main processes that have sculpted the landscape since the turn of the century. Results stemming from these processes include: increased forest stand density with a low level of growth or vigor; increased susceptibility of forest stands to bark beetle attacks and pathogens; a change in the species composition and structure of forest lands, grasslands, shrublands, and oak woodlands; and habitat alteration of shrublands, oak woodlands, and savannahs. These changes have caused an increase in fire hazard and a shift in the intensity and effects of wildfires when they occur. Current trends in silvicultural and prescribed fire practices are focusing on restoring and maintaining vegetative communities to a more fire resilient, native vegetation condition.

Vegetative conditions are the primary influence on terrestrial wildlife/animal populations and their distribution within the analysis area and across the greater landscape. Declines in mature/old-growth habitat and the quality of early and mid-seral conifer, oak woodland, shrubland, and grassland habitat have likely contributed to the decline of populations of wildlife species that prefer these habitats. The decrease in mature/old-growth habitat is likely to have resulted in lower populations of northern spotted owl and some special status species.

Aquatic Ecosystem
The streamflow regime reflects human influences that have occurred since Euro-Americans arrived. Road construction, timber harvest, land development, and water withdrawals are the major factors having the potential to adversely affect the timing and magnitude of both peak and low streamflows in the analysis area.

Channel conditions, water quality, and riparian habitat in the South Rogue-Gold Hill Watershed Analysis Area have changed considerably in the last 150 years primarily due to human activities such as logging, road building, removal of riparian vegetation, channelization, beaver removal, poorly managed livestock grazing, irrigation development, and land alteration for agriculture and residential developments. Some of the results are fragmented connectivity of riparian habitat; reduced quantity of snags and large woody material; reduced streambank stability; increased sediment production to streams; and reduced stream shading. Lack of riparian vegetation and water withdrawals have contributed to increased stream temperatures that can stress aquatic life and limit the long-term sustainability of fish and other aquatic species. Sediment is mainly transported to streams from landslides (natural and human-caused), road surfaces, fill slopes, and ditchlines. The combination of these factors have contributed to reduced stream channel complexity and stability resulting in poorer quality habitat for aquatic species and an increased susceptibility to streambank erosion.

Riparian Reserves along intermittent, perennial nonfish-bearing, and fish-bearing streams on BLM-administered lands will help to provide a future long-term source of large woody material recruitment for streams, improve stream shading, and increase the potential for use by wildlife. The use of silvicultural treatments within riparian stands could improve the health, vigor, and diversity of these areas.

Overall, the interrelated aquatic and riparian habitats in the South Rogue-Gold Hill Watershed Analysis Area are in marginal to poor condition and are below their potential for fish production. Much of the lower elevation habitat lacks quality pools and large woody material necessary for maintenance of pools, cover, spawning material, and bank stability. In the upper reaches, gravels are often embedded with silt.

INTRODUCTION

Objective of the Watershed Analysis

The South Rogue-Gold Hill Watershed Analysis documents conditions and interrelationships of ecosystem components for the analysis area. It describes the dominant features and physical, biological, and social processes within the analysis area. The document compares prehistorical (before 1850) and historical (reference) conditions with current ecosystem conditions and discusses the development of current conditions and future trends. It also ranks management objectives and recommendations for Bureau of Land Management (BLM)-administered lands as high, medium, or low priority, and directs development of a landscape plan for BLM-administered lands. This document is intended to guide subsequent project planning and decision making in the South Rogue-Gold Hill Watershed Analysis Area. This document is not a decision document under the National Environmental Policy Act (NEPA) and there is no action being implemented with this analysis. Site-specific analysis incorporating the NEPA process would occur prior to any project implementation on BLM-administered lands.

How The Analysis Was Conducted

The South Rogue-Gold Hill Watershed Analysis was prepared by an interdisciplinary team of resource professionals and specialists from the BLM Ashland Resource Area and Medford District Staff (see List of Preparers). Group discussions identified linkages among resources to produce an integrated, synthesized report.

Guidelines used to direct the preparation of the South Rogue-Gold Hill Watershed Analysis include: 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 Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (USDA and USDI 1994a) (these two documents are combined into what is known as the Northwest Forest Plan), and *Ecosystem Analysis at the Watershed Scale:* Federal Guide for Watershed Analysis, Version 2.2 (USDA et al. 1995). The analysis also refers to the *Medford District Resource Management Plan* (USDI, BLM 1995).

The South Rogue-Gold Hill Watershed Analysis is based on existing information and addresses the entire analysis area, although recommendations are only made for BLM-administered lands. Where resource information is missing, a data gap is identified. Data gaps are prioritized and listed in a separate section; missing information will be acquired as funding permits. The analysis process is dynamic and the document will be revised as new information is obtained. Types of new information may include resource data collected at the project level and monitoring data. An updated version of this document will be issued when new data and information collected indicate important changes in watershed conditions or trends.

Document Organization

The organization of this document follows the format described in the *Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis,* Version 2.2 (USDA et al. 1995). The Issues and Key Questions focus on the key ecosystem elements most relevant to the management questions and objectives, human values, or resource conditions within the analysis area.

The Characterization section identifies the dominant physical, biological, and human processes or features of the analysis area that affect ecosystem functions or conditions. The Current Conditions section details current conditions of the physical, biological, and human ecosystem elements. The Reference Conditions section describes how ecological conditions have changed over time as a result of human influences and natural disturbances in the South Rogue-Gold Hill Watershed Analysis Area. The Synthesis and Interpretation section compares existing and reference conditions of specific ecosystem elements and explains significant differences, similarities, or trends and their causes. The Management Objectives and Recommendations section identifies management objectives for BLM-administered lands within the analysis area and prioritizes management activities to achieve the objectives. The Landscape Planning section synthesizes resource data to create landscape objectives and recommendations for BLM-administered lands. Prioritized data gaps and monitoring and research needs are included in separate sections.

Maps are grouped together and placed at the end of the document. All maps for the watershed analysis were generated using BLM Medford District geographic information systems (GIS).

Public Involvement

Public participation for the West Bear Creek Watershed Analysis included a public meeting on March 13, 2001 and the opportunity to submit written and/or verbal comments.

An open house was held on March 13, 2001 at Patrick Elementary School in Gold Hill, Oregon. The purpose of the open house was to give the public the opportunity to share with the watershed analysis team their ideas, concerns, information regarding the historic or current conditions, and recommendations on how the analysis area should be managed. In addition to comments received at the open house, the BLM received 16 comment letters concerning the West Bear Creek Watershed Analysis Area. BLM staff were also available to answer questions on this watershed analysis at the West Bear Creek watershed analysis meeting on March 14, 2001.

Written comments received and verbal comments recorded at the open house meeting are summarized in Appendix A.

ISSUES AND KEY QUESTIONS

The Issues and Key Questions focus the analysis on the ecosystem elements that are most relevant to the management questions and objectives, human values, or resource conditions within the analysis area.

HUMAN USES

Characterization

1. What are the land ownership patterns and land allocations in the analysis area?
2. What are the major ways in which humans interact with the analysis area?
3. Where are the primary locations for human use of the analysis area?
4. What are the regional public concerns that are pertinent to the analysis area (e.g., air quality, environmental degradation, commodity production, etc.)?
5. What are the public concerns specific or unique to this analysis area?
6. Are there treaty or tribal rights in the analysis area?
7. Are there tribal issues and concerns in the analysis area?
8. What road types are in the analysis area and where are they located?

Current Conditions

1. Who are the people most closely associated with and potentially concerned about the analysis area?
2. What are the current human uses and trends of the analysis area (economic, recreational, other)?
3. What is the current and potential role of the analysis area in the local and regional economy?
4. What are the current conditions and trends of relevant human uses in the analysis area:
   a. government facilities, structures, and communication routes
   b. authorized and unauthorized uses
   c. transportation system
      i. What are the current road conditions?
      ii. What are the open and closed road densities (by road type) and where are high road densities located?
   d. logging
   e. special forest products
   f. grazing/agriculture
   g. minerals
   h. recreation
   i. cultural resources

Reference Conditions

1. How did native people interact with the environment?
2. What changes in human interactions have taken place since historic contact and how has this affected the native ecosystem?
3. What are the major historical human uses in the analysis area, including tribal and other cultural uses?
4. What is the history of road development and use in the analysis area?

Human Uses continued

Synthesis and Interpretation

1. What are the causes of change between historical and current human uses?
2. What are the influences and relationships between human uses and other ecosystem processes in the analysis area?
3. What human effects have fundamentally altered the ecosystem?
4. What are the anticipated social or demographic changes that could affect ecosystem management?
5. What human interactions have been and are currently beneficial to the ecosystem and can these be incorporated into current and future land management practices?
6. What are the influences and relationships between roads and other ecosystem processes?
7. How do road stream crossings affect water quality, instream habitat, and fish migration?

CLIMATE

Characterization

1. What are the climatic patterns in the analysis area?

GEOLOGY AND GEOMORPHOLOGY

Characterization

1. What is the origin of the broad variety of rock types in the analysis area and where are they located?
2. How did the rock types influence landforms, soils, and vegetation?

EROSION PROCESSES

Characterization

1. What erosion processes are dominant within the analysis area?
2. Where have they occurred or are they likely to occur?

Current Conditions

1. What are the current conditions and trends of the dominant erosion processes prevalent in the analysis area?

Reference Conditions

1. What are the historical erosion processes within the analysis area?
2. Where have they occurred?

Synthesis and Interpretation

1. What are the natural and human causes of changes between historical and current erosion processes in the analysis area?
2. What are the influences and relationships between erosion processes and other ecosystem processes?

SOIL PRODUCTIVITY

Characterization

1. How critical/vulnerable is soil productivity in the analysis area?

Soil Productivity continued

Current Conditions

1. What are the current conditions and trends of soil productivity?
2. What areas are most vulnerable to soil productivity loss by management actions?

Reference Conditions

1. What were the historical soil productivity characteristics?

Synthesis and Interpretation

1. What are the natural and human causes of change between historical and current soil productivity conditions?
2. How do natural disturbances affect long-term soil productivity?
3. What are the relationships between soil productivity and other ecosystem processes?

LANDSCAPE VEGETATION PATTERN

Characterization

1. What is the array and landscape pattern of native and non-native plant communities and seral stages in the analysis area?
2. What is the percent composition of the vegetation condition classes over the landscape?
3. What processes caused these patterns?

Reference Conditions

1. What is the historical array and landscape pattern of plant communities and seral stages in the analysis area?
2. What processes caused these patterns?

Synthesis and Interpretation

1. Have non-native species and noxious weeds changed the landscape pattern of native vegetation?

PLANT SPECIES AND HABITATS

Characterization

1. Non-native Species and Noxious Weeds
   a. What is the relative abundance and distribution of non-native plants and noxious weeds?
   b. What is the distribution and character of their habitats?
2. Special Status Plant Species and Habitats
   a. What is the relative abundance and distribution of special status vascular plant species?
   b. What is the distribution and character of their habitats?
3. Survey and Manage Species and Habitats
   a. What is the relative abundance and distribution of survey and manage plant species?
   b. What is the distribution and character of their habitats?

Plant Species and Habitats continued

Current Conditions

1. Non-native Species and Noxious Weeds
   a. What are the current habitat conditions and trends for non-native species and noxious weeds?
2. Special Status Plant Species and Habitats
   a. What are the current habitat conditions and trends for special status vascular species?
3. Survey and Manage Species and Habitats
   a. What are the current habitat conditions and trends for survey and manage species?

Reference Conditions

1. Non-native Species and Noxious Weeds
   a. What was the historical relative abundance and distribution of non-native species and noxious weeds and the condition and distribution of their habitats in the analysis area?
2. Special Status Plant Species and Habitats
   a. What was the historical relative abundance and distribution of special status vascular species and the condition and distribution of their habitats in the analysis area?
3. Survey and Manage Species and Habitats
   a. What was the historical relative abundance and distribution of survey and manage species and the condition and distribution of their habitats in the analysis area?

Synthesis and Interpretation

1. Non-native Species and Noxious Weeds
   a. What are the natural and human causes of change between historical and current species distribution and habitat quality for non-native species and noxious weeds in the analysis area?
   b. What are the influences and relationships of non-native species and noxious weeds and their habitats with other ecosystem processes in the analysis area?
2. Special Status Plant Species and Habitats
   a. What are the natural and human causes of change between historical and current species distribution and habitat quality for special status vascular species in the analysis area?
   b. What are the influences and relationships of special status vascular species and their habitats with other ecosystem processes in the analysis area?
3. Survey and Manage Species and Habitats
   a. What are the natural and human causes of change between historical and current species distribution and habitat quality for survey and manage species?

FOREST DENSITY AND VIGOR

Current Conditions

1. What are the current conditions and trends of the prevalent plant communities and seral stages in the analysis area?
2. What is the site index of the soils and how does it relate to present tree growth?
3. What vegetation condition classes are not meeting their growth potential?
4. What are the major mechanisms for vegetation disturbance?
5. Are there some vegetation condition classes promoting insect and disease problems?
6. Where are the tree insect and disease problem areas?

Reference Conditions

1. What was the historical tree vigor and growth pattern?
2. Were tree insects and disease a problem historically?

Synthesis and Interpretation

1. What are the natural and human causes of change between historical and current vegetative conditions?
2. What are the influences and relationships between vegetation and seral patterns and other ecosystem processes in the analysis area?
3. Which processes or casual mechanisms are most likely responsible for similarities, differences, and trends?
4. What are the implications of the changes and trends, including the capability of the analysis area to achieve objectives from existing plans?
5. What are the reasons for differences between current and reference tree growth patterns?

FIRE AND AIR QUALITY

Characterization

1. What are the fire regimes?

Current Conditions

1. What role does fire currently have?
2. What vegetation conditions are contributing to high fire hazard and risk?
3. What are the current fire hazards and risks?
4. What are the high values at risk that could be impacted by a wildfire?
   a. What are the risks to public health and safety?
5. How is air quality impacted by prescribed fire and wildfires?

Reference Conditions

1. What was the historic role of fire within the analysis area?

Synthesis and Interpretation

1. How have fire suppression efforts over the past 80 years caused changes between the historical and current role of fire?
2. How has the fire role change caused changes between historical and current vegetative species distribution?

TERRESTRIAL WILDLIFE SPECIES AND HABITATS

Characterization

1. Wildlife Habitat - General
    a. What is the relative number of species, distribution and character of the various habitat types found in the analysis area?
2. Threatened and Endangered Species
    a. What is the acreage, distribution and character of habitat in the analysis area?
    b. What is the role of the designated critical habitat in the analysis area?
3. Special Status/Sensitive Species
    a. What is the amount, distribution and character of habitat for those special status species that are of management concern in the analysis area?
4. Survey and Manage Species
    a. What is the amount, distribution and character of habitat for the survey and manage species found in the analysis area?

Current Conditions

1. Wildlife Habitat - General
    b. What are the current habitat conditions and trends for the various habitat types found in the analysis area?
2. Threatened and Endangered Species
    a. What are the current habitat conditions and trends for the threatened and endangered species found in the analysis area?
    b. What is the current role of habitat in the analysis area?
3. Special Status/Sensitive Species
    a. What are the current habitat conditions and trends for the special status/sensitive species found in the analysis area?
4. Survey and Manage Species
    a. What are the current habitat conditions and trends for the survey and manage species found in the analysis area?

Reference Conditions

1. Wildlife Habitat - General
    a. What was the historical relative abundance, condition and distribution of the various habitat types found in the analysis area?
2. Threatened and Endangered Species
    a. What was the historical acreage, condition and distribution of habitat for threatened and endangered species in the analysis area?
    b. What was the initial role of habitat for threatened and endangered species in the analysis area?
3. Special Status/Sensitive Species
    a. What was the historical amount, condition and distribution of habitat for the special status/sensitive species found in the analysis area?
4. Survey and Manage Species
    a. What was the historical amount, condition and distribution of habitat for the survey and manage species found in the analysis area?

Terrestrial Wildlife Species and Habitats continued

Synthesis and Interpretation

1. Wildlife Habitat - General
   b. What are the implications of natural and human caused change between historical and current relative abundance, condition and distribution of the various habitat types found in the analysis area?
2. Threatened and Endangered Species
   a. What are the implications of natural and human caused change between historical and current acreage, condition and distribution of northern spotted owl habitat in the analysis area?
   b. What are the implications of the change in role of the northern spotted owl critical habitat in the analysis area?
3. Special Status/Sensitive Species
   a. What are the implications of natural and human caused change between historical and current amounts, condition and distribution of habitat for the special status/sensitive species found in the analysis area?
4. Survey and Manage Species
   a. What are the implications of natural and human caused change between historical and current amounts, condition and distribution of habitat for the survey and manage species found in the analysis area?

HYDROLOGY

Characterization

1. What are the dominant hydrologic characteristics and other notable hydrologic features and processes in the analysis area?

Current Conditions

1. What are the current conditions and trends of the dominant hydrologic characteristics and features prevalent in the analysis area?

Reference Conditions

1. What were the historical hydrologic characteristics and features in the analysis area?

Synthesis and Interpretation

1. What are the natural and human causes of change between historical and current hydrologic conditions?
2. What are the influences and relationships between hydrologic processes and other ecosystem processes?

STREAM CHANNEL

Characterization

1. What are the basic morphological characteristics of stream valleys or segments and the general sediment transport and deposition processes in the analysis area?

Stream Channel continued

Current Conditions

1. What are the current conditions and trends of stream channel types and sediment transport and deposition processes prevalent in the analysis area?

Reference Conditions

1. What were the historical morphological characteristics of stream valleys and general sediment transport and deposition processes in the analysis area?

Synthesis and Interpretation

1. What are the natural and human causes of change between historical and current channel conditions?
2. What are the influences and relationships between channel conditions and other ecosystem processes in the analysis area?

WATER QUALITY

Characterization

1. What beneficial uses dependent on aquatic resources occur in the analysis area?
2. Which water quality parameters are critical to these uses?

Current Conditions

1. What are the current conditions and trends of beneficial uses and associated water quality parameters?

Reference Conditions

1. What were the historical water quality characteristics of the analysis area?

Synthesis and Interpretation

1. What are the natural and human causes of change between historical and current water quality conditions?
2. What are the influences and relationships between water quality and other ecosystem processes in the analysis area?

RIPARIAN AREAS

Characterization

1. What is the array and landscape pattern of plant communities in the riparian areas?
2. What processes caused these patterns?
3. What riparian-dependent species are present in the analysis area?
4. What are the general distribution and character of their habitats?

Current Conditions

1. What is the current species composition of riparian areas?
2. What are the current conditions and trends of riparian areas?
3. Where are sensitive areas and what are the reasons for sensitivity?
4. What are the current conditions and trends of riparian habitat for riparian-dependent species?

Riparian Areas continued

Reference Conditions

1. What was the historical condition of riparian areas?
2. What was the historical species composition of riparian areas?
3. What was the historical distribution and abundance of riparian-dependent wildlife species (community)?

Synthesis and Interpretation

1. What are the natural analysis area characteristics and human activities influencing riparian areas and riparian-dependent species?
2. How have these characteristics and activities influenced or changed riparian areas and habitat for riparian-dependent species?
3. What is the effect of riparian condition on instream habitat?
4. What are the influences and relationships between riparian areas and other ecosystem processes in the analysis area?

AQUATIC WILDLIFE SPECIES AND HABITATS

Characterization

1. Habitat
   b. What is the distribution and character of aquatic habitat throughout the analysis area, especially for threatened and endangered, special status, and sensitive species?
2. Species
   a. What are the relative abundance and distribution of threatened and endangered aquatic wildlife species?
   b. What are the relative abundance and distribution of special status/sensitive aquatic wildlife species?
   c. What are the relative abundance and distribution of other aquatic wildlife species present in the analysis area?

Current Conditions

1. Habitat
   a. What are the current conditions and trends of instream habitat (e.g., quantity and quality) throughout the analysis area?
   b. What are the current conditions and trends for specific habitat needs of threatened and endangered, special status, and sensitive species?
2. Relationship of Subbasin Habitat with Rogue Basin
   a. How does instream habitat in the West Bear Creek Watershed Analysis Area fit into the "big habitat picture" for the Rogue Basin threatened and endangered fish stocks?
   b. How does instream habitat in the West Bear Creek Watershed Analysis Area fit into the "big habitat picture" for the Rogue Basin special status/sensitive fish stocks?

Aquatic Wildlife Species and Habitats continued

Reference Conditions

1. Habitat
   a. What was the historical condition and distribution of instream habitats throughout the analysis area?
   b. What was the historical condition and distribution of instream habitats specific to threatened and endangered and special status/sensitive species?
2. Species
   a. What was the historical relative abundance and distribution of threatened and endangered species in the analysis area?
   b. What was the historical relative abundance and distribution of special status/sensitive species in the analysis area?

Synthesis and Interpretation

1. Habitat
   a. What are the natural analysis area characteristics and human activities influencing species distribution and instream habitat condition?
   b. How have these characteristics and activities influenced or changed instream habitat condition, in general and specifically for threatened and endangered and special status/sensitive species?
2. Species
   a. How have changes in habitat condition influenced West Bear Creek threatened and endangered and special status/sensitive aquatic species?
   b. What are the limiting factors for long-term sustainability of threatened and endangered and special status/sensitive aquatic species?
3. Ecosystem Processes
   a. What are the influences and relationships of aquatic species and their habitats with other ecosystem processes in the analysis area?

WATERSHED CHARACTERIZATION

The Characterization section identifies the dominant physical, biological, and human processes or features of the analysis area that affect ecosystem functions or conditions. The watershed analysis team identified the relevant land allocations and the most important plan objectives and regulatory constraints that influence resource management in this analysis area.

INTRODUCTION

The South Rogue-Gold Hill Watershed Analysis Area is located in the Klamath Mountains in southwestern Oregon. The analysis area lies south of the Rogue River between Bear Creek and Evans Creek. The southern ridges form the divide between the Middle Rogue and Applegate River Subbasins. The South Rogue-Gold Hill Watershed Analysis Area is located in the Middle Rogue River Subbasin (Map 1). The major streams in the analysis area are Kane Creek, Galls Creek, Millers Gulch, Foots Creek, and Birdseye Creek.

The South Rogue-Gold Hill Watershed Analysis Area is within Jackson County and covers lands south of the towns of Rogue River and Gold Hill. Some of the peaks that define the southern edge of the analysis area include Timber Mountain and Old Blue Mountain. The analysis area covers 64 square miles (59,566 acres). The towns of Rogue River and Gold Hill and just north of the analysis area. Elevation in the analysis area ranges from approximately 1,000 feet where the west edge of the analysis area intersects the Rogue River to 4,430 feet at Timber Mountain.

Land Ownership

Land ownership is a mix of public and private (Table 1 and Map 2). The Bureau of Land Management (BLM) manages 15,495 acres within the analysis area. Private lands account for 25,534 acres in the analysis area. Private lands not owned by major timber companies are found along the major streams in the analysis area. BLM parcels are distributed throughout the analysis area. Boise Cascade Corporation and Rough and Ready Lumber Company are significant landowners in the southern portion of the analysis area.

Table 1. Land Ownership

Ownership	Acres	Percent of Analysis area
Bureau of Land Management (BLM), Medford District, Ashland Resource Area	15,495	38
Private	25,534	62
Total	41,029	100

Federal Land Allocations

Federal land use allocations in the analysis area are shown in Table 2 and Map 3. Objectives and management actions/directions for these land use allocations are found in the *Medford District Resource Management Plan* (USDI, BLM 1995:24-40).

Table 2. Federal Land Allocations

Federal Land Allocations	Acres
Late-Successional Reserve	300
Riparian Reserves (estimated)[1]	4,208
Matrix	15,195
John's Peak/Timber Mountain OHV Area	Unknown[2]

1/ Riparian Reserves occur across all land allocations.
2/ The Timber Mountain Recreation Area Management Plan will determine the scope of this area.

HUMAN USES

People use the South Rogue-Gold Hill Watershed Analysis Area for habitation as well as a variety of recreational and economic purposes. From old Highway 99, which crosses the northern boundary of the analysis area, four county roads travel south along the stream valleys resulting in an urban/agriculture corridor along the major streams. Urban or agricultural developments account for only 10 percent of the analysis area. Privately owned residences, hobby farms, and agricultural lands are primarily concentrated along the major streams in the analysis area. Logging and timber harvest occur on public and private lands in the higher elevations.

Regional public issues reflect the dominant uses of the analysis area. Recreational concerns include the loss of historically used trails due to encroaching woodland development and the widespread use of off-highway vehicles (OHVs). Other issues include the loss of open areas due to development, the general degradation of the natural environment, poor water quality, and the lack of good fish habitat. In addition, there are a number of regional issues that are reflected in local concerns for this analysis area. Air quality, which has been a problem in the past, has improved in recent years. Urban interface issues include concerns about wildfire, fire protection, and smoke; concerns over low water flows in local streams due to irrigation withdrawals; the spread of noxious weeds; and timber harvest. Rapid population growth and the development associated with it has exacerbated many of these concerns.

Native American Tribes

The analysis area was formerly inhabited by the Takelma Indians, with the Shasta Indians and the Klamath Tribe also utilizing the area. Surviving Takelma and Shasta were removed from the analysis area at the end of the Rogue Indian Wars in 1856. The Takelma, and some Shasta, were taken to reservations in northern Oregon. The descendants of these tribes are members of two federally recognized tribes: the Confederated Tribes of Grand Ronde and the Confederated Tribes of Siletz. Shasta natives also managed to survive in northern California and descendants are part of the federally recognized Quartz Valley Rancheria.

There are no treaty reserved rights in the analysis area. However, descendants of the Takelma and the Shasta, and the tribal groups to which they belong today, are active in promoting the heritage and current welfare of their members. These groups take a strong interest in the management of their native lands. Traditional use areas, as well as archaeological sites reflecting these peoples' history, may occur within the analysis area. The Confederated Tribes of Grand Ronde and the Confederated Tribes of Siletz, the Cow Creek Band of the Umpquas, and the Shasta are concerned with the management of such locations anywhere in this analysis area.

Transportation System

Roads in the analysis area are owned or managed by the BLM, timber companies, Jackson County, and many private landowners. Major roads within the analysis area include Old Stage, Birdseye Creek, Foots Creek, Galls Creek, and Kane Creek roads (Map 4). Travel routes in the analysis area are used by cars, trucks, heavy equipment, motorcycles, bicycles, horses, pedestrians, and other modes of transportation. These routes are used for recreation, resource management, and private property access. The BLM provides a transportation system for many different recreation experiences and management opportunities.

Three road surface types are found on BLM roads: bituminous (asphalt), rocked, and natural (no surface protection). Main access roads usually have a bituminous surface, but may have a crushed rock surface. Roads off main access roads usually have a crushed rock surface, and dead end spurs generally have a natural surface. Adequately surfaced roads generally allow for year-round travel and reduce soil erosion, which helps to minimize stream sedimentation. There are developed quarries on private and federal land in the analysis area where rock may be obtained for surfacing roads and drainage protection. The BLM obtains water from developed water sources in the analysis area for road operations such as surfacing and dust abatement.

Road planning, location, design, construction, use, and maintenance are conducted with the goal of meeting transportation objectives while protecting resources. Best Management Practices from the *Medford District Resource Management Plan* (USDI, BLM 1995:149-177) provide guidance for resource protection.

CLIMATE

Mild, wet winters and hot, dry summers characterize the South Rogue-Gold Hill Watershed Analysis Area. During the winter months, the moist, westerly flow of air from the Pacific Ocean results in frequent storms of varied intensities. Average annual precipitation in the analysis area ranges from approximately 24 inches at the lower elevations to 36 inches at the higher elevations in the western portion of the analysis area (Map 5). There are two precipitation zones in the analysis area: rainfall and rain-on-snow zones (Table 3, Map 6). None of the analysis area is within the snow zone. Winter precipitation is predominately in the form of rain, with the majority occurring in the late fall, winter, and early spring. A mixture of snow and rain occurs between approximately 3,500 feet and 5,000 feet and this area is referred to as either the rain-on-snow zone or transient snow zone. The snow level in this zone fluctuates throughout the winter in response to alternating warm and cold fronts. The rain-on-snow zone comprises a very small portion (three percent) of the analysis area.

Table 3. Precipitation Zone Distribution by Analysis Subwatershed

Analysis Subwatershed	Rainfall Zone (<3,500 ft.) (percent)	Rain-on-Snow Zone (3,500 - 5,000 ft.) (percent)
Kane Creek	99	1
Galls Creek	92	8
Millers Gulch & frontals	100	0
Foots Creek	97	3
Birdseye Creek & frontals	98	2
Totals for South Rogue-Gold Hill Analysis Area	97	3

Source: Medford BLM Geographical Information System (GIS)

There are two National Oceanic and Atmospheric Administration (NOAA) weather stations adjacent to the analysis area: one is the Medford Experiment Station (elevation 1,457 ft.), located southeast of the analysis area and the other is in the city of Grants Pass (elevation 925 ft.), located northwest of the analysis area. The majority of precipitation (66-76 percent of the yearly total) falls during November through March (Table 4). Annual precipitation can fluctuate widely from year-to-year. The 30-year average (normal) annual precipitation at the Medford Experiment Station is 21.22 inches and at the Grants Pass station it is 31.12 inches (Oregon Climate Service 2000).

Table 4. Precipitation at NOAA Stations - Monthly Means for 1961-1990

NOAA Station	Precipitation (inches)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Medford Exp.	2.87	2.05	2.09	1.38	1.11	0.77	0.29	0.61	1.03	1.68	3.34	3.64
Grants Pass	5.17	3.82	3.52	1.80	1.16	0.51	0.22	0.48	0.90	2.45	5.31	5.69

Source: Oregon Climate Service 2000

During the summer months, the area is dominated by the Pacific high pressure system, which results in hot, dry summers. Summer rainstorms occur occasionally and are usually of short duration and limited area coverage. The nearest NOAA weather stations with air temperature data are located at the Medford Experiment Station and Grants Pass (Tables 5 and 6).

Table 5. Average Monthly Max, Min, and Mean Air Temperatures at Medford Experiment Station (NOAA) (1961-1990)

	Air Temperature (°F)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Max	46.2	53.6	58.6	65.0	73.0	81.4	88.8	88.3	81.5	68.3	52.6	45.1	66.9
Min	30.1	32.0	34.3	36.5	41.3	47.7	50.6	50.7	44.2	37.7	34.6	30.9	39.3
Mean	38.2	42.8	46.4	50.8	57.1	64.5	69.7	69.5	62.9	53.0	43.6	38.0	53.1

Source: Oregon Climate Service 2000

Table 6. Average Monthly Max, Min, and Mean Air Temperatures at Grants Pass (NOAA) (1961-1990)

	Air Temperature (°F)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Max	47.6	54.9	60.5	67.0	74.7	83.0	90.1	89.8	83.1	70.0	53.8	46.3	68.3
Min	32.7	34.4	36.0	38.4	43.6	49.7	53.1	52.7	46.7	41.2	37.9	33.6	41.7
Mean	40.2	44.6	48.3	52.7	59.1	66.3	71.6	71.3	64.9	55.6	45.9	39.9	55.0

Source: Oregon Climate Service 2000

Current climatic patterns need to be viewed with a long-term perspective. Based on tree-ring growth rates and recorded meteorological data, the past 200 to 300 years have been marked by cycles of hot, dry spells and temperate-to-cool weather that have lasted varying periods of time (LaLande 1995).

GEOLOGY

The South Rogue-Gold Hill Analysis Area straddles the contact between the eastern edge of the Klamath Mountains Geologic Province (also called the Siskiyou Mountains), and the Western Oregon Interior Valleys (physiographic) Province. The geology of the analysis area can be briefly described as eroding metamorphic and granitic uplands with minor amounts of sedimentary deposits draping the lower slopes (Map 7, Appendix B).

The Klamath Province consists of adjacent belts of rock that in a curved fashion, roughly parallel the coastline of northern California and southern Oregon. These belts are progressively younger as they approach the coast, ranging in age from 350 to 153 million years. They consist of a complex collection of collapsed, back-arc basins and accreted terrains, with the older of any two adjacent belts thrust faulted over the top of the younger (this is an anomalous situation in that worldwide, younger rocks are generally on top of older rocks). Each of these belts was originally a section of ocean crust approximately 7 kilometers (+4 miles) in thickness. In the analysis area, only one of these belts is present. After attachment to North America these plates were intruded by granite.

Geologic History

The Origin of Granite and Precious Metal Deposits in the Analysis Area

Below all active volcanoes is a chamber that contains vast quantities (ten to 30 cubic miles) of molten rock derived from subducted ocean floors that have melted. Some of this magma rises to the surface to erupt from the volcano, but the vast majority will stay beneath the surface in the magma chamber. As time passes and the magma chamber cools, crystals form. The many different types of crystals form at different temperatures. Rock forming minerals rich in iron crystallize at temperatures as high as 1200°C. Lighter crystals such as quartz may not form until temperatures decrease to 700°C.

As these initial iron-rich minerals crystallize in this molten soup, they sink to the bottom of the magma chamber. This depletes the amount of heavy elements remaining as molten material. As this process continues, the characteristics of the molten rock within the magma chamber changes from a very fluid iron-rich, basalt-like magma to a thicker, lighter-colored andesite-like magma. Gases (water) and elements (gold, mercury, copper) not used by the initial crystals are concentrated in the remaining molten rock. When the magma chamber is almost completely solidified, the remaining liquid containing quartz, gold, mercury, and copper is squeezed out into the overlying and surrounding rock, depositing quartz veins that may contain precious minerals. All of the hard-rock precious-mineral deposits in the analysis area were formed in this way. When the entire magma chamber solidifies and the overlying volcano erodes away, the remaining rock mass is a granite.

Throughout much of the last 150 million years, this area was relatively flat. Relief was gentle and was likely characterized by broad flood plains, with a few large meandering rivers, and rolling hills. Starting about 14 million years ago and continuing through the present, the area around the analysis area was uplifted. The uplift was centered under Condrey Mountain, to the south and west, on the Rogue and Klamath River Divide, and is referred to in geologic literature as the Condrey Mountain Dome (CMD). The CMD was uplifted a minimum of 7 km (+23,000 feet) in elevation. As this uplift progressed the surrounding area, including the analysis area, also rose and/or tilted, though to a much lesser degree.

With this great increase in relief, the 7-km thick belt of rock quickly eroded away. Erosion removed over 20,000 vertical feet of rock. This great volume of material resulted in sediment-choked braided streams in the Bear Creek, Williams and Illinois Valleys. Deposits left by these braided streams are referred to as Tertiary non-marine sandstones (Tn). Preserved braided stream deposits, like these, are rarely preserved in the geologic record. Due to decreased sediment inputs, Bear Creek is no longer a braided stream. Fish, wildlife and fauna evolved in this sediment-rich regime. Tertiary non-marine sandstone is the oldest stream sediment in the Bear Creek Valley, and may record the initiation of the Bear Creek drainage system.

The uplift of the Condrey Mountain Dome occurred in periodic events. This intermittent uplift is thought to continue today, though at a much slower rate. Raveling, earthflows, debris torrents and glaciers acted as the dominant forms of mass wasting and sculpted the present day watershed.

Faults and Earthquakes

Although there are many faults in the analysis area, none are considered active. Though inactive, they helped carve the present landscape. When faults move, rock on either side of the fault is crushed. Drainage systems superimposed on the analysis area preferentially follow faults due to the erodability of crushed rock. Many of the creeks in the analysis area are structurally (fault) controlled including Kane, Galls, Birdseye and Foots Creeks.

Recent studies indicate that every 300 to 450 years an extremely large earthquake occurs near the Pacific Northwest coast that has the potential to affect the analysis area. Ocean floor is continuously sliding beneath the Pacific Northwest at a rate of 1.6 inches each year. It is also moving toward the coast at the same rate. However, near the coast the ocean floor does not move continuously, but sticks, causing stress to build up for long periods until it is released all at once in an earthquake as large as 9.2 in magnitude. A 9.2 magnitude quake would shake continuously for 3-to-5 minutes.

A worst-case quake of this size might not have a single center of shaking. It is thought that the entire Cascadia Subduction Zone along the coast from northern California to Canada would move, with strong shaking expected along the full 800-mile-length of the I-5 corridor from British Columbia to northern California. Evidence indicates the last great Pacific Northwest quake occurred in 1700 AD. Geologists predict that another will occur within the next several hundred years.

Rock Types and Soils present in the Analysis Area

The geologic materials have been subject to weathering, mass wasting and erosion processes controlled by past and present climatic conditions. Landforms in the analysis area visible today are the result of continual interactions between climate and regional geology over eons of time. The various types of rock distributed throughout the watershed affect soils. Different mineralogy, structures, inherent strength of the bedrock, and resistance to erosion and mass wasting influence the landforms. Metamorphic and granitic rock and their associated soils are the predominant rock and soil types found in the analysis area (Maps 7 and 8).

Metamorphic Rocks and Associated Soils

Metamorphic rock types make up over 78 percent of the analysis area. Metasedimentary and metavolcanic rocks (**TrPzs** and **TrPv** on Map 7) found in the watershed are relatively resistant to erosion, and for this reason they are often found on steep slopes. Soils on these types of rock are shallow, composed of silts and clays with variable amounts of rock fragments. Generally, the upper fractured bedrock has only a thin weathering zone.

Metasedimentary and metavolcanic rock forms a very dense, tight formation as a result of interlocking crystals in the original sediments and lava flows, and low grade metamorphism. Unlike granitic intrusions that form miles below the earth’s surface, lava flows and sediments are in a pressure and temperature environment much closer to those under which they were formed (atmospheric). As a result, they are more resistant to weathering and erosion. This, coupled with their position in the lower precipitation zone of the watershed, leads to the rugged relief of the metavolcanics.

Granitic Rocks and Associated Soils

Granitic rocks (KJg) constitute less than eight percent of the analysis area and are the most erosive and unstable rocktype found in the analysis area. Soils derived from granite are the Tallowbox and Shefflein soils (Appendix C). Soils formed from granitic rock are generally moderately deep over decomposed bedrock and are highly erosive because of low cohesive coarse textured particles. Rapid erosion on steep slopes keeps fresh granite near the surface, while transported decomposed granite (DG) increases embeddedness of streams by filling interstices (space between stream gravels) with coarse sand.

Throughout the analysis area, granite is found as discontinuous pods (less than two square miles each) in the headwaters of Kane Creek, midslope along Galls Creek, the headwaters of the Left and Middle Forks of Foots Creek, midslope of Right Fork of Foots Creek and the headwaters of Birdseye Creeks (Map 7).

All of these outliers of granitic outcrops are parts of the Grey Back belt, which was intruded into the overlying metamorphic rocks during the Late Jurassic (153 million years ago), and are probably connected below the present surface of the Earth.

Soils formed from granitic rock are generally moderately deep over decomposed bedrock and are highly erosive because of low cohesive coarse textured particles. Rapid erosion on steep slopes keeps fresh granite near the surface, while transported DG increases embeddedness of streams by filling interstices (space between stream gravels) with coarse sand.

Soil Development

The interactions, through time, of climate, living organisms, parent materials, and topographical relief resulted in soil development. Precipitation and temperature are the most important climatic factors affecting soil development. The Mediterranean-like climate of the analysis area is characterized by hot, dry summers and cool, moist winters. The soil temperature regime in the analysis area is mesic with mean annual soil temperatures averages 8^{o} C or more, but less than 15^{o} C. This moderate temperature range is conducive to an active biologic soil community.

By 10,000 years ago, glaciers had disappeared, and the warm dry climate of the Holocene Epoch began. Wet climatic periods caused the soil to move down the landscape resulting in discontinuity of depth. Most of the early soil that originally formed on hill slopes was moved by water to the valley floor. As the valley floor began to fill with soil, it created a base for soil to accumulate on the mountain toe slopes and side slope depressions. The soils and topography that formed in this analysis area were directly influenced by the weatherability of the parent material. The soils in areas that receive a greater amount of precipitation tend to be moderately deep and well developed due to the interacting influences of the basic mineralogy of the parent material and the accumulation of organic matter. Soils formed from granitic rock are generally moderately deep over decomposed bedrock and are highly erosive because of low cohesion (lack of clay to hold mineral particles together).

EROSION PROCESSES

There are three main erosion processes in the Analysis Area: mass wasting, surface erosion, and channel cutting. Though mass wasting and surface erosion are responsible for the majority of annual sediment transport to streams in the analysis area, these processes are of minor concern except in isolated areas. Areas of concern for erosion are those that are found on granitic rocktypes, i.e., Tallowbox-Shefflein soil types.

Mass Wasting

Mass wasting is a term for describing a wide variety of processes that involve natural or human-caused downslope movement of masses of soil and rock material. The term "landslide" is commonly used as a blanket term that covers several modes of slope instability (Haneberg and Sims 1995). When these processes are active, as they were during the January 1997 storm, large adjustments in stream channels and hillslopes can occur (Haneburg and Sims 1995). Landslides can transport material rapidly as in the case of debris torrents, or occur slowly as with earthflows or creep movement. These mass wasting events often cause adverse impacts to fish habitat by depositing large volumes of sediment into the streams. Roads, bridges, and culverts are often damaged when major flood events, such as the 1964, 1974, and 1997 floods, trigger landslides. No landslides were reported in the analysis area following the1997 flood.

In the headwaters of intermittent streams, erosion is continually moving sediment from hillsides into debris-filled draws. As this material is piled deeper and deeper, it eventually becomes unstable. During a heavy rain, like the 1997 event, the slug of material may move in any of the forms of a landslide (slump, rotational slump, etc.). If conditions are right (i.e., excess water and/or slope) the material often undergoes a "phase change." Landslides, for example, become debris flows, which then become wood-charged debris torrents.

As the slug of debris starts moving, its speed and momentum increase rapidly. The disturbance cascades down the stream channel incorporating into itself all material in and adjacent to the channel, including full-grown trees and their roots. Debris flows can reach speeds of 60 km/h. This is a cyclical phenomenon, and given time channels heal, re-fill with debris and fail again. Virtually all mountain streams should be considered debris-flow paths.

Surface Erosion

Surface erosion is the detachment and transport of individual soil particles or small aggregates from the land surface (Satterlund and Adams 1992). It is caused by the action of rain-drops and surface runoff. Surface erosion can move soil particles a small distance or transport large volumes of sediment to streams every year. It may remove soil in more or less thin layers (sheet erosion), in rills, or in gullies. Rills and gullies occur most often when surface water runoff is concentrated and confined into narrow spaces, especially on coarse-grained soils. On steep, dry slopes, gravity alone may be sufficient to cause movement (ravel) (Satterlund and Adams 1992). Surface erosion generally occurs in areas where roads, fire, timber harvesting, grazing, or land development exposes bare soil. The largest volumes of sediment are moved during intense, long-duration storms. The main factors influencing surface erosion in the analysis area are high intensity storms and granitic soil types (Map 8).

Channel Cutting

Channel cutting is the detachment and movement of material from a stream channel. It may result from the movement of individual particles, as in shifting grains of sand in bars, or from mass movement, as when a large part of an undercut bank falls and is swept downstream (Satterlund and Adams 1992). The main factors influencing channel cutting in the analysis area are high intensity storms, rain-on-snow events and high water velocities.

SOIL PRODUCTIVITY

Soil in the analysis area serves two important functions: it is the primary medium for most vegetative life, and it filters and stores water that is slowly released into the nearby stream courses.

Soil productivity is the capability of a soil to produce a specified plant or sequence of plants under specific management (USDA 1993). Soil productivity of forest lands is largely defined in terms of site quality, which is measured by the volume of timber the land can produce in a given time. Site quality within a given microclimate is associated with the soil's capacity to provide moisture and nutrients. The soil's ability to provide moisture is dependent on the texture, depth, and rock fragment content in the rooting zone. The soil's ability to provide nutrients necessary for plant growth is dependent on soil organisms and organic matter content. Beneficial soil organisms control many biological processes within the soil, such as organic matter decomposition, nitrogen fixation, and plant nutrient uptake (Amaranthus et al. 1989). A cool, moist environment with an abundance of suitable organic matter encourages the growth and productivity of these organisms. Surface duff and woody material insulate the soil layer and keep soil conditions cool and moist. Therefore, the depth of surface duff and the abundance of downed woody material is a good indication of site productivity.

The climate also affects duff thickness. The organic matter derived from deciduous trees and shrubs decomposes readily under the influence of warm temperatures in the valley. As a result, plant nutrients are more rapidly recycled. Thin duff thickness in conjunction with an ample source of deciduous material indicates the presence of an active and healthy biologic soil community which is converting plant litter into nutrients for plant uptake. Precipitation and temperature are the most important climatic factors affecting soil development. The amount of precipitation is not high enough in this area to result in excessive leaching of bases out of the soil profile; consequently, nutrients are retained on site for plant uptake.

LANDSCAPE VEGETATION PATTERN

The present day vegetation pattern across the analysis area landscape results from the dynamic processes of nature and human influences over time. As a consequence, the variation and scales of landscape components are innumerable.

Landscape ecological analysis and design have been brought to the forefront of natural resource management with the concept of ecosystem-based management. Landscapes are thought of as aggregates of similar patches of vegetation and landforms that originate through climatic influences, geomorphic processes, natural disturbances, human activities, and plant succession (Forman and Godron 1986). Diaz and Apostol (1992) describe landscapes as having three elements: matrix, patches, and corridors. Matrix is defined as the most contiguous vegetation type. Patches are areas of vegetation that are similar internally, but differ from the vegetation surrounding them. Corridors are landscape elements that connect similar patches through a dissimilar matrix or aggregation of patches. Ecological analysis of the landscape considers the processes that form the landscape patterns, the arrangement and extent of various vegetative types, and the three-dimensional shape of the land, along with causes and rates of change.

Studies of the landscape vegetation pattern from the Western Oregon Digital Image Project’s satellite data (WODIP)(Pacer Infotec Inc. and USDI 1998) shows that 77 percent of the watershed analysis area has a forest land matrix (Map 9, Table 7). Patches of grassland and/or shrubs are scattered throughout the forest. The patches of non-forest vegetation indicate hot, dry areas with perhaps shallow soils that are not conducive for growing coniferous trees. Across the landscape, the forest matrix is extremely variable in size and species composition as influenced by topography, aspect changes, soil differences, plant succession, and the edge effect between the different vegetation types. Natural disturbances such as fire, windthrow, and bark beetles along with human activity have also contributed to the forest stand variability. The result of these factors is an extreme richness in the number of forest landscape elements.

The vegetation pattern becomes more complex when more structural components are included in the analysis. A variable vegetation pattern is the result of different vegetation diameter and height classes, topoedaphic influences, and disturbances. The satellite imagery map (Map 9, Table 7) categorizes the vegetation into various vegetation types, size classes, and levels of canopy closure.

Old Highway 99 crosses the northern boundary of the analysis area. From this highway, four county roads travel south along the stream valleys, resulting in an urban/agriculture corridor across the landscape (10 percent of the analysis area). Some clearcutting has occurred on each road system, mostly in the southern portion of the analysis area.

Table 7. Structural Components by Vegetation Classification

Vegetation Classification	Percent of Analysis area	Description			
Urban/Agriculture	10	Cities, Towns, Villages, Farm Lands, Cattle, Llamas			
Grass/Non-forest	13	Grasslands and Shrublands			
Hardwoods	17	Defined as all hardwoods regardless of size or canopy closure.			
		DBH[1]	**Vegetation Type**	**Structure**	**% Canopy Closure**
Seedlings/Poles	24	<10"	conifer & mixed	all stories	all closures
Large Poles	25	10-19"	conifer & mixed	all stories	all closures
Mature/Old-growth	11	>20"	conifer & mixed	all stories	<65
		>20"	conifer & mixed	1 story	≥ 65
		>20"	conifer & mixed	2 story	≥ 65
		>30"	conifer & mixed	2 story	≥ 65

1/ Diameter at Breast Height Source: Western Oregon Digital Image Processing

Vegetation Classification

The vegetation of the South Rogue-Gold Hill Watershed Analysis Area is extremely diverse. This diversity applies to the many plant communities that are present and the interactions of the organisms which compose these communities. Franklin and Dyrness (1973) classify the vegetation of the analysis area as being in the Interior Valley zone. The classification system is based on elevation, temperature, and moisture. At a lower level of dichotomy, Atzet and McCrimmon (1990) describe plant associations within the forest zones. East to west facing slopes typically have pine tree series plant associations, especially in the lower elevations. Northwest to northeast facing slopes have Douglas-fir tree series plant associations. The most common plant associations include Douglas-fir (PSME)/Poison Oak (RHDI); PSME/RHDI - Piper's Oregon grape (BEPI); PSME/Dwarf Oregon grape (BENE); Ponderosa pine (PIPO) - California black oak (QUKE); and PIPO - PSME.

The vegetation condition classes listed in Table 8 are defined in the Medford District Watershed Analysis Guidelines (USDI 1994). These classes describe the vegetation type or form, and the tree size classes are described by diameter classes. The map of these vegetation condition classes

(Map 9) is derived from BLM Micro*Storms/GIS data. At this time data is only available for BLM administered lands and a data gap exists for private lands.

Table 8. Vegetation Condition classes for BLM-Administered Land

Vegetation Condition Classes	Percent of BLM Land
Grass, Forb, Herbaceous	1
Shrub, Non-forest Land	1
Hardwood/Woodland	29
Early (0 to 5 years) and Seedlings/Saplings (0 to 4.9 inches DBH)	9
Pole (5 to 11 inches DBH)	14
Mid (Large Poles, 11 to 21 inches DBH)	27
Mature/Old-Growth (21^{+} inches DBH)	19

Major Processes Influencing the Landscape Pattern
The analysis area appears to have a frequent fire return interval. There are many young, even-aged, single-storied forest stands that are 52 to 79 years of age. There is also a 75 to 109 age class forest. The last big fire occurred in 1987, so the fire return interval could be as frequent as 40 to 60 years.

During the last decade, drought in combination with stand overstocking has contributed to low tree vigor across the entire forest landscape. As a result, bark beetles have killed thousands of trees across the landscape. The Douglas-fir bark beetle (Dendroctonus pseudotsugae) has killed Douglas-fir trees mostly along the edges of the drier oak woodlands, and the Western pine beetle (Dendroctonus brevicomis) has killed large diameter ponderosa pines across the landscape.

Other processes influencing the landscape pattern include fire suppression, wind, and forest pathogens. Fire suppression has allowed plant communities to progress towards climax conditions, i.e. the last successional stage of a plant community. All of these processes are slowly shifting the forests from the stem exclusion stage to the understory reinitiation stage and old-growth stages of forest stand development.

Timber harvesting has effected the landscape vegetation pattern mostly in the southern portion of the watershed analysis area on a small scale. Twenty-four percent of the analysis area has seedlings through pole sized trees as a result of fires and timber harvesting.

PLANT SPECIES AND HABITATS

Introduced Plant Species and Noxious Weeds
Only a portion of the analysis area has been formally inventoried for introduced plants and noxious weeds. Through these inventories and casual observation, it is recognized that most introduced plants and noxious weeds occur on the valley floor and foothills. Not coincidentally,

it is these areas that have experienced the greatest human disturbance. These plants occur less frequently in the upper reaches of the watershed but still associated with human activities. The human activities that expose mineral soil produce the conditions most apt to be invaded by introduced plants and noxious weeds. Past human activities that produced favorable conditions for introduced plants and noxious weeds have been land clearing for agricultural or urban purposes, transportation system development, logging, mining, overgrazing, and off-highway vehicle use.

Noxious weeds, as defined by the Oregon State Weed Board, are plants that are injurious to public health, agriculture, recreation, wildlife, or any public or private property and as such have been declared a menace to public welfare. These plants are usually, but not necessarily, introduced species. Noxious weeds are classified as either 1) Target weeds, 2) “A” designated weeds, or 3) “B” designated weeds. Target weeds are priority weeds designated by the State Weed Board on which Oregon Department of Agriculture (ODA) will implement a statewide management plan. “A” designated weeds are species of known economic importance occurring in Oregon in small enough infestations to make eradication or containment possible. Economic importance is based on the plants potential to cause detrimental effects to agricultural and/or horticultural industries, native flora and fauna, recreational areas, or is harmful to humans and animals.

Weeds on the “A” list also include those not known to occur in Oregon but their presence in neighboring states makes their future occurrence imminent. Infestations of “A” list weeds are subject to intensive control when found. “B” designated weeds are weeds of economic importance that are regionally abundant but with limited distribution in some counties. “B” list weeds are subject to intensive control at the state or county level as determined on a case-by-case basis.

Introduced plants and noxious weeds have the potential to affect ecological processes of a natural community. These influences will generally produce undesirable effects to the native plant communities by altering structure and composition. The natural biodiversity will be reduced and often is replaced by a monotypic weed community. These infestations can reduce the productivity of agronomic, range, and forestry systems by utilizing resources such as water, light, and soil nutrients. A list of introduced plants and noxious weeds known to occur in the analysis area is in Appendix D.

The following laws, regulations, and policies guide the management of noxious weeds and introduced plant species:

- Federal Noxious Weed Act of 1974, as amended by Section 15-Management of Undesirable Plants on Federal Lands (1990).
- Federal Land Policy and Management Act of 1976
- Executive Order 13112 - Invasive Species (February 3, 1999)
- BLM Manual 517 - Use of Pesticides
- BLM Manual 609 - Control of Undesirable or Noxious Weeds
- BLM Manual 9011 - Chemical Pest Control
- BLM Manual 9014 - Use of Biological Control Agents of Pests on Public Lands
- BLM Manual 9015 - Management and Coordination of Noxious Weed Activities
- BLM Manual 9220 - Implementation of Integrated Pest Management
- Noxious Weed Strategy for Oregon/Washington BLM (August 1994)

- Final Northwest Area Noxious Weed Control Program EIS (December 1995) and Supplement (March 1997)
- Medford District Integrated Weed Management Plan and Environmental Assessment (April 1998)
- Public Rangelands Improvement Act of 1978
- Carlson Foley Act of 1968
- Final Environmental Impact Statement for Vegetation Treatment on BLM lands in 13 Western States (1991)

Special Status Plant Species and Habitats
Thirty-nine populations (four species) of special status vascular plant species are known to exist in the South Rogue/Gold Hill Watershed Analysis Area. Special status plants are those species whose survival is of concern due to their limited distribution, low number of individuals or populations, and potential threats to their habitat. Generally, it is BLM policy to manage for the conservation of special status plants and their associated habitats and ensure that actions authorized, funded, or carried out do not contribute to the need to list any species as threatened or endangered. Many of these populations occur in the upper reaches of the watershed where there has been less disturbance and more suitable habitat exists. Rules, guidelines and recommendations for managing these species are addressed in the Endangered Species Act of 1973, Oregon Administrative Rule 603-073, and BLM Manual Section 6840.

Survey and Manage Plant Species and Habitats
Forty-five sites (four species) of Survey and Manage plants are known to exist in the West Bear Creek Watershed Analysis Area. Survey and Manage plant species include species of vascular plants, mosses, liverworts, hornworts, lichens, and fungi. Fungi are included in the plant group, however, taxonomically they are considered a separate kingdom. The standards and guidelines for these species are addressed in the Northwest Forest Plan (USDA and USDI 1994a) and are designed to benefit these species and their habitats.

Management recommendations have been developed for 12 species of vascular plants (BLM Instruction Memorandum (IM) OR-99-27), five species of bryophytes (IM OR-99-039), 29 species of lichens (IM OR-2000-042), and 151 species of fungi (IM OR-98-003). Draft management recommendations are being reviewed for 19 species of bryophytes (IM OR-97-027). Species without management recommendations would use information in Appendix J2 of the 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 (USDA and USDI 1994b).

FIRE AND AIR QUALITY
Fire is recognized within the Northwest Forest Plan as a key natural disturbance process throughout southwest Oregon (Atzet and Wheeler 1982). Human-caused and lightning fires have been a source of disturbance to the landscape for thousands of years. Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their culture (Pullen 1996). 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.

Fire Regimes
Climate and topography combine to create the two types of fire regimes in the analysis area. Fire regime is a broad term and is described as the frequency, severity and extent of fires occurring in an area (Agee, 1993). Vegetation types are helpful in delineating fire regimes. Using vegetation types as a basis for historic fire regime delineation, a low-severity and moderate severity fire regime were identified within this watershed analysis area (Map 10). These regimes are based on the affects of fire on the dominant vegetation.

Approximately 73 percent of the analysis area has been identified as having a low-severity fire regime. A low-severity regime is characterized by nearly continual summer drought. Fires are frequent (every 1-25 years), burn with low intensity, and are widespread. Typical vegetation types favored by a low-severity regime are grasslands, shrub lands, hardwoods and mixed hardwood and pine. These plant communities are adapted to recover rapidly from fire and are directly or indirectly dependent on fire for their continued persistence. The dominant trees within this regime are adapted to resist fire due to the thick bark they develop at a young age.

Approximately 27 percent of the analysis area has been identified as having a low-severity fire regime. This regime is associated with the mixed coniferous vegetation type. This regime is characterized by long summer dry periods with frequent fires (every 25- 100 years). This regime is the most difficult to characterize and is often located in a transitional position between low and high elevation forests. Fires burn with different degrees of intensity within this regime. Stand replacement fires as well as low intensity fires will occur depending on burning conditions. The overall effect of fire on the landscape is a mosaic burn.

Air Quality
Air quality is influenced by weather and emissions sources. Emission sources most likely to impact air quality at the watershed scale are summer fires in the region. Prescribed burning operations may produce local impacts to air quality during the fall, winter, and spring months.

TERRESTRIAL WILDLIFE SPECIES AND HABITATS

The South Rogue-Gold Hill Watershed Analysis Area is comprised of the following natural plant communities as described by Brown (1985): grass-forb dry hillside, mountain shrubland and chaparral, deciduous hardwood, and mixed coniferous forest. Cropland and orchards are present on private lands in the lower elevations. These habitats support approximately 230 species of terrestrial vertebrate wildlife species that are known or suspected to be present in the analysis area. This total includes both resident and migrant species. Species that are representative of the above-mentioned habitats include the following:

Grass-Forb Dry Hillside: gopher snake, western meadowlark, California ground squirrel
Mountain Shrubland and Chaparral: western fence lizard, wrentit, dusky-footed woodrat
Deciduous Hardwood Forest: ringneck snake, acorn woodpecker, western gray squirrel
Mixed Conifer Forest
Seedling/Sapling: northwestern garter snake, mountain quail, pocket gopher
Pole (5-11" Diameter at Breast Height (DBH)): alligator lizard, golden-crowned kinglet, porcupine
Mid Seral (11-21" DBH): ensatina, Steller's jay, cougar
Mature/Old-Growth (21+" DBH): northern spotted owl, northern flying squirrel

Refer to the Landscape Vegetation Pattern section for the relative abundance of the habitats/vegetative condition classes, and a description of their distribution on the landscape.

Special Status Species
The only special status species of management concern known to be present in the analysis area are the northern spotted owl, a species listed as threatened under the auspices of the Endangered Species Act of 1973, as amended, and the great gray owl. There are four known owl sites and approximately 4,220 acres of suitable spotted owl habitat are present on BLM managed land in the analysis area (Map 11). Suitable habitat data for private land is not available. Suitable spotted owl habitat generally provides for nesting, roosting or foraging and has the following attributes: a high degree of conifer canopy closure (approximately 60 percent or more), a multilayered canopy, large snags and coarse woody material.

Survey and Manage Species
The great gray owl, designated as Survey and Manage (Category C) in the *Record of Decision and Standards and Guidelines for Amendment to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (SEIS ROD), is known to be present in the analysis area. Habitat for the great gray owl is late-successional conifer forest associated with meadows or other open grassy areas. Additional protection for six species of bats suspected or known to be present in the analysis area (Townsend's big-eared bat, silver-haired bat, fringed myotis, long-eared myotis, long-legged myotis, and pallid bat) is also addressed in the SEIS ROD. Systematic surveys for these species and the habitat/sites they are commonly associated with have not been conducted in the analysis area.

HYDROLOGY

For purposes of the hydrology discussion, the South Rogue-Gold Hill Watershed Analysis Area is stratified into five analysis subwatersheds: Kane Creek, Galls Creek, Millers Gulch, Foots Creek, and Birdseye Creek (Map 12). The Millers Gulch and Birdseye Creek analysis subwatersheds also include several unnamed drainages that flow into the Rogue River. These unnamed tributaries to the Rogue River are termed frontals.

Hydrologic Features
Groundwater availability in the analysis area is unknown. The only wells with water rights are located in the Kane Creek and Foots Creek areas.

Surface water in the South Rogue-Gold Hill Watershed Analysis Area includes streams, springs, wetlands, reservoirs, and ditches. There are approximately 379 stream miles in the analysis area. The five stream systems within the analysis area are: Kane Creek, Galls Creek, Millers Gulch, Foots Creek, and Birdseye Creek and they all flow into the Rogue River (Table 9, Map 12). The mouth of Birdseye Creek is 113.0 miles upstream from the mouth of the Rogue River, the mouth of Foots Creek is 113.5 miles upstream, Galls Creek is 118.2 miles upstream, and Kane Creek is 119.6 miles upstream (Columbia Basin Inter-Agency Committee 1967).

Table 9. Stream Order and Major Tributaries

Stream Name	Stream Order at Mouth	Major Tributaries
Kane Creek	4	Harris Gulch, Panther Gulch
Galls Creek	4	East Branch Galls Creek, West Branch Galls Creek
Miller Gulch	4	none
Foots Creek	6	Left Fork Foots Creek, Middle Fork Foots Creek, Right Fork Foots Creek
Birdseye Creek	4	Left Fork Birdseye Creek

The analysis subwatersheds vary in acreage, ownership, stream miles, and stream density (Table 10. The Foots Creek analysis subwatershed is the largest (40 percent of the analysis area), followed by Galls Creek (20 percent of the analysis area), Birdseye Creek (16 percent), Kane Creek (15 percent), and Millers Gulch (8 percent). Ownership in each of the analysis subwatersheds is predominately private except for the Birdseye Creek analysis subwatershed that has an equal amount of public and private ownership. Foots Creek Analysis Subwatershed has the highest stream density (6.2 mi./sq. mi.) and Millers Gulch Analysis Subwatershed has the lowest stream density (4.9 mi./sq. mi.).

Table 10. Ownership and Stream Information

Analysis Subwatershed	Area (acres)	Area (sq. mi.)	Ownership (percent)		Stream Miles and Percent		Total Stream Miles	Stream Density (mi./sq. mi.)
			BLM	Private	BLM	Private		
Kane Creek	5,951	9.3	18	82	6.6 (12%)	50.2 (88%)	56.8	6.1
Galls Creek	8,496	13.3	44	56	27.5 (35%)	50.5 (65%)	78.0	5.9
Millers Gulch (& frontals)	3,420	5.3	49	51	10.1 (33%)	16.3 (67%)	26.4	4.9
Foots Creek	16,497	25.8	35	65	45.8 (29%)	114.2 (71%)	160.0	6.2
Birdseye Creek (& frontals)	6,664	10.4	50	50	23.6 (40%)	33.9 (60%)	57.5	5.5
Totals for South Rogue-Gold Hill Analysis Area	41028.0	64.1	38	62	113.6 (29%)	271.7 (71%)	378.7	5.9

Source: Medford BLM Geographical Information System (GIS)

Three stream categories are defined for BLM-administered lands in the Northwest Forest Plan: fish-bearing, permanently flowing nonfish-bearing, and intermittent streams (Table 11, Map 13). None of the nonfish-bearing streams have been inventoried to determine whether they are permanently flowing or intermittent. However, an approximation obtained from aerial photos was made to estimate miles of nonfish-bearing perennial and intermittent streams. The vast majority of streams on BLM-administered lands are nonfish-bearing intermittent streams (94 percent), followed by nonfish-bearing perennial streams (five percent), and less than one percent of the BLM stream miles are fish-bearing.

Table 11. Stream Miles by Stream Category for BLM-Administered Lands

Analysis Subwatershed	Northwest Forest Plan Stream Category for Riparian Reserves			Total Stream Miles with Riparian Reserves
	Fish-bearing Streams Miles	Perennial Nonfish-bearing Streams[1] Miles	Intermittent Streams[1] Miles	
Kane Creek	0.0	0.5	6.1	6.6
Galls Creek	0.1	0.9	26.5	27.5
Millers Gulch (& frontals)	0.0	0.2	9.9	10.1
Foots Creek	0.0	2.8	43.0	45.8
Birdseye Creek (& frontals)	0.5	1.5	21.6	23.6
Totals for South Rogue-Gold Hill Analysis Area	0.6	5.9	107.1	113.6

1/ Stream category estimated from aerial photos.
Source: Medford BLM GIS

The 1984 National Wetlands Inventory prepared by the U.S. Fish and Wildlife Service does not include any wetland information for the South Rogue-Gold Hill Watershed Analysis Area. Wetlands on BLM-managed lands would be inventoried for site-specific project analysis. Only two unnamed springs are shown on the 7.5 minute USGS topographic maps for the analysis area: one in Birdseye Creek Analysis Subwatershed and one in the Foots Creek Analysis Subwatershed.

There are no lakes or major reservoirs in the analysis area, however there are small privately constructed reservoirs scattered throughout the lower elevations of the analysis area. The Gold Hill District Irrigation Canal parallels the south side of the Rogue River and other irrigation ditches are located along the lower reaches of the major streams.

Hydrologic Characteristics

None of the streams in the analysis area have continuous recording streamflow gages. The two operational United States Geological Survey (USGS) gaging stations on the Rogue River are located above (station no.14359000 at Raygold) and below (station no.14361500 at Grants Pass) the analysis area (Table 12).

The discharge above the USGS gaging stations has been regulated since 1977 by Lost Creek Lake. There are many diversions from the Rogue River and tributaries upstream of the two gaging stations. The water transport and storage activities affecting the flow in the Rogue River make it difficult to develop a streamflow relationship between the Rogue River and its tributaries in the analysis area.

Table 12. USGS Gaging Stations

Station	Period of Record (water year)[1]	Drainage Area (mi.^{2})	Extreme Discharges Maximum (cfs)	Extreme Discharges Minimum (cfs)	Average Annual Discharge (cfs)	Average Annual Runoff (acre-feet/yr.)
Rogue River at Raygold	1906-1977 1978-1999	2,053	131,000	418	2,976 2,978	2,156,000 2,157,000
Rogue River at Grants Pass	1939-1977 1978-1999	2,459	152,000	195	3,543 3,372	2,566,000 2,443,000

1/ Period of record separated into years before and after regulation by Lost Creek Lake.
Source: U.S. Geological Survey Water Resources Data (USDI, GS 1982, 1986, and 1997).

Although no streamflow data exists for the unregulated Rogue River tributaries within the analysis area, it can be assumed based on flow information from other unregulated streams in the Rogue Basin that flows generally follow the seasonal precipitation pattern. Moderate to high flows generally occur from mid-November through April. Low flows normally coincide with the period of low precipitation from July through September or October.

STREAM CHANNEL

Level I Rosgen channel morphology classification (Rosgen 1996) has been done for streams in the analysis area (Map 14, Table 13). Stream classification is based on stream gradients, sinuosities, valley form, entrenchment, and confinement (Rosgen 1996). These stream characteristics were obtained from 7.5 minute USGS topographic maps and aerial photographs. Channel types are discussed in greater detail in Current Conditions (Appendix E provides descriptions of Rosgen morphological stream types).

Table 13. Stream Channel Types

Subwatershed	Stream Types						
	Aa+ (miles)	A (miles)	B (miles)	C (miles)	F (miles)	G (miles)	Total Stream Miles
Kane Creek	37.4	9.6	3.1	2.8	0.0	3.9	56.8
Galls Creek	65.8	7.7	4.5	0.0	0.0	0.0	78.0
Millers Gulch (& frontals)	21.9	1.5	0.0	0.0	0.8	2.2	26.4
Foots Creek	131.0	19.7	7.5	0.0	1.2	0.6	160.0
Birdseye Creek (& frontals)	47.5	6.4	1.4	0.0	2.2	0.0	57.5
Totals for South Rogue-Gold Hill Analysis Area	303.6	44.9	16.5	2.8	4.2	6.7	378.7

Source: Medford BLM GIS

Streams in the analysis area have a wide variety of channel characteristics, ranging from Rosgen type Aa+ to type G. Channels are predominantly (80 percent) type Aa+. These stream channels are located in the upper reaches and tend to be very steep (greater than 10 percent slope) with vertical steps. They are characterized by deeply entrenched V-shaped valleys that are confined by steep hillslopes. Transported material is quickly moved through these reaches. Substrate is mostly bedrock and cobble. These streams have the highest potential for debris torrents.

Type A channels comprise 12 percent of the analysis area streams and are generally found downstream of the type Aa+ channels. These stream channels are steep (4 to 10 percent slope), entrenched, cascading, step/pool streams in V-shaped valleys confined by steep hillslopes.

Type B channels are found in the lower reach of Birdseye Creek, the lower reaches of Left Fork and Right Fork Foots Creek to about one mile below their confluence, from the mouth of Galls Creek to approximately 4.5 miles upstream, and several portions of the lower reaches of Kane Creek. These channel reaches have moderate gradients (from 2 percent to 3.9 percent), are moderately entrenched, and riffle dominated.

Kane Creek exhibits type C channel characteristics approximately 0.5 mile upstream from the mouth where it forms two channels for 1.4 miles. These two reaches are low gradient (less than 2 percent), meandering, riffle/pool, alluvial channels with broad, well-defined floodplains.

One percent of the stream channels in the analysis area are type F and they are located in the lower portions of the Millers Gulch, Foots Creek, and Birdseye Creek analysis subwatersheds. The type F reaches are low gradient (less than 2 percent), entrenched, meandering, riffle/pool channels with high width/depth ratios.

Type G channels comprise less than 2 percent of the analysis area streams and are found in the lower portions of the Kane Creek, Millers Gulch, and Foots Creek analysis subwatersheds. Type G channels are entrenched gullies on moderate gradients (2 to 3.9 percent) with low width/depth ratios. These channels tend to be deeply incised in alluvial or colluvial materials and are unstable with high bank erosion rates.

WATER QUALITY

The Oregon Department of Environmental Quality's (ODEQ) water quality program is designed to protect designated beneficial uses of the State's waters. The designated beneficial uses for the South Rogue-Gold Hill Watershed Analysis Area are: domestic water supply (public and private), industrial water supply, irrigation, livestock watering, anadromous fish passage, salmonid fish rearing, salmonid fish spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetics quality, and hydro power (ODEQ 1992). The designation of beneficial uses is important because it determines the water quality criteria that will be applied to that water body. Water quality standards are typically designed to protect the most sensitive beneficial uses within a waterbody. The most sensitive beneficial uses for the South Rogue-Gold Hill Watershed Analysis Area are domestic water supply, anadromous fish passage, salmonid fish rearing, salmonid fish spawning, and resident fish and aquatic life (MacDonald et al. 1991:39). Flow modifications, temperature, dissolved oxygen, pH, bacteria/pathogens, turbidity, sedimentation, and habitat modifications are the key water quality indicators most critical to these sensitive beneficial uses.

RIPARIAN AREAS

Heavy development in the lower reaches of the analysis area's riparian areas has removed riparian vegetation. There is little shade and little large woody debris, with no potential for future recruitment, bank stability is compromised and there is little sediment control. Remaining vegetation consists of mature deciduous trees, with some willows and Himalayan blackberries. Himalayan blackberries, a highly invasive non-native species, do not provide shade, dissipate energy during high flow events, or enhance flood-water retention and ground-water recharge the way native species historically did.

The upper reaches of the riparian areas are not as impacted by development. Roads, which frequently parallel riparian corridors, are the primary disturbance in these reaches. Overstory vegetation in the upper sections consists of mature, large diameter deciduous trees of big leaf maple and alder with some Douglas-fir and incense-cedar. There is a thick understory of snowberry, ferns, and hazelnut.

Riparian areas provide habitat for riparian-dependant wildlife species, a transition zone between riparian and upslope habitat, and dispersal corridors for terrestrial wildlife. Some of the animals that depend on riparian areas in the analysis area include fish, mollusks, aquatic macroinvertebrates, amphibians, bats, beaver, western pond turtles, American dippers, great blue herons, and osprey.

The Northwest Forest Plan provides interim Riparian Reserve widths for streams (USDA and USDI 1994a:C-30). These widths are adopted for streams in the West Bear Creek Watershed Analysis Area (Map 15).

AQUATIC WILDLIFE SPECIES AND HABITATS

Anadromous Fish

The tributaries within the South Rogue-Gold Hill Watershed Analysis watershed analysis area support one of the largest runs of summer steelhead (*Oncorhynchus mykiss*) in Oregon. Summer steelhead were considered a candidate species for listing under the ESA of 1973. In April 2001, the National Marine Fisheries Services ruled that listing was not warranted. Tributaries in the analysis area provide for an estimated 25 percent of the summer steelhead reproduction in the Rogue River basin. Summer steelhead adults enter the tributaries as soon as flow levels are sufficient, usually in December. Spawning occurs in December through February, fry emerge in April and May, and most fry migrate out in May and June, often only a few days before the streams become intermittent or dry (Everest, 1973).

ODFW records show current summer steelhead use in approximately 3.25 miles of mainstem Birdseye, 3.3 miles of Left Fork Foots Creek and an additional 1.0 mile of Right Fork Foots Creek, 5.5 miles of Galls Creek, and 4.5 miles of Kane Creek. BLM fish distribution maps also show that steelhead use Miller Gulch, but it is unknown how far up they go (Table 14, Map 16).

ODFW spawning records from 1976 to 1999 show a decline in numbers of steelhead redds. Although the declining trend is obvious, the reasons for the decline are not. The drought conditions during the 1980s and early 1990s, an increase in roads and culverts, reduction of riparian vegetation, timber harvesting, and withdrawals for irrigation can affect natural flow patterns, impacting the ability of summer steelhead to use these tributaries for spawning.

Coho (*Onchorhynchus kisutch*), a species listed as threatened under the ESA (May 1997), are also present in the analysis area. ODFW 1993 spawning surveys show that coho spawn in the first 0.25 miles of Birdseye and 3.3 miles of Left Fork Foots Creek. Like summer steelhead, coho adults move up the stream to spawn as soon as flows are high enough to allow them, usually December. Coho, spawn in the first 0.25 miles of Birdseye and 3.3 mile of Left Fork Foots Creek (Table 14).

Resident Fish Populations
Other fish species in the watershed analysis area include cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*Oncorhynchus mykiss*), sculpin (*Cottus* sp.), and dace (*Rhinichthys sp.*). Information on fish distribution of cutthroat trout, rainbow trout, sculpin, and dace is incomplete. The upper limits for fish distribution have not been determined for rainbow trout, sculpin, or dace. Only some of the tributaries have been surveyed for distribution of cutthroat trout. Cutthroat are found in 3.25 miles of mainstem Birdseye, 1.5 miles of Left Fork Birdseye, 5.5 miles of Left Fork Foots Creek and 1.25 miles of Right Fork Foots Creek, and 5.25 miles of Kane Creek. They are estimated to use 5.5 miles of Galls Creek. Fish use in Middle Fork Foots Creek and Millers Gulch is unknown (Table 14).

Table 14. Approximate Stream Miles of Salmonid Use

	Coho	Summer Steelhead	Rainbow Trout	Cutthroat Trout
Birdseye	0.25	3.25	3.25	3.25
Left Fork Birdseye	none	none	distribution unknown	1.5
Left Fork Foots Creek (from mouth)	3.3	3.3	3.3	5.5
Right Fork Foots Creek (from split w/ Left Fork)	none	distribution unknown	1.25	1.25
Middle Fork Foots Creek	none	distribution unknown	distribution unknown	distribution unknown
Galls Creek	none	5.5	5.5	5.5
Miller Gulch	none	distribution unknown	distribution unknown	distribution unknown
Kane Creek	none	4.5	5	5.25

The lower reaches of the tributaries are in highly developed areas of primarily rural residential use. Development, including residences, roads, and irrigation diversions encroach on the riparian corridor, resulting in bank destabilization and erosion problems, lack of shade, lack of large woody debris (LWD) and lack of recruitment for future LWD. The tributaries have become channelized, changing the available fish habitat. There are few pools that can be used for resting and rearing. Silt from active erosion both within the riparian corridor and in the uplands has embedded available gravels, limiting spawning and rearing habitat, as well as impacting macroinvertebrate production (Bolda 2000).

The upper sections of the tributaries provide better fish habitat. The primary impact comes from the roads paralleling them and/or crossing streams. The upper reaches have adequate shade, stable banks with little evidence of erosion, adequate supplies of LWD and potential for more. There are adequate pools in a substrate with high percentage of cobble and gravel for spawning. However, in many cases, the gravels in the upper sections are embedded with silt (Bolda 2000).

CURRENT CONDITIONS

The Current Conditions section provides more detail than the Characterization section and documents the current conditions and trends of the analysis area.

HUMAN USES

The South Rogue-Gold Hill Watershed Analysis Area includes a mix of public and private lands, with the majority of the land in private ownership (see Characterization section, Human Uses). Private lands are primarily used for residence, ranching, and timber. Public lands are also used for grazing and timber harvest in addition to recreation which is a significant use in the analysis area.

The people most closely associated with the analysis area include the local residents and landowners as well as many groups and individuals that have an interest in the analysis area and use it for a variety of purposes including economic and recreational activities. The towns of Gold Hill and Rogue River border the northern edge of the analysis area. A portion of Rogue River is actually in the analysis area. Interactions among private citizens, businesses, local groups, and government agencies are important avenues for education and information sharing and will contribute to efforts at ecosystem management in the analysis area.

Current Human Uses and Trends

Farming and ranching characterized the early communities of the analysis area (Wheeler 1971); descendants of early immigrants still reside in the analysis area. Timber production and logging are human uses that occur on public lands and lands owned by private timber companies. As elsewhere in the region, farming, ranching, and logging have declined in recent years. The service, trade, and manufacturing sectors of the regional economy are growing at a faster rate; these trends are likely to affect the analysis area.

Recreation on public lands has been important in the past and is likely to increase in the future. The towns of Rogue River and Gold Hill are utilized by rafting companies and white water enthusiasts as staging areas for trips on the Rogue River. Timber Mountain, located in the northern part of the analysis area, has historically been used by local and regional residents for Off-Highway Vehicle (OHV) use. OHV use has increased in recent years, reflecting the growing popularity of OHVs throughout the west. Non-timber products and recreational uses on public lands will probably receive more emphasis in the future.

Population growth in the analysis area increased in the past decade (Table 15). As a whole, Jackson County increased by 22.31 percent, while Rogue River and Gold Hill grew by 13.7 percent and 28.57 percent respectively. The majority of this increase is due to migration. Population growth impacts the analysis area as there are more demands placed on natural resources, open space, transportation systems, and recreational systems, as well as city and county services such as schools, emergency services, health and human services, and water supply. The trend in growth is likely to continue in the coming decade.

Table 15. Population Increases Affecting the South Rogue-Gold Hill Analysis Area[1]

	1990 Population	2000 Population	Percent Increase
Jackson County	146,389	179,050	22.31%
Rogue River	1,759	2,000	13.70%
Gold Hill	980	1,260	28.57%

[1] 2000 population estimates are from Center for Population Research and Census, Portland State University.

Elsewhere in the region there is a growing "commuter" class of residents in the rural areas (Preister 1994). These people reside in rural areas but commute from their rural homes and communities to jobs in the more industrial urban areas. Many people residing in the analysis area commute to work in Ashland and Medford. This trend is likely to continue in the analysis area.

Facilities and Structures
The South Rogue-Gold Hill Watershed Analysis Area has no known authorized facilities or structures within the watershed boundaries as defined.

Authorized and Unauthorized Uses
A number of other BLM authorizations have been granted for various uses within the analysis area. There are eleven right-of-way grants for roads, eleven right-of-way grants for minor utility systems (electric and phone lines), and five right-of-way grants for water lines. These authorized uses are to private individuals or to utility companies providing service to private customers.

There are no known unauthorized uses of the types described above on public land within the analysis area. However, some of these uses may exist. Some examples of unauthorized activity occurring in the analysis area are illegal dumping, vandalism, and illegal drug-related activity.

Land Use Permits
No BLM special land use permits have been issued under the Realty Program in recent years. This potential exists, but at this time no applications are on file and none are anticipated in the near future.

Easements
Over the years, BLM has acquired many easements within the analysis area. These easements were acquired mainly in support of the timber management program. Some of these easements provide access rights for the public and others do not.

Land Exchanges/Sales
No land exchanges are being considered within the analysis area. In the last Resource Management Plan (RMP) five BLM parcels that lack legal access and are isolated from other public lands were identified as meeting the basic criteria for potential disposal through sale or exchange. However, the Medford District has not pursued this option and it is unlikely that this will become a District priority in the near future.

Land Acquisitions
BLM has not acquired any land in this analysis area within the last ten years, and no acquisitions are anticipated in the near future.

Transportation System
BLM's Geographical Information System (GIS) and Transportation Information Management System (TIMS) identifies approximately 250 total miles of road within the analysis area, of which 29 percent are controlled by BLM. Roads in the analysis area vary from primitive four wheel drive roads to paved highways. BLM controls 19 miles of natural surface roads, 54 miles of rocked roads, and no bituminous surfaced roads. Most county roads have a bituminous surface and the private roads either are usually rocked or are left unsurfaced.

BLM roads were constructed and are maintained for log hauling and administrative purposes. In recent years most road construction has occurred primarily on private lands. BLM inventories contain very little information about non-BLM controlled roads.

Road maintenance is conducted by the different owners and management agencies. Water, oil, or lignin are usually applied to road surfaces when hauling during dry periods for dust abatement and to keep roads from disintegrating. There are developed water sources in the analysis area where the BLM may obtain water. Water is used when placing surface rock and for road maintenance, which allows for proper processing and reduced segregation of the road surface rock.

Due to BLM's checkerboard land ownership, the Bureau has entered into numerous reciprocal right-of-way and road use agreements. These agreements do not include rights for the general public to use roads constructed under these reciprocal right-of-way agreements. These agreements enable the BLM to use private roads to access BLM lands and private landowners to access their lands over BLM roads. The agreements are an essential part of a complete transportation system and have resulted in significant cost savings to the public, environmental benefits, and fewer roads.

The BLM charges fees for commercial use of roads and then uses these fees to help pay for road maintenance. A reduction in timber harvest levels has resulted in a significant decrease in the primary funding source for maintaining the transportation system. Many roads previously maintained at a high level are not being maintained to that extent any longer. To reduce maintenance requirements and erosion potential, some unnecessary roads have been decommissioned. Other roads are closed until future access is needed and many others are maintained at the lowest possible levels. BLM roads have a maintenance level assigned to them. The roads are monitored and the maintenance levels are modified when needs and conditions change. Maintenance levels range from minimal standards on short roads to high standards on main roads. Sharing and maintaining roads with landowners has also reduced the amount of road necessary for access and maintenance costs. The goal is to maintain the entire transportation system in a safe and environmentally sound condition. The result is a transportation system that provides for various recreational activities, private access, logging, fire fighting access, and other land management uses.

Road maintenance includes removing safety hazards, reducing soil erosion potential and providing for fish passage at all potential fish bearing stream crossings. Safety hazards include hazard trees that have the potential to fall on houses, recreation areas, or roadways. Hazard trees are usually dead, but may be alive with roots under-cut or with significant physical damage to the trunk or root system. Proper maintenance of road drainage systems and stream crossing culverts is essential to avoid both erosion and fish passage problems. Most of the existing culverts were designed to withstand 50-year flood events. New drainage structures will be designed to withstand a 100-year flood event and when appropriate, provide for fish passage. Road protection measures include constructing drainage structures, grass seeding, blocking roads, placing road surface rock, and applying bituminous surfacing.

BLM roads are generally open for public use unless blocked by gates or other methods. Gates and other road barriers regulate vehicle access to reduce maintenance costs, soil erosion, transfer of noxious weeds, and wildlife disturbance. The BLM road inventory shows approximately 29 miles of BLM-controlled roads are located behind road blocks. Within the analysis area, the highest road densities are located on private lands.

Logging

From 1985-1995, the BLM advertised eight different timber sales in the analysis area. A total of 20.8 million board feet (MMBF) of timber was removed from 4247 acres (See Appendix F for detailed information on these sales). One percent of the total acres (33 ac.) were tractor logged, twenty-three percent (976 ac.) were cabled logged, and seventy-six percent (3238 ac.) were helicopter logged. Partial cut harvest was conducted on 4,016 acres with a variety of different prescriptions, including a mortality salvage harvest on 3,278 acres. Two hundred and thirty-one acres were clearcut of which one hundred fifty-six acres were associated with salvaging timber from the large fires that burned in 1987. The clearcut acres were sold in 1988 or 1989.

The most recent major harvest on BLM-managed lands within the analysis area was Birdseye Rogue Timber Sale. Approximately 1,754 thousand board feet (MBF) were removed from 410 acres within the analysis area. Eighty-three of these acres were cable logged and the rest were helicopter logged. Yarding was completed in the summer of 1999. Approximately 41 acres of the Isabelle timber sale, which was sold in FY99, are located in this watershed. These acres are located along the ridgetop boarding the Middle Applegate watershed. There are no timber sales planned in this analysis area through the fiscal year 2005.

Since 1950, approximately 7,500 acres of BLM-administered land have been entered for some type of timber harvest (Table 16). This accounts for 48 percent of BLM-administered land in the analysis area, but only18 percent of the entire analysis area. Approximately 1,165 of these acres were clearcut, with nearly half of the clearcuts taking place in the 1980s.

Table 16. Acres Harvested and Volume Removed on BLM-Managed Lands*

Decade of Sale	Clearcut Acres	Select Cut Acres	Salvage Acres	Shelter-wood Acres	Overstory Removal Acres	Thinning Acres	Volume Removed (MMBF[1])
1950s	3	293	106	0	0	0	3.0
1960s	397	937	162	0	0	0	18.8
1970s	100	1518	228	204	162	0	27.8
1980s	647	0	32	313	403	0	23.6
1990s	18	333	3200	102	342	121	14.7
2000s	0	0	1	0	0	0	0

1/ MMBF = millions of board feet
* Figures reflect forest inventory data (Micro*Storms database) as of May 1, 2000. It is estimated that approximately 2,100 acres has been double counted meaning these acres have had more than one entry.

Oregon Department of Forestry's (ODF) Notification of Operations database (1990-1999) was referenced in order to investigate logging and other operations conducted on private land within the analysis area. This database only contains the location, operator/land owner, year, activities, methods used, and acreage for proposed operations. The operator/landowner may deviate from the planned operation. Because of this potential deviation, only general information is available regarding operations within the analysis area.

Most of the notifications fell into one of the following categories: 1) herbicide, insecticide, rodenticide, fertilizer, and fungicide application; 2) road construction/reconstruction; and 3) harvesting. Herbicides, insecticides, rodenticides, fertilizers, and fungicides have been used by private landowners throughout the analysis area at different levels of application. Approximately 3.2 miles of new road have been planned by private landowners/operators since 1990 and approximately 15 miles of road were planned for renovation.

Harvesting consists of two different harvest types: 1) commercial thinning and 2) removal of all or most of the merchantable conifers or large hardwoods from the unit during harvesting. From 1990-1999, approximately 14,500 acres of commercial thins were either harvested or planned for harvest from private lands in the analysis area. During the same period, only 52 acres of clearcuts have been planned. The 14,552 acres planned for some type of timber removal on private land would have accounted for harvest on approximately 35 percent of the analysis area in the 1990s. When combined with harvest on BLM land, a total of 44 percent of the analysis area may have been entered for harvest in the 1990s.

Special Forest Products

The BLM is working with the Forest Service to develop regional and national strategies that recognize the importance of managing special forest products (SFPs). These strategies emphasize four themes: 1) to incorporate harvesting of SFPs into an ecosystem management framework with guidelines for sustainable harvest, species conservation, and protection of ecosystem functions; 2) to involve the public including industrial, Native American, and recreational users of these resources in making decisions about the future of SFPs on public lands; 3) to view the management of accessibility to SFPs as major factors in assisting rural economic diversification in formerly timber-dependent communities; and 4) to develop and implement inventory, monitoring, and research programs to ensure species protection and ecosystem health (Molina et al. 1997).

Special forest products have been extracted from the analysis area for at least 50 years. The primary SFPs in the analysis area are fuel wood, salvage saw timber, and cedar boughs. The level of fuel wood removal probably peaked in the late 1970s through the mid-1980s when logging activity and wood stove use were high. Since then, restrictions on wood burning in the Rogue Valley, combined with decreasing timber sale activity has resulted in a dramatic reduction in fuel wood cutting. Public lands in the analysis area could continue to be a source for individual/family Christmas tree cutting due to close proximity to the Rogue Valley. Currently, harvest levels are very low for other SFPs, such as floral greenery and mushrooms.

Grazing/Agriculture

Cattle operations are the number one agricultural commodity in Oregon, contributing 12.8 percent of the total gross value of agricultural products. Jackson County ranks 16th in the state for gross farm and ranch sales (Andrews 1993). Within the analysis area, cattle operations are the largest non-forestry agricultural venture. The Rogue-Gold Hill Watershed Analysis Area is designated as open range outside of incorporated towns. Ninety-six percent of the BLM-managed lands are allocated to six grazing allotments covering 28,844 acres (Map 17).

Five of the six allotments (Foots Creek, Applegate, Timber Mountain, Stage Road, and Ecker) are located entirely within the analysis area. Although the total permitted use in the analysis area is 766 Animal Unit Months (AUMs), the actual five year average use from 1994 to 1998 was only 21 AUMs. The Foots Creek Allotments (described below) is in use. The Applegate (25,558 acres), Timber Mountain (1720 acres), Stage Road (40 acres), and Ecker (386) allotments are vacant. The Sardine and Galls Creek allotment (only half of which is in the analysis area) was cancelled by decision of the Medford District Manager in 1980. The non-use status of these allotments can primarily be attributed to the poor quality of these areas for livestock grazing. The allotments are characterized by steep hills and brushy vegetation with little desirable forage. No one has applied to lease these allotments, and the declining agricultural base in the adjacent areas makes it unlikely that anyone would apply for a lease. Appendix G summarizes information for each allotment in the analysis area.

Other agriculture in the analysis area is varied and mostly small acreage, domestic farms and gardens. There may be some orchards still in production, although most operations are found at lower elevations and outside of the analysis area. Many small family farms and orchards are being subdivided and sold for other uses.

In August of 1997, the BLM adopted new rules for rangeland health (USDI, BLM 1997). Rangeland health can be defined as the degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained. Rangeland Health Standards and Grazing Guidelines and Determination of National Environmental Policy Act (NEPA) Adequacy were completed for the Foots Creek Allotments in 1999 and are summarized below.

Foots Creek Allotment - This allotment consists entirely of uplands and has a preference of 12 AUMs. Utilization on the Foots Creek Allotment is slight (6-20 percent). There are no riparian/wetland areas or stream reaches present. The Foots Creek allotment occupies the uplands of two drainages: Birdseye Creek and Foots Creek. Birdseye Creek is currently listed as a water quality limited stream under §303d of the Clean Water Act for water temperature. However, the lands surrounding Birdseye Creek, as well as Foots Creek remain in predominately private ownership with small scale agricultural activity, and impacts on water quality are more likely to occur there.

Vegetation in Foots Creek Allotment is classified as Pine-Douglas fir-Fescue. The overstory is composed of conifers (Ponderosa pine and Douglas fir), oaks (California black and Oregon white), and madrone. The understory is a mix of grasses, shrubs and forbs: chinqapin, ceanothus sp., Oregon grape, yarrow; medusahead rye, stipa sp., festuca sp., bromus sp., and dogtail. Vegetation on the allotment appears healthy.

Soils in the area are classified as Vannoy silt loam, 12 to 36 percent south slopes; and Vannoy-Voorhies complex 35 to 55 percent south slopes. They are generally moderately deep, well drained soils with a surface layer of biotic debris covering silt loam. Permeability is described as moderately slow, with a water capacity of 5 inches, and a corresponding rooting depth of about 20 to 40 inches. These soils have moderate (.37) erosion factors by water. There are game trails, cattle trails, and some primitive roads running through this allotment. Runoff is high during storm events and erosion is a potential problem. However, in the past cattle turn-out has been delayed due to overly wet conditions to anticipate and correct for compaction and erosion problems in this allotment.

Minerals

Historically, mineral production played a significant role in the development of the analysis area and the nearby communities. Today, there is still considerable interest in mineral exploration and development as evidenced by the large number of mining claims on file. At the time of research, there were fifty-five mining claims of record. Of these fifty-five claims, forty-two are lode claims and the remaining thirteen are placer claims. All lode and placer claims are 20 acres.

Placer claims are typically located along a stream channel in which auriferous (gold bearing) gravels are processed for their mineral content. In the past, there were a number of sizable placer mining operations within the analysis area. The most notable of these was on Foots Creek. As late as 1941, a bucket dredge was in operation on Foots Creek. It was a sixty-seven bucket electric powered dredge with a daily production capacity of 4000 cubic yards. This type of mining led to severe disturbance of the stream channel, the associated riparian vegetation, and the fishery resource. Evidence of this type of mining is still readily detected along the main stem of Foots Creek plus some of the principle tributary streams.

A number of the early-day lode claims went to patent under the 1872 Mining Law as private land. These patented claims have been developed and mined commercially for their high grade silica deposits through the years. The largest mining operation in the watershed analysis area is the Bristol-Silica mine. This mine began production in the late 1930's and has operated intermittently since that time. It has produced high-grade silica, decorative rock, and a variety of construction materials over the years. The mine covers approximately thirty-six acres on the previously patented private land and another twelve acres located on adjacent BLM land (under Federal Mining Claims). This mining activity can be seen today on the hillside east of Valley of the Rogue State Park from Interstate 5.

Today, all mining claims on Federal lands are subject to Surface Management regulations under Title 43 of the Code of Federal Regulations (CFR), Subpart 3809, and the Use and Occupancy regulations, Subpart 3715. In addition, there are dredge size and season of use restrictions imposed by the State. In the analysis area suction dredging is only permitted between June 15 and September 15 of a given year in order to protect important fish species.

Recreation
There are no developed recreational facilities within the analysis area. Recreational activities within the analysis area include hiking, fishing, dispersed camping, hunting, sightseeing, horseback riding, picnicking, driving for pleasure, mountain biking, target shooting, mushroom and berry picking, firewood gathering, and off-highway-vehicle (OHV) use.

Timber Mountain/ John's Peak Off-Highway Vehicle Designation
The 1995 Medford District's Resource Management Plan (RMP) identified 16,250 acres as the John's Peak/Timber Mountain OHV area. The RMP specified that this area would be managed to provide for OHV use. A portion of this designated area is within the analysis area. This area was designated to acknowledge 50 years of OHV use in this area, to manage the existing use, and to reduce adverse impacts to soils, water, wildlife, and residents by limiting the use to existing roads and designated trails.

Thousands of riders from the Rogue Valley use this and adjacent areas for OHV use. A local OHV group, the Motorcycle Riders Association (MRA), has over 400 families in its club. The existing trail system allows riders to travel the ridge system from Grants Pass to Jacksonville. The MRA sponsors three to four organized OHV events yearly, using a combination of private and public lands. These events draw riders from throughout the western United States and Canada. The area is extremely popular with the riders and use has been increasing for the past 50 years. Subsequent to the completion of this analysis, a management plan will be prepared for BLM-administered lands that include the John's Peak/Timber Mountain OHV area.

Cultural Resources (Archaeological and Historic Sites)
There are a few known archaeological sites within the analysis area, representing both the history of the native peoples and that of the early settlers. A portion of the Applegate Trail route runs through the analysis area, as well as remnants of mining operations such as an ore processing mill, adits, cabins and an arrastra. The recorded pre-historic sites are among the most important in the area and include a burial site along with a ceremonial pictograph site. Future work in the analysis area should take account of this heritage and avoid impacts to these native and historic sites.

EROSION PROCESSES

Natural Processes Affecting Erosion Rates and Slope Stability
High rain episodes, especially following a severe wildfire, would be the primary natural event affecting erosional rates in the analysis area.

Wildfire
Wildfire is a natural process capable of removing extensive soil cover in the analysis area. There can be substantial erosion from a fire-disturbed site when an intense rainfall event occurs within

a year or two after a severe fire. Vegetative cover or litterfall is generally reestablished within the first two years after a disturbance, protecting soils from further rainfall impact. The erosion that occurs after a wildfire can result in significant topsoil loss and subsequent stream degradation. Topsoil loss due to wildfires has been reduced over the past 70 years since fire suppression has resulted in fewer natural fires exposing soils. The excessive vegetation resulting from 70 years of fire suppression has increased the risk that an intense wildfire of long duration will occur and cause severe soil erosion and landslide problems.

Areas most at risk for topsoil loss due to a severe wildfire are those lands found on granitic rock and the associated Tallowbox-Shefflein soils. This is due to the sandy nature of these non-cohesive rocktypes, and the hydrophobic (water repellant) nature of granitic soils when severely burned. Water repellancy causes precipitation to flow overland rather than soaking into the ground.

Slope Stability
Landslide features on BLM-managed land are classified as unsuitable for management and are not treated. Currently, there are no lands in the analysis area that are classified as unsuitable for management due to slope stability concerns. Debris slides, as described in the Characterization section, are likely to occur due to the non-cohesive sediment loads produced by granite. No debris slides were reported in the analysis area following the1997 flood, but as granitic terrane continues to add sediment to debris-filled draws, debris slides will eventually re-occur. Natural landslides provide a much needed benefit to aquatic systems by delivering gravels and large woody material with roots attached from the uplands to fish bearing streams.

For reproduction, many fish species as well as insects and microscopic aquatic life need well-sorted and poorly graded gravel (deficient in fines) for egg incubation. The open texture of poorly graded gravel provides protection of eggs from predation and the upwelling of water through these gravels provides a continuously refreshed source of oxygen. Water cascading over and around landslide-delivered trees and boulders contributes to this process by creating upward moving eddies that lift fine sediment out of the gravels to be swept away by the current. Consequently, landslides are a natural and needed component of the ecosystem. An exception to this would be a landslide originating in granitic rocktypes. Though granite landslides are a needed source of boulders and trees, there is very little cobble produced from this terrane and an excessive amount of sand-sized sediment.

Surface erosion due to natural processes is found where surface water is concentrated in drainages or draws. Sheet, rill, and ravel erosion occur most frequently on canyon sideslopes and valley floors. The largest amount of sediment transported to streams because of surface erosion comes from the steeper, stream-adjacent slopes.

Human Activities Affecting Slope Stability
Erosion processes are often most active near managed areas or areas managed in the recent past, such as roads and clearcuts. Slumps and/or tension cracks are often found in road prisms, cut slopes, and fill slopes. The following are the major human activities that have impacted erosion processes in analysis area. These activities are generally listed in order from largest to smallest impact potential.

Road Development
Road construction has been the largest human impact to the analysis area in terms of compaction, sediment delivered to streams and negative impacts to fishery habitats. Roads with inadequate drainage can result in rills, gullies, slumps, and debris-flow landslides during peak flow events (especially the 1964, 1974, and 1997 storms). Non-surfaced roads on granitic rocktypes are especially prone to surface erosion.

Roads can intercept overland flows and concentrate the water into areas that can saturate weak soils and create conditions that are conducive for slope failures and surface erosion. Many roads in the analysis area have been constructed with culverts and ditches or drain dips as the drainage structures. However, some of these roads are unsurfaced and usually do not have armoring below water-bars or drain dips to protect against erosion and mass wasting. Use of natural surface roads left open during the rainy season has caused ruts which concentrate runoff. Intense rain storms and rain-on-snow events have produced heavy runoff from these unsurfaced roadways. As a result of the concentrated run-off, rills and/or ruts sometimes develop on the steep grades. During intense storms, high energy runoff is often concentrated into rills on steep road grades which transports sediment into streams, especially at stream crossings and where roads parallel streams.

High road densities, greater than 4.0 miles per square mile, are found in some sections of the analysis area (Map 18). Most notable high density areas are BLM-administered lands that have been actively managed for timber production, privately managed timberlands and residential areas. When these high road densities are combined with weak soils (Tallowbox and Shefflein soils) and are near riparian and/or unstable areas, effects to the environment are the most severe.

Timber Harvesting
Clearcut timber harvesting is second only to roads in causing adverse impacts to streams, soils, and fisheries. Clearcutting is not currently a major concern on BLM-administered land in the analysis area, as it is not permitted under the Medford District's Resource Management Plan (USDI, BLM 1995).

Clearcut timber harvest is still being conducted on private lands. Clearcut units with slopes greater than 50 percent in canyon sideslopes have the highest risk for landslide activation and reactivation during peak flow events. Clearcut logging decreases rooting strength in the soil and can increase the groundwater available to unstable and potentially unstable terrain. This increases the likelihood of accelerating landslide movements. Surface erosion and landslides often start at the base or just below the clearcut units. Over time, these areas of erosion and minor sliding generally revegetate and heal naturally.

Recreational Off-Highway Vehicles (OHVs)
OHV use is primarily concentrated in the southeast portion of the watershed. This area, centered around Timber Mountain, is located on the most erosive soils in the watershed, the granitic rock-based Shefflein and Tallowbox Soils. Soils formed from granitic rock are generally moderately deep over decomposed bedrock and are highly erosive because of low cohesive coarse textured particles. Rapid erosion on steep slopes keeps fresh granite near the surface. Seemingly localized impacts can be far reaching as sediment delivery to aquatic habitat is increased. Though highly erosive, no known slope stability concerns have developed in this area.

Agricultural Practices
Historically, concentrations of cattle and sheep along streams, ponds, and other wetlands may have contributed to a loss of vegetative cover and subsequent erosion in the riparian areas. Erosion from grazing is generally most severe near streams and on steep slopes. In recent years, the use of lands within this analysis area for livestock grazing has diminished. The number of cattle on the land today is significantly less than the early days of the range. Currently, there are eight allotments for cattle grazing in the Analysis Area, allowing for a total of 1,292 animal unit months (AUM); yet usage since 1994 has only averages 192 AUM per year (see Human Use, Grazing).

Plowing of fields and flood irrigation practices also impact riparian ecosystems as soil is loosened and fine sediments are introduced to streams.

Conclusion
Roads, clearcut timber harvest, OHV use, prescribed burning, rural urban development and agricultural practices (runoff and livestock grazing) have accelerated the rate at which erosion and landslides can transport sediment and debris to streams. Of these human activities, roads have had the greatest effect on moving sediment into streams. Thus, more sediment has been mobilized and deposited in streams in a much shorter time frame than would have occurred naturally. These human impacts have adversely affected fish habitat and water quality.

Future Trends
The amount of sediment introduced to streams through erosion processes is slightly above natural rates. If timber harvest and road building intensifies, erosion rates could accelerate in the future. Natural surface roads and trails will continue to be the main source of sediment to streams. As major storms occur, combined human uses will continue to be factors that contribute to accelerated mass wasting and surface erosion. Inadequately drained roads and unstable road cut and fill slopes will increase the likelihood that new failures will be initiated. In the steeper mountainous side slopes, sheet erosion and debris slides will move sediment into streams.

The impact of future storm events and the extent they may affect the analysis area are unknown. Natural landslide and erosion processes cannot be halted; however, stabilization measures could be implemented to mitigate adverse impacts on water quality.

SOIL PRODUCTIVITY
Soils in the analysis area have been forming for thousands to millions of years. Environmental factors such as wildfires, vegetation, and climate have been the major influence on soil formation and productivity. Only in the last century have human activities significantly impacted soil productivity. Activities such as timber harvest, road building and wildfire suppression have interrupted the "natural" processes of soil development. Various agricultural activities also may have impacted the soils ability to produce vegetation and provide clean water to the streams.

The soil productivity of timber harvested areas has declined. This loss in soil productivity is directly related to an increase in soil erosion rates due to the yarding of material and the loss of vegetative cover. This is especially true for steep, mountainous sideslopes that have been clearcut and broadcast burned. The removal of organic material during logging operations that would otherwise be returned to the soil has had a negative affect on soil productivity.

Productivity losses can also be attributed to tractor logging as it can compact the soil and decreases pore space used to store oxygen and water in the soil. Since 1996, tractor logging has taken place on only 52 acres of BLM administered lands. However, tractor logging has been used extensively on privately owned lands, often on lands steeper than 35 percent slope. The amount of soil productivity lost is dependent on the amount of area compacted. Compacted skid roads usually experience a 50 percent reduction in site productivity.

On major skid trails and roads, increased compaction has resulted in some surface erosion and sediment accumulation in depressed areas. Soil recovery is slow and could take many decades. Recovery processes, while not well understood, probably depend on the type of vegetative succession that occurs, amount of existing site organic matter, and future disturbance regimes.

Road construction has taken land out of timber production. The soil productivity loss is directly proportional to the amount of roads built in the analysis area. Roads also have an indirect affect on soil productivity on steep mountain sideslopes. Inadequately built roads on unstable slopes and/or in headwall situations, often cause slope failure resulting in landslides or debris torrents.

Fire suppression activities over the last 70 years have changed the local fire regimes in the analysis area. Although wildfire frequency has decreased, fire intensity has increased, resulting in the consumption of more surface duff and large woody material. High intensity wildfires also heat the soil and greatly reduce soil organism populations. Although the forest usually experiences a short-term flush of nutrients from the oxidation of burned organic material, long-term nutrient cycling is interrupted.

PLANT SPECIES AND HABITATS

Introduced Plant Species and Noxious Weeds

Introduced plant species and noxious weeds are found throughout the analysis area and they maintain a continuous and increasing presence in the analysis area. Some species may have been intentionally introduced after major ecological disturbances to reduce erosion and hold the soil until native species gradually re-establish. Other highly adaptive species may have been brought in to improve available forage for wildlife and livestock under past direction of public agencies and private individuals. Still others are plants which have escaped cultivation in lower elevation fields, lawns, and gardens. Finally, some introduced species have simply expanded their range along corridors created by regional transportation systems.

Any activity that creates disturbed soil and forms a corridor into an area, can act as a pathway for dispersal. Many introduced species in the analysis area can be found along roadsides, quarries, areas of previous timber harvest, power and telephone line right-of-ways, and other areas of disturbance. Once established, they can rapidly spread to other areas, as many of these species out-compete native vegetation, even in the absence of a disturbance.

Many introduced species can potentially out-compete and displace native plants and thus alter the composition and relationships of the ecosystem. Successfully introduced species typically have superior survival and/or reproductive techniques. They can compete with native plants for water and nutrients, frequently develop and reproduce earlier at higher rates, and often have the ability to disperse over long distances using wind, water, animals, humans, and passing vehicles.

Some introduced plants cause extreme harm to the ecosystem and/or economic interests and have been designated as noxious weeds. Federal land managers cooperate with Oregon Department of Agriculture's (ODA) efforts to control and identify target species of noxious weeds by tracking their distribution on federal lands. Noxious weed populations must be located quickly to increase the effectiveness of control efforts. Integrated Weed Management (IWM) involves four general categories of management options including cultural, biological, physical, and chemical. IWM is a decision making process that uses site specific information to make decisions about treatment choices. IWM is based on the fact that combined strategies for weed management work more effectively than any single strategy. The current IWM practice method of choice for weed control is biological control. Not all noxious weeds, however, have current biological predators to control their populations and there are concerns that even under best management practices, populations of noxious weeds may continue to become established and/or expand.

As more people establish themselves in the valley, more land is disturbed and more travel into the mountains occurs. This trend coincides with the trend of increasing weeds in the analysis area. Some control efforts have occurred with varying results. Control efforts in the analysis area have included herbicide treatment, physical control, cultural adaptations, and biological control. Physical and biological control of yellow starthistle has included hand pulling and release of insects that feed on different parts of the plants. Cultural adaptations to livestock grazing have been attempted for control of yellow starthistle. Herbicides have been used to control yellow starthistle and Himalayan blackberry.

Inventories in the analysis area report one Target weed species (yellow starthistle) and four species of "B" designated weeds. Appendix H provides a list of introduced plants and noxious weeds.

Special Status Plant Species and Habitats

Four species of special status vascular plants are known to occur in the analysis area (Table 17). Much of the analysis area has not been surveyed for special status plants. Only small areas associated with management activities have been formally inventoried.

Table 17. Special Status Plants

Scientific Name	Common Name	Status[1]	No. of Populations	Trend[2]
Cypripedium fasciculatum	clustered lady's-slipper	BSO	19	V
Cypripedium montanum	mountain lady's-slipper	BTO	18	V
Fritillaria gentneri	Gentner's fritillary	FEO	1	V
Lithophragma heterophyllum	many-leaf prairie star	BTO	1	V

1/ Status
- BTO = Bureau Tracking in Oregon
- BSO = Bureau Sensitive in Oregon
- FEO = Federal Endangered in Oregon

2/ Trend of species within the analysis area is based on population numbers, population health, and available habitat
- = = stable
- /\ = increasing
- V = decreasing

Cypripedium fasciculatum (clustered lady's-slipper) is a Bureau Sensitive species in Oregon, a Survey and Manage Category 1C species under the Final Supplemental Environmental Impact Statement for Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA and USDI 2001), and a candidate for listing with the State of Oregon under the Oregon Endangered Species Act. This plant is found east to the Rocky Mountains but is considered threatened with extinction in Oregon and rare throughout its range. Mid-to-late-successional forests with canopy closures greater than 60 percent appear to be the optimum habitat for this species. *Cypripedium fasciculatum* is a slow-growing, long-lived orchid with a mycorrhizal association and an arguable dependence on fire. Forest habitat for this plant has been negatively affected by timber harvest and fire suppression.

Cypripedium montanum (mountain lady's-slipper) is a Bureau Tracking species in Oregon and a Survey and Manage Category 1C species under the Final Supplemental Environmental Impact Statement for Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA and USDI 2001). The mountain lady's-slipper is found in Oregon, California, Washington, and Idaho. It is generally secure throughout its range but its persistence is a concern because of declining numbers or habitat. *Cypripedium montanum*, like *C. fasciculatum*, is found in mid-to-late-successional forests with canopy closures greater than 60 percent. Most populations of these two orchids are on the upper slopes of northerly aspects in the analysis area. These two orchids are frequently found together and, as such, are negatively affected by the same management actions, timber harvest and fire suppression.

Fritillaria gentneri (Gentner's fritillary) is listed as Endangered under the Endangered Species Act of 1973, as amended. This large, red-flowered lily is found only in Jackson and Josephine Counties. Its usual habitat is oak woodland and conifer forest edges. The ESA prohibits anyone from maliciously damaging or destroying any endangered plant species on federal lands; or removing, cutting, digging up, or damaging or destroying any endangered plant from any location (public or private) in knowing violation of any law or regulation of a state, including during violation of criminal trespass laws (ESA Section 9(a)(2)(B)). The one known population of Gentner's fritillary in the analysis area is in a conifer forest edge above and along an existing BLM road that follows a secondary ridge. Activities that have negatively affected this species are residential and agricultural development, logging, road and trail improvement, off-highway vehicle use, and collection.

Lithophragma heterophyllum (many-leaf prairie star) is a Bureau Tracking species in Oregon. In Oregon, it is considered rare while in California it is probably secure but with long-term persistence concerns. The habitat for the many-leaf prairie star is shaded conifer forest. The one known population in the analysis area is a single plant in an old timber harvest unit. The poor condition of this population is likely related to the overstory removal. The survey was performed only in the harvest unit; it is possible that the population extends into the neighboring forest. Habitat for this plant has been negatively affected by timber harvest.

Survey and Manage Plant Species and Habitats
Four species of Survey & Manage plants are known to occur in the analysis area (Table 18). These two vascular plant species are also special status plant species. No occurrences of Survey & Manage lichens, bryophytes, or fungi were located in the analysis area.

Table 18. Survey and Manage Plant Species and Habitats

Species	Category [1]	Habitat Requirement	Number of Sites	Trend[2]
Bryoria tortuosa	1D	oak woodland, shrubland	7	/\
Cypripedium fasciculatum	1C	conifer forest	19	\/
Cypripedium montanum	1C	conifer forest	18	\/
Dendriscocaulon intricatulum	1B	conifer forest with oak	1	=

1/ Categories are from the *Final Supplemental Environmental Impact Statement for Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA and USDI 2001).
2/ Trend of species within the analysis area is based on population numbers, population health, and available habitat
= = stable
/\ = increasing
\/ = decreasing

Bryoria tortuosa is an uncommon lichen where pre-disturbance surveys are not necessary. The range of this lichen is central California to British Columbia. It is locally abundant in the dry forest zones of eastern Oregon and Washington and southwestern Oregon. In the analysis area it is usually found on Oregon White oak and manzanita. Managing high-priority sites would meet the objectives for species persistence in the Klamath province.

Cypripedium fasciculatum and *C. montanum* are uncommon species where pre-disturbance surveys are practical. Concerns exist in regard to long-term survival and maintaining stable and well-distributed populations for both lady's-slippers because many of the populations consist of very few individuals.

Dendriscocaulon intricatulum is a rare lichen where pre-disturbance surveys are not practical. It is a Pacific Northwest endemic ranging from southeast Alaska to northern California. *D. intricatulum* has been found in a variety of habitats, including open conifer and deciduous stands, oak woodlands, oak balds, and moist conifer forests at low to mid-elevation in the western Cascades. The single site in the analysis area is in a second growth Douglas-fir forest. The lichen was found on California black oak.

FOREST DENSITY AND VIGOR

Vegetation disturbance mechanisms (abiotic and biotic) that influence forest stand structure are fire and fire suppression, bark beetles, logging, pathogens, and wind. In most cases, the biotic factors are influencing the forest structure in response to the overstocking and low vigor of the forest stands and are therefore secondary. The primary concern with the shrublands, woodlands, and unmanaged forest stands is the excessively abundant vegetation which causes low vigor and/or poor growth. Much of the analysis area has thousands of stems per acre of shrubs and tree species. Stems of vegetation per acre should be in the hundreds or less depending upon the age of the plant community. Low tree vigor occurs when diameter growth falls below 1.5 inches over 10 years and results in trees that are more susceptible to bark beetle attack (Hall 1995). In a 21 dominant tree sample, only 29 percent of the trees met the desired level of growth.

Vegetation Disturbance Mechanisms
Biotic processes that are influencing the forest stand dynamics and structure in the analysis area include fire, bark beetles, wind, and to a small extent forest pathogens. These biotic processes can cause tree and possibly stand mortality, shifting the forest stands to the stand initiation or understory reinitiation stages of development. These are the stages in which the tree canopy layer opens and allows regeneration to occur and become established in the understory.

Fire appears to be the major disturbance mechanism in the analysis area. Young, single canopy layer, mixed species forest stands are common. Old-growth forests are also present with younger tree age classes in the understory. At least five different forest stand age classes are apparent, and forest stand structure varies according to past disturbances. The species composition of the young stands is very diverse. Common tree species are Douglas-fir, Pacific madrone, California black oak, ponderosa pine, sugar pine, and incense cedar.

During the drought years of the 1990s, bark beetles killed many overstory trees over 100-years of age. Large diameter Douglas-fir trees growing on the drier pine sites died. Mortality also occurred on the drier Douglas-fir sites when tree densities were high. Large diameter ponderosa pines scattered across the landscape were also killed.

Pathogens that are in the analysis area include brown cubical butt rot (*Phaeolus schweinitzii*)and red ring rot (*Phellinus pini*). Windborne spores can infect new hosts through tiny dead branch stubs or tree stumps and remain dormant until the tree is stressed, usually by wounding. All of these processes create unhealthy trees that become safety hazards when located near houses or recreation areas, or roadways. Wind can cause infected trees to break or blow down. Wind-thrown timber is most common on the higher ridges when soils become saturated during the fall through spring months.

Forest Productivity
Forest productivity is generally defined in terms of site quality, which is a measure of tree growth over a given period of time. Site quality is determined by the physical characteristics of the soil, steepness of slope, aspect, microclimate, and species present. An indirect method of measuring site quality is to determine the site index of the soil. Site index is simply the height a tree will grow in a given time period. The Soil Survey of Jackson County Area, Oregon (1993) uses a reference age of 50 years for Douglas-fir. The soil survey indicates most of the soil series in the analysis area are capable of growing Douglas-fir trees to a height of 60 to 80 feet in 50 years. The best soils (Jayar, Rogue, Shefflein, and Vannoy series) will grow trees 80 feet tall in 50 years; the poorest soil (Tallowbox series) has a site index of 60 feet. These site potentials may not be met in the present-day overstocked forest stands.

For the majority of the large-pole and mature Douglas-fir stands in the analysis area, the average relative density index is approximately 0.70 (the ratio of the actual stand density to the maximum stand density attainable in a stand with the same mean tree volume) (Drew and Flewelling 1979). A relative density index of 0.55 is considered to be the point of imminent competition/mortality, at which point, trees have a greater probability of dying from biotic factors, mainly bark beetles.

Individual tree vigor in the analysis area is low. Tree vigor is a measure of health and is defined as the ratio of annual stemwood growth to the area of leaves present to capture sunlight (Waring, et.al., 1980). Trees with vigor ratings below 30 will succumb to attack from bark beetles of relatively low intensity. Trees with vigor ratings between 30 and 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 and 100 can generally survive one or more years of relatively heavy attacks and trees with ratings above 100 cannot be killed by bark beetles. A sample of 24 trees found in the analysis area had vigor ratings ranging from 30.04 to 130.74. Fifty-four percent of the sample trees had vigor rating between 30 and 70. Seventeen percent of the sample trees did have a vigor rating above 100. The sample trees were codominant and dominant size class trees with diameters ranging from 8 to 35 inches at breast height. Even though this is a small sample size scattered throughout the analysis area, this poor vigor trend is expected to be found in all forest stands with a relative density index of .7 and higher.

Trends
In general, the overstocked pole through mature size class forests found throughout the analysis area have a low level of growth or vigor and are susceptible to bark beetle attack and pathogens. Bark beetle attacks could continue and increase in intensity. Dense forest stands with ladder fuels are prone to intense forest fires. If fires occur, the forest area may be composed of more shrub and hardwood species in the future. Without fire, early seral, shade intolerant pine species and California black oak will continue to decline. Over time, the canopy closure of the older forest stands will become more open and the species composition of the forest stands will change.

FIRE AND AIR QUALITY
In the early 1900s, uncontrolled fires were considered detrimental to forests. Suppression of all fires became a major goal of land management agencies. From the 1950s to present, fire suppression became increasingly efficient due to additions in suppression forces. As a result of the absence of fire there has been a buildup of unnatural fuel loadings and a change in vegetative conditions.

Based on calculations using fire return intervals, five fire cycles have been eliminated in the southwest Oregon mixed conifer forests that occur at low elevations (Thomas and Agee 1986). Species, such as ponderosa pine and oaks, have decreased. Many once open stands are now heavily stocked with conifers changing their horizontal and vertical structures. As surface fuels and the laddering effect of fuels has increased, so has the threat of crown fires which were once historically rare (Lotan et al.1981). This absence of fire has changed historic fire regimes from low severity to moderate to high fire regimes.

Frequent low intensity fires serve as a thinning mechanism, thereby naturally regulating the density of the forests by killing unsuited and small trees. In addition, ponderosa pine trees that thrive in fire prone environments quickly get shaded out by the more shade tolerant Douglas-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 tend to be more fire-resistant and vigorous.

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

The absence of fire has negatively affected grasslands, shrublands, and woodlands. Research in the last few decades has shown that many southern Oregon shrub and herbaceous plant species are either directly or indirectly fire-dependent. Several shrub species are directly dependent on fires for germination - without fire, these shrub stands cannot be rejuvenated. Grass and forbs species may show increased seed production and/or germination associated with fire.

Indirectly fire-dependent herbaceous species are crowded out by larger statured and longer lived woody species. This is particularly so for grasses and forbs within dense stands of wedgeleaf ceanothus and whiteleaf manzanita. High shrub canopy closure prevents herbaceous species from completing their life-cycle and producing viable seed. Since many grass species have a short-lived seed-bank, these plants may drop out of high canopy shrub lands without fire.

Fire history recorded over the past 20 years in Southwest Oregon indicate a trend of more large fires which burn at higher intensities in vegetation types associated with low-severity fire regimes and moderate-severity fire regimes. This trend is also seen throughout the western United States. Contributing factors are the increase of fuel loading due to the absence of fire, recent drought conditions and past management practices.

Fire Risk
Fire risk is defined as the chance of various ignition sources causing a fire that threatens valuable resources, property, and life. Historic lightning occurrence indicates there is the potential of lightning fires starting throughout all elevations within the analysis area. The highest fire risk areas are major ridge lines due to lightning strikes and lands adjacent to roads and private property because of the potential for human-caused fires.

Historical records show that lightning and human caused fires are common in this analysis area. Activities within this area such as camping, recreational use, and major travel corridors (Interstate 5) add to the risk component for the possibility of a fire occurring from human causes. The time frame most conducive for fires to occur is from July through September.

Information from the Oregon Department of Forestry database shows a total of 238 fires occurred throughout the watershed analysis area from 1967 to 1999. Humans caused fires account for 76 percent of the total fires. The majority of fires (98%) were less than 1 acre in size. Fire data previous to 1967 is not available. The largest fire occurring in the analysis area since 1967 was the Savage Creek Fire in 1987. This fire was 2,799 acres in size and burned approximately 1,600 acres in the analysis area. Approximately 70% of the area burned at a moderate to high intensity.

Some of the values at risk from fire exclusion, high intensity wildfire, or fire suppression within this analysis area are private residential and agricultural property, water quality, forest resources and recreation sites (Table19).

Table 19. Values at Risk Due to Fire Exclusion, High Intensity Wildfire, or Wildfire Suppression Activities

Resource	Values at Risk
Recreation/Social	Aesthetic: Visual, spatial, and spiritual.
Habitat	Threatened and endangered species, and thermal cover.
Improvements	Private homes, natural gas pipeline, power transmission lines, farming and ranching facilities, managed timber stands.
Archeological Sites	Numerous sites (vulnerable to suppression activities).
Soils/Geology	Increased surface erosion, loss of litter layer, decrease in site productivity, change in soil structure, slope stability, and accelerated landslide activity.
Economic	Suppression costs and loss of products (recreation, timber, special products, livestock, range, and rural development).
Botanical	Numerous sites (vulnerable to suppression activities). All areas are susceptible to encroachment by non-native species in the event of high intensity fire. Suppression activities such as fireline construction, placement of camp sites, and vehicle use can impact all botanical habitat; moist mountain meadows are particularly sensitive.
Safety	Firefighters, public, visibility, telephone and power lines.
Air Quality	Public health and visual quality.

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 difficulty of control of a fire. Fire hazard is a useful tool in the planning process because it helps in prioritizing watersheds and areas within a watershed in need of fuels management treatment. Hazard ratings were developed using vegetation (type, density, and vertical structure), aspect, elevation, and slope. Throughout the analysis area 39 percent of the landscape has high fire hazard, 52 percent has moderate fire hazard, and 8 percent has low fire hazard (Map 19).

Communities at Risk

A United States Congressional requirement for the 2001 appropriations bill was to list in the Federal Register communities at risk from wildland fires. The towns of Gold Hill and Rogue River were included in this list. Areas that were identified will receive special attention from federal land management agencies and state foresters to reduce wildfire hazards.

Resistance to Suppression

In general, the existing fuel profile in the lower elevations of the analysis area represents a moderate to high resistance to suppression under average climatic conditions. Most of the timber stands have a dense overstory and a moderate amount of ground fuel and ladder fuels are present. This creates optimal conditions for the occurrence of crown fires that could result in large stand replacement fires. This type of fire also presents an extreme safety hazard to suppression crews and the public.

Air Quality
Levels of smoke or air pollutants have only been measured over the past three to four decades. The Clean Air Act directed the State of Oregon to meet the national ambient air quality standards by 1994. The Oregon Smoke Management Plan identifies strategies to minimize the impacts of smoke from prescribed burning on smoke sensitive areas within western Oregon. Particulate matter the size of 10 microns (PM10) or less is the specific pollutant addressed in this strategy. The goal of the Oregon Smoke Management Plan is to reduce particulate matter emissions from prescribed burning by 50 percent by the year 2000 for all of western Oregon. Particulate matter has been reduced by 42 percent since the baseline period (1991).

The population centers of Grants Pass and Medford/Ashland have been in violation of the national ambient air quality standards for PM10 and are classified as non-attainment areas for this pollutant. The analysis area is not included in the non-attainment areas. Major sources of particulate matter within the Medford/Ashland area are smoke from woodstoves (63 percent), dust, and industrial sources (18 percent).

Although still classified as non-attainment areas, the population centers of Grants Pass and Medford/Ashland have not been in violation of the national ambient air quality standards for PM10 for the past seven years.

The wildfires that occurred in southern Oregon in 1987 emitted as much particulate matter as all other burning that occurred within the state that year. Emissions from wildfires are significantly higher than from prescribed burning. Prescribed burning under spring-like conditions consumes less of the larger fuels creating fewer emissions. Smoke dispersal is easier to achieve due to the general weather conditions that occur during the spring. The use of aerial ignition reduces the total emissions by accelerating the ignition period and reducing the total combustion process due to the reduction of the smoldering stage. Prescribed burning contributes less than four percent of the annual total of particulate matter within the Medford/Ashland area. To date, no prescribed burning has taken place within the analysis area.

TERRESTRIAL WILDLIFE SPECIES AND HABITATS

Current Habitat Conditions and Trends for Wildlife
The quality of habitat provided by the various plant communities and structural classes in the analysis area varies considerably. In general, habitat conditions are in a declining trend.

Introduced noxious species such as yellow starthistle are invading and replacing native grass-forb dry hillside habitat. Over time, some of this habitat has also been replaced by mountain shrubland communities. Mountain shrubland communities are also in decline due to the loss of wildfire from the ecosystem. Most mountain shrubland habitat depends on fire for regeneration, and with the advent of fire suppression, the trend has been toward senescence with little regeneration. The result is a lack of early seral habitat in this plant community. Oak-woodland/deciduous hardwood habitat has decreased in condition and abundance due to the encroachment of conifers and the overstocking of oaks. In some areas this encroachment comes as a result of fire suppression. Frequent low-intensity fires killed encroaching conifers and smaller oaks. Oak-woodland/deciduous hardwood habitat has also been removed for agriculture and development purposes.

In the conifer plant communities, snags and down woody material are probably inadequate in many of the early seral and pole stands due to their removal during timber harvest. Due to fire suppression some pole and mature conifer stands are more dense than they would be under natural fire regimes. There is little intrastand structure in these dense stands and as a result species richness is depauperate.

The abundance of mature/old-growth habitat has declined due to timber harvest, and much of the remaining mature/old-growth habitat is fragmented and less functional for species preferring interior mature/old-growth habitat. Mature/old-growth habitat is important to a number of wildlife species within the analysis area, including the northern spotted owl. The decline in the amount of this habitat resulted in the federal listing of the northern spotted owl as threatened and the subsequent development of the Northwest Forest Plan (NFP). There are approximately 4,500 acres of mature/old-growth habitat in the analysis area.

Although supportive data are unavailable, the general decline in habitat condition probably has not resulted in significant change in the diversity of wildlife species in the analysis area. However, considerable change in species abundance and distribution would be expected.

Threatened/Endangered Species
The northern spotted owl, federally listed as a threatened species under the auspices of the Endangered Species Act of 1973, as amended, is present in the analysis area. There are four known spotted owl nest sites/activity centers present.

Approximately 4,220 acres of suitable northern spotted owl habitat are present on BLM managed land within the analysis area (Map 11). Suitable spotted owl habitat generally provides nesting or roosting/foraging functions, and generally has the following attributes: a high degree of conifer canopy closure (approximately 60 percent or greater), a multilayered canopy, and large snags and coarse woody material. In addition to the suitable habitat, there are approximately 3,475 acres of dispersal-only habitat on BLM managed land. Dispersal-only habitat provides limited foraging opportunity and a degree of protection from predators during dispersal. Canopy closure is generally 40-60 percent. Suitable and dispersal-only habitat data are not available for private lands within the analysis area, but it is likely that a limited amount of both suitable and dispersal-only habitat is present on private lands.

Most suitable and dispersal-only habitat on BLM-managed land in the analysis area is in the matrix land allocation (see Glossary). Under the NFP, the bulk of the programmed timber harvest is scheduled to come from this allocation; therefore, suitable and dispersal-only habitat is likely to be degraded or removed in the future. The exceptions to this are 100 acre buffers around the known spotted owl sites. These are protected areas and timber harvest is not likely to occur in them. Any suitable or dispersal-only habitat on private land is also likely to be harvested in the future.

Special Status Species
Special status species include those species that are listed by the U.S. Fish and Wildlife Service as threatened or endangered, proposed for listing as threatened or endangered, candidates for listing as threatened or endangered, or are listed by the BLM as sensitive, assessment, or tracking species. Oregon BLM tracking species are somewhat unique as a special status species because

they are addressed in Oregon BLM special status species policy, but are not considered a special status species for management purposes (see Glossary for explanation of these categories). Twenty-four special status species are known or suspected, based on known range and availability of suitable habitat, to be present in the analysis area (Table 20).

Ten of the special status species are associated with conifer or woodland forest habitat, and habitat for these species is expected to decline in the future due to timber harvest, special forest products removal, agricultural expansion and residential/rural residential development. The remaining species are considered special status species due to general rarity, lack of information, or population declines due to unknown reasons. Continuing regional and statewide studies and surveys may someday answer some of the concerns regarding these species.

Table 20. Special Status Terrestrial Vertebrate Wildlife Species

Species	Status[1]	Known/ Suspected	Reason for SSS Status
Western Toad (*Bufo boreas*)	BT	Known	Declining population - reasons unknown [2]
Western Pond Turtle (*Clemmys marmorata*)	BS	Known	Declining population due to habitat loss and predation from introduced species [2]
Northern Spotted Owl (*Strix occidentalis caurina*)	FT	Known	Declining population due to habitat loss (mature/old-growth forest) [2]
Great Gray Owl (*Strix nebulosa*)	BT	Suspected	Loss of mature/old-growth habitat [2]
Acorn Woodpecker (*Melanerpes formicivorus*)	BT	Known	Declining population due to habitat loss (oak-woodland) [2]
Pileated Woodpecker (*Dryocopus pileatus*)	BT	Known	Declining population due to habitat loss (mature/old-growth forest) [2].
Western Bluebird (*Sialia mexicana*)	BT	Known	Declining population due to habitat loss (snags) and competition for nest sites [2].
Townsend's Big-eared Bat (*Plecotus townsendii*)	BS	Known	General rarity; lack of information; disturbance at maternity, hibernacula & roost sites [2]
Western Gray Squirrel (*Sciurus griseus*)	BT	Known	Declining populations due to forested habitat loss and competition for food [2].
Foothill Yellow-legged Frog (*Rana boylii*)	BT	Suspected	Declining population - reasons unknown [2]
Sharp-tailed Snake (*Contia tenuis*)	BT	Suspected	Isolated populations; habitat loss (decaying logs) [2]

Species	Status[1]	Known/ Suspected	Reason for SSS Status
California Mountain Kingsnake (*Lampropeltis zonata*)	BT	Suspected	General rarity; collecting [2]
Common Kingsnake (*Lampropeltis getultus*)	BT	Suspected	General rarity; collecting [2]
Northern Sagebrush Lizard (*Sceloporus graciosus graciosus*)	BT	Suspected	Unknown
White-tailed Kite (*Elanus leucurus*)	BT	Suspected	Unknown
Northern Goshawk (*Accipiter gentilis*)	BS	Suspected	Declining population due to habitat loss (mature/old-growth forest) [2]
Lewis' Woodpecker (*Asyndesmus lewis)*	BT	Known	Declining population due to habitat loss (oak-woodland) [2]
Blue-gray Gnatcatcher (*Polioptila caeurlea*)	BT	Suspected	Unknown
Pacific Pallid Bat (*Antrozous pallidus)*	BT	Suspected	General rarity due to limited habitat (cliffs, caves, mines) and disturbance at these sites [2]
Silver-haired Bat (*Lasionycteris noctivagans)*	BT	Suspected	Declining population due to loss of habitat (snag and decadent trees in mature/old-growth forests) [2]
Long-eared Myotis (*Myotis evotis*)	BT	Known	General rarity; lack of information; loss of forested habitat [2]
Fringed Myotis (*Myotis thysanodes*)	BT	Suspected	General rarity and susceptible to disturbance [2]
Long-legged Myotis (*Myotis volans*)	BT	Suspected	Lack of information and declining habitat (large snags and abandoned buildings) [2]
Yuma Myotis (*Myotis yumanensis*)	BT	Suspected	Unknown

1/ Status:
FT = Listed as threatened under the ESA
BS = Bureau Sensitive
BA = Bureau Assessment
BT = Bureau Tracking

2/ Marshall 1996

Survey and Manage Species, Protection Buffer Species, and Bat Roost Sites
The great gray owl, designated as Survey and Manage (Category C) in the *Record of Decision and Standards and Guidelines for Amendment to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (SEIS ROD), is suspected to be present in the analysis area based on known sites in adjacent watersheds. Additional protection for six species of bats known or suspected to be present in the analysis area (Townsend's big-eared bat, silver-haired bat, fringed myotis, long-eared myotis, long-legged myotis, and pallid bat) is also addressed in the SEIS ROD. Systematic surveys for these species and the habitat/sites they are commonly associated with have not been conducted in the analysis area. The known great gray owl and bat sites have been located during opportunistic surveys.

If located, great gray owl nest sites would be protected with 0.25 mile buffers, and bat roost sites, maternity sites and hibernacula would be protected with 250 foot buffers. In addition, meadows larger than 10 acres would receive 300 foot buffers. Other than these buffers, habitat for these species is available for harvest and would likely be harvested in the future.

HYDROLOGY
For purposes of the hydrology discussion, the South Rogue-Gold Hill Watershed Analysis Area is stratified into five analysis subwatersheds: Kane Creek, Galls Creek, Millers Gulch and frontals, Foots Creek, and Birdseye Creek and frontals (Map 12).

Streamflow
The timing, magnitude, duration, and spatial distribution of streamflows are of importance to water users, riparian/floodplain landowners, aquatic life, and riparian and aquatic habitats. Sediment, nutrient, and wood routing are dependent upon streamflow regimes. Alterations to the natural hydrologic cycle have the potential to affect peak and low flows with subsequent changes to channel morphology, water quality, and aquatic ecosystems.

Peak Flow
The rain-dominated runoff pattern in the analysis area produces peak flows that generally occur during the period of high rainfall after soils are saturated, from December through March. Rain-on-snow events are not significant in the analysis area because only 3 percent of the area is within the transient snow zone (see Characterization, Climate section).

Vegetation removal and soil compaction are the major causes of changes to hydrologic processes (such as infiltration, interception, and evapotranspiration). These changes, both natural and human-caused, occurring individually or in combination can result in increased magnitude and frequency of peak flows. Increases in size and frequency of peak flows may result in accelerated streambank erosion, scouring and deposition of stream beds, and increased sediment transport.

A severe, extensive wildfire is the natural-caused vegetation disturbance having the greatest potential to increase the size and frequency of peak flows. Loss of large areas of vegetation due to a wildfire would likely adversely affect the analysis area's hydrologic response. The primary human-caused vegetation disturbances that can potentially affect the timing and magnitude of peak flows in the analysis area are timber harvest and conversion of forested sites to agriculture use.

Vegetation removal reduces interception and evapotranspiration rates and allows more precipitation to reach the soil surface and drain into streams or become groundwater. These hydrologic changes gradually diminish over time as vegetation returns. Vegetation regrowth is considered to be hydrologically unrecovered until it obtains the same crown closure as the previous unmanaged stand. For the South Rogue-Gold Hill analysis area, Douglas-fir stands are considered to be 100 percent hydrologically recovered when they reach 50 to70 percent crown closure on north aspects and 30 to 50 percent crown closure on other aspects. Pine stands are estimated to reach 100 percent hydrologic recovery when the crown closure is 20 to 30 percent, regardless of aspect. These canopy closures reflect reference conditions when forest fires were more frequent and other biotic agents such as insects, disease, and windthrow were not controlled.. The range of natural variability for vegetation in the analysis area includes canopy closures that would be greater than and less than full hydrologic recovery.

The estimated percent hydrologic recovery by analysis subwatershed (Table 21) was calculated by applying recovery factors to the vegetation information derived from Western Oregon Digital Image Processing satellite imagery data (Map 9, Table 7). Areas classified as water, rock, and grassland/shrubland are considered fully recovered for this analysis. Urban/agricultural areas are treated as zero percent recovered. The satellite imagery data does not have the capability of distinguishing between tree series, thus the pine stands had to be treated the same as Douglas-fir in the hydrologic recovery analysis. A crown closure of 45 percent was used as an estimate of full hydrologic recovery of hardwood and forested areas. Early seral stands were treated as recovered grass/shrublands instead of unrecovered openings because the satellite imagery data combines them.

Effects on hydrologic processes due to vegetation changes are most significant in transient snow zones. Peak flows resulting from vegetation removal in a rainfall-dominated zone are not known to cause the substantial impacts that rain-on-snow events can trigger (GWEB 1999). Only three percent of the analysis area is within the transient snow zone.

Vegetative cover in all the analysis subwatersheds appears to be in fair to good condition with the Foots Creek Analysis Subwatershed being in the best condition hydrologically and Kane Creek and Millers Gulch analysis subwatersheds being in the poorest condition hydrologically.

Table 21. Estimated Percent of Hydrologic Recovery by Subwatershed

Analysis Subwatershed	Percent of Area Hydrologically Recovered[1]
Kane Creek	76
Galls Creek	90
Millers Gulch and frontals	80
Foots Creek	92
Birdseye Creek & frontals	86
Total	87

1/ Estimates for hydrologic recovery were obtained by using vegetation information from the 1993 satellite imagery data, which does not reflect the most current vegetative condition.

Soil compaction affects the hydrologic efficiency within a watershed by reducing the infiltration rate and causing more rainfall to quickly become surface runoff instead of moving slowly through the soil to stream channels (Brown 1983). The resultant changes in flow routing have the potential to affect the timing and magnitude of peak flows. The duration of these changes is permanent for areas that are permanently compacted. Human-caused activities that result in soil compaction within the analysis area include roads, yarding corridors, off-highway vehicle (OHV) trails, land development, agriculture, and concentrated livestock grazing.

Roads are the major source of soil compaction within the analysis area. Roads quickly transport shallow subsurface flow intercepted by roadcuts and water from the road surface to streams (Wemple 1994). The road-altered hydrologic network may increase the magnitude of peak flows and alter the timing when runoff enters a stream. This effect is more pronounced in areas with high road densities and where roads are in close proximity to streams. The BLM GIS (Geographical Information System) transportation theme contains all roads on BLM-managed lands, but only a portion of roads on non-BLM lands (Map 4). Road miles for three sections of private land within the analysis area were estimated from aerial photos to illustrate the incompleteness of the GIS transportation theme. Road miles not included on the GIS transportation theme for these three sections are 1.9, 1.0, and 1.5 miles. Adding the roads not included on GIS would increase the road densities such that all the analysis subwatersheds would be considered to have high road densities (Table 22). The Miller Gulch and Kane Creek analysis subwatersheds have the highest road densities with 5.8 and 5.2 miles of road per square mile respectively. Sections with road densities greater than 4.0 miles/square mile are highlighted on Map 18 and listed in Appendix H. Kane Creek Analysis Subwatershed has the greatest number of stream crossings per square mile (20.9) followed by Millers Gulch (16.6). Sections with road/stream intersections greater than 10 per square mile are included in Appendix H.

Table 22. Road and Stream Crossing Densities

Analysis Subwatershed	Total Road Length (Miles[1])	BLM Roads[2] (percent)	Road Density (miles per sq. mile)	Stream Crossings (number per sq. mile)
Kane Creek	48.0	10	5.2	20.9
Galls Creek	52.8	42	4.0	13.5
Millers Gulch & frontals	30.5	13	5.8	16.6
Foots Creek	75.4	20	2.9	12.3
Birdseye Creek & frontals	37.3	54	3.6	11.4
Totals	244.0	27	3.8	14.0

1/ Roads shown on the BLM GIS transportation theme.
2/ Roads with BLM control or on BLM-administered land.

Areas compacted from yarding corridors and OHV trails are located throughout the forested portions of the analysis area while soil compaction due to land development, agriculture, and concentrated livestock grazing occurs at the lower elevations within the analysis area, primarily within and adjacent to floodplains.

Low Flow

Summer streamflows in the analysis area reflect the low summer rainfall (Table 4, Characterization section), water withdrawals, and sustained high evapotranspiration. The greatest need for water occurs during the summer when demand for irrigation use is highest.

Total quantities of water are not sufficient to satisfy all existing water uses (OWRD 1989). Instream water rights are water rights held in trust by the Oregon Water Resources Department to maintain water instream for public use. Instream water rights in the analysis area are for fishery, aquatic life, and water quality values (Tables 23 and 24).

Table 23. Instream Water Rights - Priority Date and Purpose

Stream Name	Priority Date	Purpose
Kane Creek	9/29/1969	Supporting aquatic life and minimizing pollution
Galls Creek	1/16/1991	Resident fish rearing
Foots Creek	12/7/1990	Anadromous and resident fish rearing
Birdseye Creek	1/16/1991	Anadromous and resident fish rearing

Source: OWRD 2000a

Table 24. Instream Water Rights - Monthly Flows

Stream Name	Instream Water Rights (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kane Creek	4.0	4.0	4.0	4.0	2.0	1.0	1.0	1.0	1.0	4.0	4.0	4.0
Galls Creek	13.9	15.0	15.0	8.3	3.2	1.0	0.6	0.4	0.3	0.4	1.5	9.0/10.6
Foots Creek	26.0	26.0	26.0	18.2	6.7	3.1	1.2	0.9	0.8	1.1	3.8	24.3
Birdseye Creek	7.5 /7.6	9.8	8.8	4.2	1.4	0.6	0.2	0.1	0.1	0.2	0.7	5.8

Source: OWRD 2000a

Water diversions are mainly located in the lower stream reaches, with the majority in the Kane Creek Analysis Subwatershed (Map 20). The majority (87 percent) of valid water rights issued by the Oregon Water Resources Department are for industrial purposes (mining), followed by irrigation (Table 25). It is not known to what extent water is still being used for mining activities. Surface water use is greatest in the Foots Creek Analysis Subwatershed.

Table 25. Surface Water Rights

Analysis Subwatershed	Water Use (cfs)						
	Irrigation	Fish/Wildlife	Agriculture	Industrial	Domestic	Recreation	Total
Kane Creek	2.64	0.00	0.02	4.00	0.13	0.00	6.79
Galls Creek	2.12	0.00	0.00	14.85	0.03	0.00	17.00
Millers Gulch	0.38	0.00	0.00	5.00	0.03	0.00	5.41
Foots Creek	10.40	0.00	0.00	120.92	5.45	0.01	136.78
Birdseye Creek	2.72	0.00	0.03	10.50	0.15	0.00	13.40
Totals	18.26	0.00	0.05	155.27	5.79	0.01	179.38

Source: OWRD 2000a

Water rights for groundwater in the analysis area amount to 1.13 cfs for irrigation in Kane Creek and 0.13 for irrigation in Foots Creek.

The Oregon Water Resources Department (OWRD) developed a regression analysis based on geography and precipitation patterns to estimate natural monthly streamflows at the 50 and 80 percent exceedance levels for streams without measured streamflows. The 50 and 80 percent flow exceedance values refer to discharges that occur at least 50 or 80 percent (respectively) of the time during a given month. The Water Availability Report System (WARS) uses these estimates to determine water availability after deducting estimated consumptive uses and instream flows from the predicted natural streamflows. Streams defined by OWRD as "over-appropriated" for surface water are those streams where the quantity of surface water available during a specified period is not sufficient to meet the expected demands from all water rights at least 80 percent of the time during that period (OWRD 1990). The 80 percent flow exceedance value is used to determine if water is available for issuing a new surface water right; 50 percent flow exceedance value is used for determining availability of surface water storage. Galls, Foots, and Birdseye Creeks are all fully appropriated at the 80 percent exceedance level and Kane Creek is fully appropriated for all months except February and March at the 80 percent exceedance level (Tables 26 and 27). Information is not available for Miller Gulch.

Table 26. Estimated 50 Percent Streamflow Exceedance Levels and Water Availability

Month	Kane Creek		Galls Creek		Foots Creek		Birdseye Creek	
	Natural Stream-flow (cfs)	Water Avail-ability (cfs)	Natural Stream-flow (cfs)	Water Avail-ability (cfs)	Natural Stream-flow (cfs)	Water Avail-ability (cfs)	Natural Stream-flow (cfs)	Water Avail-ability (cfs)
January	8.51	4.38	13.90	0.00	31.00	3.90	7.57	-0.06
February	11.00	6.88	17.80	2.80	39.60	12.50	9.76	-0.07
March	9.70	5.56	16.40	1.40	36.20	9.10	8.76	-0.06
April	4.54	0.30	8.34	-0.13	18.20	-1.30	4.15	-0.22
May	1.54	-0.81	3.16	-0.20	6.74	-1.40	1.43	-0.33
June	0.84	-0.63	1.46	0.19	3.13	-1.53	0.64	-0.45
July	0.32	-1.29	0.57	-0.36	1.24	-1.69	0.23	-0.59
August	0.21	-1.30	0.40	-0.30	0.88	-1.58	0.14	-0.50
September	0.14	-1.21	0.32	-0.20	0.75	-1.41	0.11	-0.34
October	0.18	-3.97	0.44	-0.08	1.12	-1.19	0.15	-0.14
November	0.67	-3.39	1.46	-0.02	3.81	-1.09	0.66	-0.05
December	6.39	2.28	10.60	0.00	24.30	-1.10	5.78	-0.06

Source: OWRD 2000b

Table 27. Estimated 80 Percent Streamflow Exceedance Levels and Water Availability

Month	Kane Creek		Galls Creek		Foots Creek		Birdseye Creek	
	Natural Stream-flow (cfs)	Water Avail-ability (cfs)	Natural Stream-flow (cfs)	Water Avail-ability (cfs)	Natural Stream-flow (cfs)	Water Avail-ability (cfs)	Natural Stream-flow (cfs)	Water Avail-ability (cfs)
January	2.80	-1.33	4.72	-9.20	10.50	-16.60	2.48	-5.15
February	5.16	1.01	8.66	-6.36	19.10	-8.00	4.59	-5.24
March	4.49	0.35	7.75	-7.27	17.10	-10.00	4.02	-4.80
April	2.13	-2.11	3.94	-4.53	8.58	-10.90	1.92	-2.45
May	0.99	-1.36	1.96	-1.40	4.12	-4.02	0.88	-0.88
June	0.40	-1.07	0.85	-0.43	1.85	-2.81	0.34	-0.75
July	0.20	-1.41	0.45	-0.48	1.01	-1.92	0.16	-0.66
August	0.17	-1.34	0.38	-0.32	0.84	-1.62	0.12	-0.52
September	0.12	-1.24	0.27	-0.25	0.60	-1.56	0.08	-0.37
October	0.13	-4.02	0.31	-0.21	0.74	-1.57	0.10	-0.19
November	0.25	-3.81	0.59	-0.89	1.54	-3.36	0.23	-0.48
December	1.15	-2.96	2.14	-8.48	4.91	-20.50	1.09	-4.75

Source: OWRD 2000b

The Oregon Department of Fish and Wildlife has identified Foots and Birdseye Creeks as priorities for summer streamflow restoration (ODFW 2000).

Trends

Future vegetation changes are not likely to affect the magnitude or timing of peak flows because there is a low potential risk of peak-flow enhancement in this rain-dominated analysis area. Although reduced harvest and restoration efforts under the Northwest Forest Plan (USDA and USDI 1994a) will accelerate the vegetation recovery process on BLM-managed lands, forest harvest is likely to continue at the current levels on private timber lands.

The potential risk for peak-flow enhancement due to roads is estimated to be moderate to high for the analysis area. Roads will continue to affect peak flows unless they are decommissioned or obliterated. Other sources of soil compaction include yarding trails/corridors and off-highway vehicles (OHVs) (especially in the John's Peak area) in the steeper, forested portions of the analysis area and land development, agriculture, and concentrated livestock grazing at the lower elevations.

The low summer flow situation in the analysis area is not likely to change substantially in the future. Years with below normal precipitation will be especially critical for fish and other instream uses. Increased development in the analysis area will place higher demands on streamflow and groundwater. However, new water diversions are only being approved for stored water, therefore, there will not be any additional year-round withdrawals. Foots and Birdseye Creeks have been identified by ODFW as high priorities for summer streamflow restoration so there may be some low flow increases in these two streams if such restoration occurs.

STREAM CHANNEL

In general, stream channels in the South Rogue-Gold Hill Analysis Area have been straightened and channelized, stream elevations have dropped as streambeds are scoured out, and pools have filled in with sediment. In the upper reaches stream channels are deeply entrenched in steep V-shaped valleys. There is a deficit of large wood in these steep gradient channels. This lack of sufficient instream structure to slow high stream energy results in floods that are more destructive downstream.

In the lower reaches, stream channels are confined by roads and development, restricting the natural tendency of streams to move laterally. Some reaches have been channelized to prevent the loss of agricultural lands to flood damage. Low gradient streams in valley bottoms are entrenched and are unable to access the adjacent floodplain except during major peak flow events.

Throughout the analysis area, granite is found as discontinuous pods (less than two square miles each) in the headwaters of Kane Creek, midslope along Galls Creek, the headwaters of the Left and Middle Forks of Foots Creek, midslope of Right Fork of Foots Creek and the headwaters of Birdseye Creeks (Map 7). Granitic rocks are the most erosive and unstable rocktype found in the analysis area. Streams that flow through areas with granitics are subject to rapid erosion, especially on steep slopes. This keeps fresh granite near the surface, and the transported decomposed granite results in a substrate with a high percentage of coarse sand and increases the embeddedness of streams.

More detailed channel description is available for the following streams: Birdseye Creek, Foots Creek, Galls Creek, Miller Gulch, and Kane Creek, and is discussed below.

Kane Creek

The very upper section of Kane Creek has a high ratio of pools at 40 percent step pools and 60 percent riffles. Large woody debris is at or above the ODFW benchmark of 20 pieces per 100 meters. The gradient in this upper section averages three percent. However, substrate has a very high content of sand, and embeddedness is estimated at 40 percent (Bolda 2000).

The land use in the lower third of Kane Creek is rural residential with evidence of heavy grazing. A 1991 ODFW survey on the lower third of Kane Creek found that the gradient is four percent for the first 400 meters, and then averages 1.2 percent. Fifty four percent of the habitat is riffles, 26 percent glides, and 14 percent pools. This is well below the desired ratio of 35 percent pools (ODFW 1997). The dominant substrates are gravel (40 percent), cobble (33 percent), and sand (19 percent). There is evidence of heavy grazing in the riparian corridor causing significant bank erosion. Large woody debris was not tallied in this section (ODFW 1991).

The stream at the mouth of Kane Creek is downcut and scoured to bedrock in several places. The substrate is very embedded. The mouth is bordered by houses with a narrow riparian corridor of 20 feet or less (Bolda 2000).

Miller Gulch
Like the other streams in the analysis area, the mouth of Miller Gulch is heavily developed and has houses bordering it, a road crossing, and agricultural fields encroaching into the riparian zone. The banks at the mouth are very steep and actively eroding.

Galls Creek
The lower 4,000 meters of Galls Creek has a gradient of 2.4 percent with a habitat composed of riffles (69 percent), pools (15 percent), and glides (10 percent). The dominant substrate is cobble (54 percent) and gravel (31 percent) (1991 ODFW).

The area surrounding the mouth of Galls Creek is heavily developed with houses and roads. The mouth of Galls Creek has a very narrow riparian corridor at the mouth. There is a large deposit of alluvial gravel and fines at the mouth (Bolda 2000).

Foots Creek
Land use along the lower section of Foots Creek, from the mouth to the split between the right and left forks, is rural residential. Stream habitat in this lower section is dominated by riffles (58 percent), glides (25 percent), and pools (17 percent). An ODFW benchmark indicates that a pool ratio of 35 percent is preferable (ODFW 1997). The dominant substrates are gravel and cobble 43 percent each, and gradient averages 1.5 percent. Problems in the lower section include water withdrawals for irrigation, road crossings directly through the creek, and heavy mining activity with dredging and large piles of tailings eroding into the creek (ODFW 1991).

The mouth of Foots Creek is bordered by houses and is completely lacking riparian vegetation. The banks are very steep and actively eroding. As with the mouths of all the tributaries, there are large alluvial deposits of gravels and fines up to 3 feet high (Bolda 2000).

The upper section of Left Fork Foots Creek (37-3W-20) has a well vegetated riparian corridor with a shade cover of 80 percent or greater over the channel (see riparian section for further description) and many step pools (Bolda 2000). The pool/riffle ratio is estimated at 40 percent pools to 60 percent riffles. Large woody debris is estimated to be at or above desired levels of 20 pieces per 100 meters (ODFW 1997), and substrate is a cobble gravel mixture with few fines (Bolda 2000). Above the culvert at road 37-3W-12 crossing, the habitat is similar, except the substrate is much more embedded with fines (Bolda 2000).

Birdseye Creek
The upper reaches of Birdseye above road 37-4-4 have adequate large woody debris and many step pools, although the stream substrate has an estimated embeddedness of 30 to 40 percent (Bolda 2000). In the lower reaches of Birdseye, I-5 crosses at the mouth, which in this case prevents other development, leaving a well shaded riparian corridor. The banks are very steep and actively eroding and the substrate is 30 to 40 percent embedded (Bolda 2000).

WATER QUALITY
Section 303(d) of the Clean Water Act requires each state to identify streams, rivers, and lakes that do not meet water quality standards even after the implementation of technology-based controls. These waters are referred to as "water quality limited" and states are required to submit lists of these water bodies to the Environmental Protection Agency every four years. Water

quality limited waters require the application of total maximum daily loads (TMDLs) which is a strategy for improving water quality to the point where recognized beneficial uses of the waters are fully supported. A TMDL addresses pollution problems by identifying those problems, linking them to watershed characteristics and management practices, establishing objectives for water quality improvement, and identifying and implementing new or altered management measures designed to achieve those objectives (ODEQ 1997). A Water Quality Management Plan (WQMP) that will serve as a TMDL to address nonpoint sources is scheduled to be prepared for the Rogue-Gold Hill Watershed in 2003. Agencies involved in developing the WQMP include the Oregon Department of Environmental Quality (ODEQ), Oregon Department of Agriculture (ODA), Oregon Department of Forestry (ODF), and the BLM (Medford District).

The Oregon Department of Environmental Quality's 1998 list of water quality limited streams (also known as the 303(d) list) includes two streams within the South Rogue-Gold Hill Watershed Analysis Area (Table 28, Map 21).

Table 28. Water Quality Limited Streams

Stream Name	Description	Parameter
Birdseye Creek	Mouth to headwaters	Temperature - summer
Galls Creek	Mouth to headwaters	Temperature - summer

Source: ODEQ 2000

Water quality parameters most critical to the beneficial uses (Characterization section, Water Quality) in the analysis area are: temperature, dissolved oxygen, pH, bacteria/pathogens, turbidity, sedimentation, and flow and habitat modifications. Flow and habitat modifications are discussed in Hydrology and Aquatic Wildlife, respectively. The processes and disturbances affecting the other critical water quality parameters and current conditions are described below.

Temperature

Many factors contribute to elevated stream temperatures in the analysis area. Low summer streamflows, hot summer air temperatures, low gradient valley bottoms, lack of riparian vegetation, and high channel width-to-depth ratios result in stream temperatures that can stress aquatic life. Natural disturbances that can affect stream temperature are climate (high air temperatures), below normal annual precipitation and low summer rainfall (low flows), wildfires (loss of riparian vegetation), and floods (loss of riparian vegetation). Human-caused disturbances affecting stream temperatures in the South Rogue-Gold Hill Analysis Area include water withdrawals, channel alterations, and removal of riparian vegetation through road building, logging, grazing, mining, residential clearing, and agricultural development.

The State water quality criteria for temperature is established to protect resident fish and aquatic life, and salmonid fish spawning and rearing. The temperature standard for summer temperatures in the Rogue Basin states that the seven day moving average of the daily maximum shall not exceed 64°F (ODEQ 1999:57). Birdseye and Galls Creeks exceed the temperature standard and are listed as water quality limited (Table 28).

Kane, Galls, Right Fork Foots, and Birdseye Creeks are the only streams in the analysis area that have been monitored for temperature (Table 29).

Table 29. Stream Temperature Monitoring Data

Year Monitored	Kane Creek		Galls Creek		Right Fork Foots Creek		Birdseye Creek	
	7 Day Ave. Max. Temp. (°F)	# Times 7 Day Ave. Max. > 64°F	7 Day Ave. Max. Temp. (°F)	# Times 7 Day Ave. Max. > 64°F	7 Day Ave. Max. Temp. (°F)	# Times 7 Day Ave. Max. > 64°F	7 Day Ave. Max. Temp. (°F)	# Times 7 Day Ave. Max. > 64°F
1994	---	---	---	---	---	---	67.0	19
1995	---	---	---	---	---	---	63.2	0
1996	---	---	---	---	---	---	65.6	7
1997	---	---	75.6	78	---	---	64.3	4
1998	---	---	74.2	79	---	---	65.2	9
1999	---	---	71.7	75	---	---	63.6	0
2000	62.0	0	73.8[1]	46	60.2	0	64.8	11

1/ Incomplete data - Galls Creek went dry on July 30, 2000.
Source: USDI BLM 1994, 1995, 1996, 1997, 1998, 1999, 2000

Dissolved Oxygen

Dissolved oxygen concentration refers to the amount of oxygen dissolved in water. Dissolved oxygen is critical to the biological community in the stream and to the breakdown of organic material (MacDonald et al. 1991). Dissolved oxygen concentrations are primarily related to water temperature (MacDonald et al. 1991). When water temperatures increase, oxygen concentrations decrease. Oregon's dissolved oxygen standard describes the minimum amount of dissolved oxygen required for different water bodies (i.e., waters that support salmonid spawning until fry emergence from the gravels, waters providing cold water aquatic resources, waters providing cool-water aquatic resources, etc.). The 30-day mean minimum for cold water aquatic life is 8.0 mg/l (ODEQ 1999:Table 21).

Low dissolved oxygen levels generally occur during the summer months when water temperatures are high and streamflows are low. No dissolved oxygen data is known to exist for the analysis area.

pH

pH is defined as the logarithmic concentration of hydrogen ions in water in moles per liter. pH can have direct and indirect effects on stream water chemistry and the biota of aquatic ecosystems. pH varies inversely with water temperature and shows a weak inverse relationship to discharge. Forest management activities can indirectly increase pH through the introduction of large amounts of organic debris and by increasing light to streams (MacDonald et al. 1991). State water quality criterion for pH in the Rogue Basin ranges from 6.5 to 8.5 (ODEQ 1999:57).

Limited pH data is available for BLM temperature monitoring sites. pH measurements obtained in June 1998 were 8.2 for Galls Creek and 8.1 for Birdseye Creek. pH measurements obtained in June 2000 were 8.1 for Kane Creek, 8.5 for Galls Creek, 8.2 for Right Fork Foots Creek, and 8.4

for Birdseye Creek. pH measurements taken in May 2001 were 7.4 for Kane Creek, 7.9 for Galls Creek, 7.5 for Right Fork Foots Creek, and 7.6 for Birdseye Creek (USDI BLM 1998, 2000, and 2001). All pH values measured meet the State water quality pH criterion.

Bacteria/Pathogens

Waterborne pathogens include bacteria, viruses, protozoa, and other microbes that can cause skin and respiratory ailments, gastroenteritis, and other illnesses. Most drinking and recreational waters are routinely tested for certain bacteria that have been correlated with human health risk. If the average concentration of these bacteria falls below the designated standard, it is assumed that the water is safe for that use and that there are no other pathogenic bacteria that represent a significant hazard to human health (MacDonald et al. 1991). The four groups of bacteria most commonly monitored are total coliforms, fecal coliforms, fecal streptococci, and enterococci. Fecal coliform bacteria are mostly those coliform bacteria that are present in the gut and feces of warm-blooded animals and can be directly linked to sanitary water quality and human health risks.

State water quality criteria for bacteria states that for a 30-day log mean of 126 *Escherichia coli* (a species of fecal coliform) organisms per 100 ml, based on a minimum of five samples, no single sample shall exceed 406 *E. coli* organisms per 100 ml (ODEQ 1999:58). The purpose of the bacterial water quality standard is to protect the most sensitive designated beneficial use, which has been identified as water contact recreation.

No bacteria/pathogen data is known to exist for the analysis area.

Sediment and Turbidity

Sedimentation is the natural process of sediment entering a stream channel. However, an excess of fine sediments (sand-size and smaller) can cause problems such as turbidity (the presence of suspended solids) or embeddedness (buried gravels and cobbles). Sedimentation is generally associated with storm runoff and is highest during fall and winter. Natural processes occurring in the analysis area, such as surface erosion, wildfire, and flood events, contribute to increased sedimentation.

There are areas of granitic soils in the headwaters of Kane, Galls, Foots, and Birdseye Creeks, with the largest area at the headwaters of Left Fork Foots Creek. These soils are prone to surface erosion, especially after the surface is disturbed. Sediment sources in the analysis area resulting from human activities include roads, logging (tractor skid trails, yarding corridors, and landings), off-highway vehicle (OHV) trails, mining, concentrated livestock grazing in riparian zones, residential and agricultural clearing of riparian zones, maintenance of irrigation diversions, irrigation return flows, and irrigation ditch blowouts.

Roads appear to be the primary human-caused sediment source in the analysis area. Roads with one or more of the following features have the greatest potential for contributing substantial amounts of sediment to nearby streams: stream-adjacent location, mid-slope location, natural surface, and inadequate drainage control and maintenance. Road surface types in the analysis area include natural, rocked, and paved (Table 30). It is important to note that the information in Table 30 is not complete for roads on private lands. The BLM GIS transportation theme includes all BLM roads, but only a portion of roads on private lands. The surface type is unknown for 54 percent of the road miles. These "unknown" road miles are on private lands and they are mostly driveways to private residences and access roads for private timber companies. A high percentage of the road miles with unknown surface type are probably natural surfaced. proximity to streams. Stream crossing densities are shown in Table 22. Roads are adjacent to a portion of all the major streams in the analysis area and have directly contributed sediment to the stream channel. The Foots Creek Analysis Subwatershed has the greatest number of road miles within 150 feet of streams (35.6 miles), followed by Kane and Galls Creeks (19.8 and 19.5 miles respectively). Sections with road/stream intersections greater than 10 per square mile are included in Appendix H.

Table 30. Road Surface Type and Road Proximity to Streams

Analysis Subwatershed	Total Road Miles[1]	Road Surface Type (miles)				Miles of Road Within 150 ft. of Streams		Miles of Road Within 300 ft. of Streams	
		Natural	Rock	Paved	Unknown	BLM-Admin	All Lands	BLM-Admin	All Lands
Kane Creek	48.0	2.5	4.6	7.6	33.3	1.9	19.8	3.0	32.4
Galls Creek	52.8	4.3	22.0	2.6	23.8	5.4	19.5	9.3	33.0
Millers Gulch & frontals	30.5	1.8	3.9	10.9	13.9	1.5	10.3	2.7	17.2
Foots Creek	75.4	9.9	10.9	4.4	50.1	4.4	35.6	8.2	58.9
Birdseye Creek & frontals	37.3	6.2	14.6	5.0	11.5	5.8	13.0	9.5	21.3
Total	244.0	24.7	56.0	30.5	132.6	19.0	98.2	32.7	162.8

1/ Roads shown on the BLM GIS transportation theme.

Skid roads, yarding corridors, landings, and OHV trails in the analysis area also contribute to accelerated surface erosion that is liable to enter waterways. The amount of soil disturbance due to these activities has not been calculated, however, from studying the aerial photos of the analysis area, it is apparent that extensive logging in the headwaters has resulted in a high level of ground disturbance. OHV use on existing roads, skid roads, and yarding corridors has increased the amount of sediment moving off site and into nearby streams. Trails built specifically for OHV use have also resulted in sediment input to streams in the analysis area.

Although more prevalent in the past, mining still takes place within the analysis area. Currently, mining claims consist of both lode and placer type claims. It is not known how much sediment is being produced by local mining. A stream habitat survey conducted by ODFW in 1991 from the mouth of Foots Creek to the confluence of the Right and Left Forks noted heavy mining activity with dredging and large piles of tailings eroding into the creek.

Streambank destabilization and subsequent sediment input can be caused or accelerated by land uses such as channelization, residential and agricultural clearing of riparian zones, and livestock grazing. The BLM 2000 survey of the tributary mouths (see Aquatic Wildlife Species and Habitats section) noted the mouth of Foots Creek was bordered by houses with a complete lack of riparian vegetation, the mouth of Kane Creek was bordered by houses with a narrow riparian corridor remaining of 20 feet or less and the area surrounding the mouth of Galls Creek was heavily developed with houses and roads. Concentrated livestock grazing on streambanks results in erosion from trampling and streambank collapse. The 1991 ODFW stream habitat survey report for the lower third of Kane Creek mentioned evidence of heavy grazing in the riparian corridor causing significant bank erosion. Additional sediment sources in the lower reaches of the analysis area include annual maintenance of diversion structures (especially push-up gravel dams), irrigation return flows, and irrigation ditch blowouts.

The State water quality criterion for sedimentation states that the formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry shall not be allowed (ODEQ 1999:58). Beneficial uses affected include resident fish and aquatic life, and salmonid fish spawning and rearing. The State water quality criterion for turbidity states no more than ten percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activities (ODEQ 1999:57). Beneficial uses affected are resident fish and aquatic life, water supply and aesthetics.

No winter season sediment or turbidity data is known to exist for the analysis area.

Trend

Water temperatures in stream reaches on federal lands may show some improvement in the long term as the Northwest Forest Plan is implemented on federal lands and riparian vegetation recovers along the tributary streams. However, high stream temperatures will likely persist on the non-federal reaches due to water withdrawals, high width-to-depth ratios, and lack of riparian cover. The dissolved oxygen, pH, and bacteria are not expected to change in the future within the analysis area.

Sedimentation and turbidity will vary depending on the amount of soil disturbing activity in the analysis area. Timber harvest and road construction in granitic areas will likely result in additional sediment delivery to nearby streams. New road construction will likely result in increased surface erosion while road decommissioning should decrease sediment and turbidity levels. OHV trail construction, OHV use on trails that cross stream channels, and the existing residential and agricultural development along the lower stream reaches will likely continue to contribute sediment to streams.

RIPARIAN AREAS

Surveys on the riparian area, like stream habitat surveys, were limited, and specific riparian descriptions come from fish habitat surveys done in some of the fish bearing streams. For purposes of the riparian area discussion, the Rogue-Gold Hill Watershed Analysis Area is stratified into the four fish-bearing streams where data exists: Kane Creek, Galls Creek, Foots Creek, and Birdseye Creek.

Kane Creek

The 1991 ODFW stream survey was done on the lower third of Kane Creek in 1991, starting at the mouth to 3576 meters upstream (ending 1/ 4 mile upstream of old Hwy 99 crossing). The land use on the lower third of Kane Creek is described as rural residential with evidence of heavy grazing. Large woody debris was not tallied for this section, but shading averaged only 60 percent, indicating this section was not heavily forested and wood supplies were probably low. Mature deciduous trees dominated the overstory (ODFW 1991 stream survey).

The riparian corridor in the very upper part of Kane Creek in section 37-3W-11 is well shaded (90 percent) by mature hardwoods of big leaf maple and douglas fir with a thick understory of snowberry, hazelnut, and ferns. The riparian corridor is dissected on each side by parallel roads, 10 feet away on one side, 20 on the other.

The vegetation at the mouth of Kane Creek is dominated by willow. Fifty yards upstream of the mouth the corridor is approximately 60 feet of mature deciduous trees bordered by residences (Bolda 2000).

Galls Creek
Land use from the mouth of Galls Creek to Township 36S-3W-28 is rural residential. The riparian vegetation is mature deciduous. Shade in the riparian corridor averaged only 50 percent in 1991. Although large woody debris was not tallied in this section, the lack of shade would suggest there would be inadequate woody debris, with little opportunity for future woody debris (ODFW 1991 stream survey).

The BLM survey of the tributary mouths showed the riparian condition at the mouth of Galls Creek was similar to the other tributaries, the mouth was bordered by residences with a very narrow riparian corridor of 20 feet or less of mature deciduous trees. In the alluvial fan, riparian vegetation had been scoured out and there were returning willows three feet high.

Foots Creek
The land use for the lower section of Foots Creek from the mouth to the split between Right and Left Fork is rural residential (1991 ODFW stream survey). Development along this lower section of Foots Creek has led to removal of riparian vegetation, and current shade cover is only 46 percent. There is little large woody debris (LWD) available and little future LWD potential. The riparian vegetation that remains is mature deciduous, dominated by big leaf maple and alder. The riparian vegetation at the mouth of Foots Creek is dominated by willows (Bolda 2000). Residences line the riparian corridor on both sides of the creek. Some ferns cling to eroding, nearly vertical banks of the creek ending where residences lawns start.

The upper section of Left Fork Foots Creek (37-3W-20) has adequate shade cover of 80 percent or greater within a well vegetated riparian corridor. Vegetation is dominated by big leaf maple and alder with some Douglas fir and incense cedar with an understory of snowberry, ferns, and hazelnut. The primary disturbance to the riparian corridor in this section is the road, 37-4-12, which runs adjacent to the stream in the riparian corridor (Bolda 2000).

Birdseye
The upper section of Birdseye Creek was well shaded by mature hardwoods of big leaf maple and Douglas-fir with a thick understory.. BLM road 37-4-4.3 is the primary disturbance, 30 feet from the stream, it cuts through the riparian corridor. Along road 37-4-5.4 a recent timber harvest has opened up the riparian corridor. The shade of the riparian corridor is reduced to approximately 60 percent. Species composition is still mature deciduous, but of smaller diameter.

At the mouth of Birdseye, the riparian condition differs somewhat from those of the other tributaries described in this analysis. I-5 crosses at the mouth of Birdseye, which has prevented other development, leaving a well shaded riparian corridor. Species composition is mature deciduous, large diameter (30" or greater) of big leaf maple and alder. The banks rising from the creek were very steep, and although covered with some undergrowth there was not enough to stabilize the banks and there was active erosion (Bolda 2000).

AQUATIC WILDLIFE SPECIES AND HABITATS

The South Rogue-Gold Hill watershed analysis area is home to summer steelhead, listed as a candidate species under the Endangered Species Act (March 9, 2000), coho salmon (*Oncorhynchus kisutch*), a species listed as threatened as of May 1997, cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*Oncorhynchus mykiss*), sculpin (*Cottus* sp.), and dace (*Rhinichthys sp.*). See the Characterization section for information on species distribution. Kane Creek, Miller Gulch, Galls Creek, Foots Creek, and Birdseye Creek are the fish bearing streams in the analysis area.

Fish Habitat Conditions

Kane Creek

The land use in the lower third of Kane Creek is rural residential with evidence of heavy grazing. The gradient is 4 percent in the first 400m, then averages 1.2 percent for the rest of the survey. Fifty-four percent of the habitat is riffles, 26 percent glides, and 14 percent pools. This is well below the desired ratio of 35 percent pools (ODFW benchmark). The dominant substrates are gravel (40 percent), cobble (33 percent), and sand (19 percent). Shading of the riparian corridor averages about 60 percent. There is evidence of heavy grazing in the riparian corridor causing significant bank erosion. Large woody debris was not tallied in this section (ODFW 1991).

The very upper section of Kane Creek is 90 percent shaded. This section has a high ratio of pools at 40 percent step pools and 60 percent riffles. Large woody debris is at or above the desired number of 20 pieces per 100 meters (ODFW benchmark). The gradient in this upper section averages three percent. However, substrate has a very high content of sand and embeddedness is estimated at 40 percent (Bolda 2000).

The stream at the mouth of Kane Creek is downcut and scoured to bedrock in several places. This downcutting creates two waterfalls that could present passage problems at low flows, one 3 foot fall over bedrock 10 meters from the mouth, and another 3 foot waterfall over bedrock 25 meters from the mouth. The substrate is very embedded. The mouth is bordered by houses with a narrow riparian corridor of 20 feet or less (Bolda 2000).

Miller Gulch

There were no habitat surveys done on Miller Gulch. Like the other streams in the analysis area, the mouth of Miller Gulch is heavily developed and has houses bordering it, a road crossing, and agricultural fields encroaching into the riparian zone. The banks at the mouth are very steep and actively eroding.

Galls Creek

The lower 4000 meters of Galls Creek has a gradient of 2.4 percent with a habitat composed primarily of riffles (69 percent), then pools (15 percent), and glides (10 percent). The dominant substrate was cobble (54 percent) and gravel (31 percent). The stream is only 50 percent shaded above the channel (ODFW 1991).

The area surrounding the mouth of Galls Creek is heavily developed with houses and roads, as is typical for the mouths of the streams in the analysis area. The mouth of Galls Creek has a very narrow riparian corridor at the mouth. There was a large deposit of alluvial gravel and fines at the mouth, but there were no apparent passage problems.

Foots Creek

The land use for the lower section of Foots Creek from the mouth up to the split between the right and left fork is rural residential. Stream habitat in this lower section is dominated by riffles (58 percent), then glides (25 percent), and lastly pools (17 percent). The preferred ratio would have a higher percentage of pools (desired 35 percent, ODFW benchmark). The dominant substrates are gravel and cobble (both 43 percent). Gradient is 1.5 percent. Shade over the channel averages 46 percent. Some of the problems in this lower section include water being withdrawn for irrigation, road crossings directly through the creek, and heavy mining activity with dredging and large piles of tailings eroding into the creek (ODFW 1991).

The mouth of Foots Creek is bordered by houses with a complete lack of riparian vegetation. The banks are very steep and actively eroding. As with the mouths of all the tributaries, there are large alluvial deposits of gravels and fines up to 3 feet high (Bolda 2000).

The upper section of Left Fork Foots Creek (37-3W-20) has adequate shade cover of 80 percent or greater over the channel within a well vegetated riparian corridor (see riparian section for further description) with many step pools (Bolda 2000). Pool/riffle ratio is estimated at 40 percent pools to 60 percent riffles. Large woody debris is estimated to be at or above desired levels of 20 pieces per 100 meters (ODFW benchmark), and substrate is a cobble gravel mixture with few fines (Bolda 2000). Further upstream, above the culvert at road 37-3W-12 crossing, the habitat looks similar, except the substrate is much more embedded with fines (Bolda 2000).

Birdseye Creek

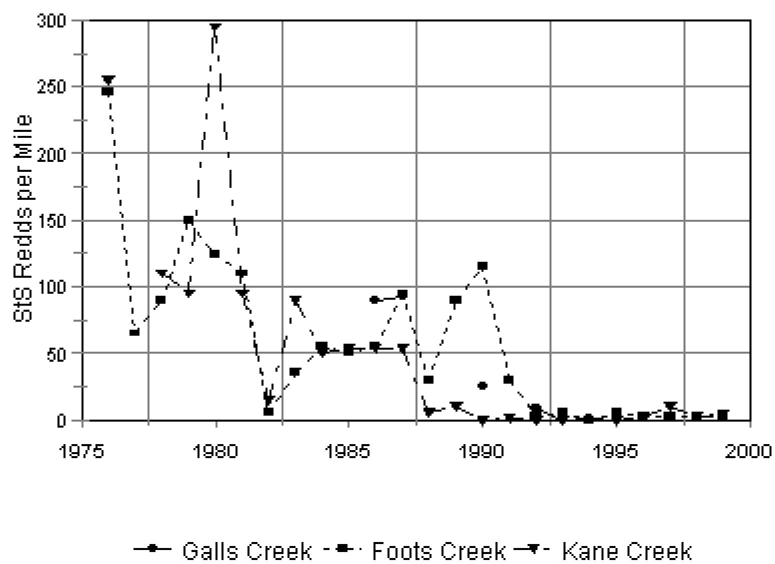
A BLM contracted macroinvertebrate bioassessment was done in Birdseye Creek in the fall of 1994 in section 37S-4W-4 SE1/4 NE1/4 just upstream from road crossing 37-4-4.1. Aquatic macroinvertebrates are good indicators of stream habitat quality. Because the life cycles and habitat needs of many aquatic insects are known, the presence or absence of particular taxa provides a good indication of the year-round stream condition. The bioassessment found that there were less small stream fauna than would be expected, with two rare taxa present (*Rhyacophila grandis* and *Cordulegaster sp.*). The lack of cold water invertebrate biota indicated that the possibility of excessive summer warming of stream temperatures. This also may have represented a temporary condition brought on by extended drought. The relatively high number of long-lived taxa present indicated that flow was perennial and disturbance only moderate (Aquatic Biology Associates 1994).

The upper reaches of Birdseye above road 37-4-4 are well-shaded with adequate large woody debris and many step pools, although the stream substrate is embedded (estimated at 30-40 percent) (BLM 2000). I-5 crosses at the mouth of Birdseye, which in this case prevents other development, leaving a well shaded riparian corridor. Although there are no passage problems, the banks are very steep and actively eroding, the water is very turbid, and the substrate is 30 to 40 percent embedded (BLM 2000 field survey).

Aquatic Wildlife Species and Habitats Trends

ODFW has conducted summer steelhead redd counts on Rogue River tributaries since 1976. One pattern that emerged from these data was a decline in numbers of summer steelhead redds from the 1970s to the early 1990s (Figure 1). The reasons for this declining trend in redd numbers are not obvious. Summer steelhead populations have been drastically reduced from historic levels throughout their range, and spawning escapement into these tributaries is probably correspondingly low. The sequence of spawning, incubation, emergence and migration of the summer steelhead is so reliant on adequate flows for a critical period of time, that any change in the natural flow patterns can affect the ability of fish to use the stream. The drought conditions during the 1980s and early 1990s, increase in roads and culverts, reduction of riparian vegetation, timber harvesting, withdrawals for irrigation, among others, all can effect the natural flow patterns, which impacts the ability of summer steelhead to use these tributaries for spawning.

Figure 1. Number of Steelhead Redds per Mile from 1976 to 1999.



Drought conditions ended in 1993, which probably improved spawning conditions. However, as development increases, riparian vegetation will continue to decrease. Recent surveys show high levels of embeddedness in spawning gravels; impacts from roads, culverts, and irrigation withdrawals continue (water quality section). ODFW continues to conduct spawning surveys and analyze these data.

REFERENCE CONDITIONS

The reference conditions section explains how ecological conditions have changed over time as a result of human influences and natural disturbances. This section provides a reference for comparison with current conditions.

HUMAN USES

Introduction

This brief environmental history traces the major interactions of past human inhabitants with the land, and suggests some effects of these interactions upon the land. Historic information is always incomplete, often anecdotal, and rarely quantifiable. Yet the story presented here provides some glimpses into the past, and something of a road map to current conditions.

Native Inhabitants and the Land

Archaeological evidence indicates that people have inhabited the region for about 10,000 years. Until about 7,000 years ago, human populations were very low and very mobile. People lived in small bands, and hunted and gathered throughout the landscape.

After about 7,000 years ago, populations began to increase, and regular camps appear in the archaeological record of the analysis area. For the next 5,000 years, people living in this region followed a remarkably stable pattern of existence, though towards the end of this period changes began to take place. During this time, native peoples lived in small bands, moving themselves seasonally about the countryside in search of valued resources, in increasingly well-defined group territories. Hunting was important, as was gathering root and seed crops. Archaeological sites dating throughout this period attest to the use of the South Rogue-Gold Hill Watershed Analysis Area during this time. By the end of this period, however, significant changes appear in the archaeological record, signifying changes in the native way of life (Winthrop 1993).

This new way of life was well established after 2,000 years ago. It was characterized by larger populations, well-defined group territories, and a higher degree of sedentism than existed previously. Permanent villages, inhabited for at least part of the year, appear in the archaeological record. These villages were usually situated at lower elevations near major rivers and streams, reflecting a stronger emphasis on fish resources. Group interactions also intensified, evident in an increase in trade and warfare. Social hierarchies developed, with wealth items representing higher status among individuals or families. This way of life continued until the coming of Euro-Americans to this region.

The native people known as the Upland Takelma, and possibly those known as the Shasta, inhabited the analysis area. The boundary between the Shasta territory and the Takelma territory has been suggested as falling in the vicinity of modern day Talent (Olmo and Hannon 1989:4; Gray 1987:17-18)

The Takelma familiarity with the landscape within the analysis area comes from ethnographic work documenting their language. The Takelma had names for many places in the analysis area. The Takelma name for Timber Mountain meant “deerhide bucket” because of a bare place on its summit shaped like a bucket (Gray 1987:75). The Takelma also had several names for Rock Point on the Rogue River, a place to catch salmon (Gray 1987:77).

The Upland Takelma as well as the Shasta, like other native peoples in the region, had developed a highly sophisticated understanding of the environment in which they lived and the resources on which they depended. As hunters/gatherers/fishers, they interacted with the environment to promote and enhance those foods and materials of most benefit to them. Roots and bulbs, such as camas and various forms of *perideridia* (e.g. ipos) provided starchy staples. Fish, especially anadromous fish such as salmon, and major ungulates (deer, elk) provided essential protein. The most favored fishing locations were located at the falls and rapids of the Rogue and its tributaries (Gray 1987:32). Acorns from oak trees were another nutritious food. In addition, a wide variety of berries, nuts, seeds (e.g. tarweed seeds), fowl, and other game augmented their diet. Other plants and animals were used for a wide variety of necessary materials to make basketry, fiber, tools, clothing, and medicines.

Native peoples throughout the region employed a number of techniques to manage their environment. Their most important tool was fire. Fire was probably used by the Shasta for thousands of years, but became a major tool for resource management during the last two thousand years, coinciding with expanding human populations and the advent of a cooler and wetter climate.

Fire was used for a variety of purposes (LaLande and Pullen 1999). Fire was used in hunting to drive game animals to the kill, and for the longer-term goal of improving and maintaining wildlife habitat. Open, park-like forests were also a goal, because they made hunting easier. Fire assisted in promoting and maintaining staple crops, such as acorns from oak trees. Fire maintained open meadows and prairies, both in the uplands and valleys, which were crucial locations for subsistence resources including game, roots, bulbs, berry patches, and grass seeds.

Native peoples used fire for specific purposes and carefully regulated its use. For example, the Shasta and the Takelma used fire to destroy beaver lodges and to kill the animals (LaLande 1989:13). The Takelma burned the hillsides of the Rogue Valley to make it easier to gather fallen acorns and to maintain grass stands (Pullen 1996:V-3). The Takelma were also known to set fires on top of yellowjacket nests in order to cook the underground larvae (Bonnicksen 2000:177). Burning took place at certain times (mainly spring and fall) and at specific intervals, and contributed to the development of the prairies and savannahs of the valleys, oak and oak/pine woodlands of the foothills, and the meadows of the uplands.

Archaeological and historic evidence documents a limited native presence in the analysis area. The steep mountainous terrain of the majority of this area would have made it suitable for seasonal resource exploitation, but most likely not as an area for semi-permanent settlement. This area would have been subject to those techniques the native peoples employed to enhance the resources present. Fire was a significant factor affecting the landscape.

Early Explorers

Early explorers and traders began passing through the area in the nineteenth century. Beginning with Peter Skene Ogden in 1827, these individuals left descriptions of their travels. These descriptions provide the earliest historic evidence we have of the environment.

Ogden was an employee of the British Hudson's Bay Company, which had a base along the Columbia River to the north. Sent out on a mission to discover and deplete the beaver of the southern Oregon country, Ogden followed the Klamath River, coming from the Klamath Basin into what is now northern California in 1827 (LaLande 1984:40-43).

Ogden continued on to the Shasta Valley, then turned north to cross the Siskiyous in the vicinity of present-day Interstate 5. He entered the Bear Creek Valley, following Hill Creek, and camped near today's Emigrant Lake. Continuing his journey northward, he described the Rogue River below the confluence of Bear Creek as being "well-wooded with Poplar Aspine and Willows." (Pullen 1996:VI-2). Ogden also observed near Gold Hill that the south-facing side of the Rogue contained different vegetation than the north-facing side: "The Country on the opposite side is also less woody and hilly and Grass more abundant." (Pullen 1996:VI-2).

These statements, taken from various passages of Ogden's journal give a brief view of the landscape through which he passed. Beaver were abundant in the streams, which followed meandering courses through the valley, hosting numerous frogs and providing good habitat for birds and raccoons. Oak and pine dotted the landscape, with lush native grasses carpeting the hills and valley. Field mice attest to an open, lightly wooded environment (LaLande 1984:64), and deer were plentiful in the hills. Many others would follow in Ogden's footsteps over the next few decades (Dillon 1975) and some would also comment on the environmental conditions along the trail.

Philip Edwards, herding cattle with the Ewing Young expedition in 1837, described the area between the river and hillsides near Gold Hill as "brushy" and the north-facing hillside as "covered with wood" (Pullen 1996:VI-3). William Brackenridge, botanist on the 1841 Wilkes expedition, found the banks "low and brushy near Gold Hill." This brush extended for over one quarter mile wide along the bank (Pullen 1996:VI-3). While Titian Ramsey Peale, also of the Wilkes expedition, observed the area near present day Valley of the Rogue State Park. He observed a broad prairie with scattered woods consisting of two species of oaks and sugar pine (Pullen 1996: VI-5). Lindsey Applegate, a member of the 1848 expedition to blaze a wagon trail from the Willamette and Rogue Valleys to California, said of the area around Gold Hill: " the Indians in large numbers came out of the thickets on the opposite side" (Pullen 1996:VI-3).

The character of vegetation on the upper slopes of the Rogue Valley was aptly described by Indian Agent Samuel Culver in 1855 when he complained to Joel Palmer that the country is composed of narrow valleys and mountains covered with timber, and an undergrowth so dense they [the Indians] can conceal themselves within a few yards of persons passing or pursuing (Pullen 1996:VI-7). The north-facing slopes of the area were probably covered with an open stand of ponderosa and sugar pines and occasional Douglas-fir. South-facing slopes were covered with grass except along ravines where oaks and chaparral occurred along with scattered ponderosa pine. Exposure to intense summer heat was probably largely responsible for this pattern, but annual burning of valley floors and slopes by the native inhabitants kept chaparral and Douglas-fir from becoming established to any great extent (Pullen 1996:VI-7).

These early travelers came through the analysis area on their way to other places. None, before the discovery of gold in the early 1850s, came to stay. Yet these people brought a new way of interacting with the land, and their actions affected the landscapes through which they passed.

All of the travelers lived off the land as they passed through. Trappers also removed many beaver, with the intent of hunting them to extinction. Removal of these animals may have affected the watercourses within which they lived, as beaver dams decayed and stream courses became more channelized.

Perhaps more importantly, these early travelers spread disease and pillaged the resources of the native peoples through whose lands they passed. The resulting ill-will culminated in a series of brutal battles during the period of pioneer settlement in the 1850s, known as the Rogue River Indian Wars. At the end of the wars in 1856, surviving native people from the Rogue Valley were removed to distant reservations, and the way of life of those Shasta left in the Shasta Valley changed radically. The carefully maintained prairies, meadows, and woodlands of the native landscape began to disappear.

Early Historic Period (1850 - 1900)
Although the analysis area does not contain a major settlement, it is tied to the nearby towns and cities of Rogue River, Gold Hill and to a certain extent Medford, and has been affected by development in the adjacent Rogue Valley.

In the spring of 1851, the only settlements in the Rogue River valley were ferry stations on the Rogue River. Vannoy's ferry adjacent to the watershed analysis area was one of these stations (Guest 1929: 96). The Donation Land Claim of 1850 and the discovery of gold in 1851/1852 contributed to the settlement and development of the area.

Mining
Gold was discovered on Foots Creek in the fall of 1852 (Guest 1929:100). Besides increasing the population within the analysis area, mining also had a tremendous impact on the resources and the landscape. Many of the early mines within the analysis area were gold placer mines. Placer mining claims were staked on or near the creek bed. Claims in the bed of the creeks were generally limited to 50 yards, extending on each side to high water mark. Bank or bar claims were limited to 40 feet on the creek running back to the hill or mountain (Anon. 1897:33).

The amount of water available was a prime factor in determining methods of mining and the length of the annual operating season for these mines (Brooks and Ramp 1968:36). The simplest methods of mining were the miner's pan, the sluice box, and the rocker and cradle (Brooks and Ramp 1968:36). The common method used by solitary prospectors involved panning the gold from the gravels using water from the river. A slightly more advanced system used rockers, cradles, and long toms. Gravels were shoveled into a wooden box, buckets of water were added, and the box was shaken to release the gold. The 'shoveling-in' and transport of water required considerable effort and much of the fine gold was lost.

The invention of the sluice was a great energy saver. The sluice provided miners with the advantage of being able to manipulate water. Instead of hauling buckets, water was diverted from the stream channel to the sluice where the gravels were washed. Furthermore, more of the fine gold could be recovered by coating the riffles in the bottom of the sluice with mercury (quicksilver) which served to amalgamate for higher recovery (Budy 2001:36). Quicksilver was not used in gold processing at first but it came in vogue in 1853 and greatly facilitated the extraction of gold (Anon. 1897:33).

None of these early methods required much investment, and the nearby forests provided wood needed for sluices and troughs to divert the water, as well as for simple shelters and cabins. For simple sluicing methods, water to wash the gravels was diverted directly from the river via wooden troughs. Often, these were built directly along the river bank and required only sufficient slope to keep the water moving. Even using such simple methods, two or three men often worked together on a claim (Budy 2001:39).

Placer gold operations took place on Galls Creek and Birdseye Creek. Galls Creek was the most productive. The Blockert mine on Galls Creek was the most important placer mine in the Gold Hill district (Brooks and Ramp 1968:240). The majority of the mining operations took place during the winter and spring months when there was water in the creeks. Rainfall in southwestern Oregon is seasonal, falling mostly during the winter months (Purdom 1977:15). Therefore, chronic water shortages occurred in the summer months.

By the summer of 1861, all the surface placers and creek beds had been worked extensively. Now miners had to dig deeper and employ new and more expensive methods of securing gold (Gilmore 1952:93-94). Hydraulic mining technology began in California in the 1850s and spread rapidly to the miners in Oregon (LaLande 1985:31 in Budy 2001:39). Hydraulic mining required a significant investment in the development of necessary water supply systems as this technology required a steady stream of water and sufficient volume to develop pressure. The system involved diverting water from a source located above the placer deposits and confining it in progressively smaller pipe to a control point where it produced a powerful spray. The earliest methods used a flexible hose fitted to a nozzle that could be directed to the gravels to be pressure washed (Evans 1883). By 1857, hydraulic mining was being developed in the Jacksonville area (Gilmore 1952:79).

Hydraulic mining employs a large, pipe-fed nozzle called a giant or monitor to direct a powerful jet of water against banks of auriferous gravel. This required the digging of ditches to ensure a steady supply of water, without which the placers could not be worked (Brooks and Ramp 1968:36). Since individual miners did not have this type of money, outside investors were needed or family corporations that had access to outside monies.

By 1900, there were a number of hydraulic mines along the creeks in the analysis area. At the head of the Foots Creek valley, Cook & Sons employed three giants and had water for 6 months of the year (Anon. 1900:57). Below Cook & Sons, the Black Gold Channel Co. also operated on Foots Creek (Anon. 1900:57). Lance Gold Mining Co. was one of the largest enterprises on Foots creek with 700 acres of ground running for about two miles along the creek. The operation included 10 miles of ditch, 2000 feet of sluice-way and a large reservoir. The operation dumped wasted directly into the Rogue River (Anon. 1900:57).

On Kane Creek, C. S. McDougal operated one giant with good results. There were also several ground sluicing enterprises on this creek (Anon. 1900:58). On Galls Creek, two giants were in operation and a number of men were kept busy ground sluicing during the rainy season (Anon. 1900:58).

Dredging was the fastest method of working placer gravels. The capacity of dredges ranged from 1,000 yards to 15,000 yards of gravel per day. The bucketline dredge consisted of a wood- or steel-hulled barge upon which is mounted a continuous chain of buckets for excavating, a screening and washing plant, and one or more conveyor belts for stacking tailings (Brooks and Ramp 1968:36). Kane Creek and lower Foots Creek were the sites for some of the earliest gold dredging in the area. The first dredge on the Rogue was set up in 1898. (Brooks and Ramp 1968:238)

Lode mining began in the 1860s after the richer and more easily obtainable placer deposits had been worked over (Brooks and Ramp 1968:238). The Braden lode mine was discovered about 1885. The first ore mined was ground in an arrastra. In the early 1900s it was equipped with a 10 stamp mill (Brooks and Ramp 1968:244, 248).

Settlement

The Donation Land Claim of 1850 allowed white settlers in Oregon after December 1, 1850 to claim 160 acres of land if they were white male citizens; a married couple could claim 320 acres (Schwantes 1989:121). Recipients were required to reside on and cultivate the land for four consecutive years in order to ensure a patent from the government for their claim (Gilmore 1952:302). Besides farmers, many miners took up land claims in conjunction with their mining activities, to have land to return to if their mining pursuits failed (Gilmore 1952:307).

David and Clarissa Birdseye had a donation land claim on what is now Birdseye Creek. The claim included the mouth of the creek (McArthur 1992:73). A hewn log house was built on their claim in 1856 (Sheffield 1974:38).

There were a number of direct impacts from this law. First, it encouraged long-term residents rather than migrants. Secondly, as the law required cultivation of the land, there was an immediate and radical change in land use. The Donation Land Claims were supposed to be square or oblong in shape. This requirement superimposed a recognizable pattern on the landscape (Schwantes 1989:121). These claims also brought fences, which not only delineated the borders of the various claims, but also prevented the Native Americans from accessing their traditional food sources.

Because of the clash of cultures and lifestyles, the U. S. Military was brought into the area. Several structures associated with the military are located within or immediately adjacent to the analysis area. Many of the first homes in the area were used as temporary forts. To transform a home into a fort, a deep trench was dug around the entire area and logs stood on end in the trench with fourteen feet rising into the air. Dirt was shoveled into the trench so that the walls were solid. The logs were about two feet thick, and holes were cut into them to shoot through (Birdseye 1984:32).

The Birdseye Fort served as field headquarters for the Oregon volunteers serving under General Lane (Sheffield 1974:38). Fort Lane which is located just outside the analysis area was built in 1853 and occupied by troops of the Regular Army for three years (Farr 1974:43).

A number of small towns sprang up to serve the needs of the settlers in the analysis area. None of these towns are in existence today. One early town was the Dardanelles whose post office was established on October 19, 1852 with William G. T'Vault as postmaster. This settlement was south of and across the Rogue River from the present town of Gold Hill (McArthur 1992:236).

The area of Dardanelles was located where present day Foley Lane and the Old Stage Road intersect. There was a toll bridge across the Rogue here (O'Hara 1993:136).

The town of Bolt was named for John Bolt, a member of the firm of Kubli and Bolt, pioneer packers and merchants for southern Oregon. It was on the south side of Rogue River about six miles east of the west boundary of Jackson county at the point where the old Pacific Highway crosses Foots Creek (McArthur 1992:84).

The town of Draper was named for miner Silas Draper. The Draper post office was established February 9, 1882 with Draper as postmaster. The office was closed in 1912 (McArthur 1992:268). The 1910 official map of Jackson County shows Draper located up Foots Creek.

In the decades following the removal of the native peoples, the major activities characterizing the new human interactions with the landscape developed. By the turn of the century, these interactions had already brought significant changes to the land. These actions included mining, ranching, logging, and agriculture. All involved some degree of resource extraction for economic benefit, and all depended upon the development of a sufficient infrastructure for movement of goods and information throughout the region.

Transportation and Communication
Most of the main routes through the area have a long history, and all were well established by the end of the nineteenth century (Fagan 1994; LaLande 1980; Klamath National Forest map archives). Early constructed roads were usually built on the flatter ground along streams and rivers where road construction was easier and access more important for homesteading, ranching, and mining.

The Applegate Trail, which was used from 1846 - 1868 by emigrants to Oregon, follows Old Stage Road and Highway 99 through the analysis area. Early travelers on this road were passing through on their way to settle in the Willamette Valley. Over the next several decades, numerous others passed along this route, known as the Siskiyou Trail, from Oregon to California. In 1859, it was improved as a toll road for wagon travel.

The north/south railroad connecting the Shasta and Rogue valleys to other major urban centers was completed in 1887. This development brought a huge boost to the region's economy, providing access to markets for timber, cattle, and agricultural produce (Jones 1980:247-251). This railroad is just outside the analysis area on the other side of the Rogue River.

Communication developments were also critical. Local newspapers and regional road networks all appeared during this period, as did the telegraph in the 1880s. As part of the process of incorporating the landscape into the new society, the federal government sent surveyors to map and record the newly acquired lands. These maps provide some brief descriptions of the land at the beginning of significant Euro-American use, and after the demise of the native way of life.

Ranching and Agriculture
During the 1850s and into the 1860s, the market for the farmers of the valleys of the Rogue River area was strictly limited to the volume of home consumption and to a limited amount of goods transported over hard, difficult transportation routes (Gilmore 1952:323-324). Early crops were

wheat. Demand from miners provided local markets for ranchers in the analysis area as early as the 1850s. Despite a slump in mining in the 1860s, local and regional markets led to further development of the industry in the 1860-70s, tied in part to the growing agricultural and timber economy. With the advent of the railroad in the 1880s, ranchers also had greater access to distant markets.

Although agriculture has not been as significant in the analysis area as it has been elsewhere in the region, developments in agriculture affected the area. Flour mills, established in Ashland in the 1850s, provided a market for wheat from local farmers in the analysis area. Irrigation accompanied the earliest settlement in the valley. Most of these efforts were small in scale, with ditches leading from local streams to local farms.

In the 1870s the growth of the orchard industry in the Rogue Valley led to several significant effects (LaLande 1980). Major irrigation works expanded. The orchard boom also led to a high demand for wood crates, fueling the growing timber industry in the region. Both the orchard and logging industries increased the demand for beef, with local ranchers provisioning loggers in the region (Hessig 1978).

Timber

Logging in the analysis area was a minor enterprise from the 1850-80s, spurred by the local needs of miners and settlers. Logging took place mainly at lower elevations. Sugar pine was a target species, and milling was done at small, local mills (LaLande 1980:135). Development of the railroad in the 1880s increased access to markets and timberlands.

Hunting and Recreation

Throughout the nineteenth century, hunting and trapping continued intensively within the analysis area. There was an active market for deer hides and pelts (beaver and other types) (LaLande 1980:132; Hessig 1978:22). Hunting for sport continued, and ranchers sought to eliminate predators, especially cougars and grizzly bears, dangerous to their stock.

With the development of transportation networks and the settlement of the countryside, recreational pastimes became part of the pattern of land use as well.

Effects Upon the Land

By the turn of the century, the new way of life introduced by Euro-American settlers was well entrenched and had brought significant changes to the land. The native peoples had been removed, and the careful caretaking philosophy that motivated their interactions with the landscape was also gone. Interestingly, the changes brought by the new way of life were not specifically linked to major changes in population; there were probably about as many people actually living within the analysis area before and after the shift from a native to a Euro-American way of life. The major changes were due in part to radical differences in economy and technology. These differences were reflected in early development of the infrastructure–roads and communication networks--which facilitated a market economy and the ranching, logging, and agricultural industries dependent upon it.

The Euro-American way of life brought rapid change to certain elements of the local environment. Major predators were hunted down or removed, as were major game animals. The absence of native burning began to change the character of the vegetation, especially of the meadows, prairies and grasslands, and oak and pine woodlands. Grazing, especially the unregulated grazing of the nineteenth century, affected native bunchgrasses. Ranchers burned to promote forage for their stock, but their burning was less discriminate than that of their native predecessors, and often escaped into major fires in the timberlands. Logging began to take out major timber reserves, especially accessible sugar pine (LaLande 1980). Agriculture introduced new species to the land, and roads and trails increased traffic of all kinds throughout the area.

Early Twentieth Century (c. 1900 - World War II)
One of the biggest developments in mining was the introduction of electricity. In 1903 a dam was built across the Rogue River at Gold Ray and in 1904 electricity was sent out from the first power-house (Tucker 1931:157). Electricity provided another source of power for the dredges thus increasing their capacity.

In 1903, Champlin Electric Gold Dredging Co. purchased property on lower Foots Creek and constructed a steam-powered bucket-line dredge. Electric power from the Gold Ray plant near Gold Hill was installed in 1905. The capacity of this dredge was 2000 yards per day (Brooks and Ramp 1968:240). In 1908, the Electric Gold Dredging Co. worked a tributary of Kane Creek in the SW 1/4 Sec. 36, T.36S R. 3W. The electric power shovel fed a washing plant at the rate of 500 cubic yards in 10 hours (Brooks and Ramp 1968:240).

The area above the forks of Foots Creek, for a distance of about two miles on each fork, was dredged over a period of seven years (1928-1935) by the Rogue River Gold Mining Co (Brooks and Ramp 1968:240). In January 1941, the Murphy-Murray Dredging Co. started digging on Middle Fork Foots Creek above the area dredged by Rogue River Gold Mining Co. and covered an area about 1 ½ miles up stream. In March 1941 the dredge was dismantled and moved out of the area (Brooks and Ramp 1968:240). The Murphy-Murray dredge was located on Foots Creek in the early 1940s. During 1940 this dredging company produced 4,253 ounces of gold and 616 ounces of silver from 627,261 cubic yards of Foots Creek gravel (Brooks and Ramp 1968:238). The dredge had a capacity of 4000 cubic yards daily and dug 20 feet below the water line (Brooks and Ramp 1968:37). Dredging on Foots Creek apparently had several periods of inactivity and new starts. In late summer and fall, low water often necessitated the shutting down of operations until after rainfall again replenished the supply (Brooks and Ramp 1968:240).

The analysis area is known for pocket mines. The “Revenue Pocket” was found and mined out (date unknown) by the Rhotan brothers on Kane Creek in Sec. 11 T. 37S. R. 3W. At an elevation of about 2,570 feet, it was mined in the early 1900s (Brooks and Ramp 1968:239,263).

Transportation
As late as 1910, the outlying roads of the county were not in good condition (Tucker 1931:156). In 1913, the western Better Roads Movement initiated construction of the Pacific Highway over the Siskiyous (Atwood 1995:7). With the advent of the auto in the early twentieth century, the route was improved again as Highway 99. Highway 99 basically follows the Rogue River through the analysis area.

A further improvement in roads came about as a result of the automobile and the desire of people to travel year-round. In 1913 and 1914 the Pacific Highway from Central Point to Phoenix was paved, becoming the first paved highway in the state. By 1931 the full extent of the Pacific Highway was paved (Tucker 1931:156).

Ranching, Agriculture, Timber

Ranching and agriculture continued to be significant activities in the region. Ranching was primarily affected by the development of government regulations, which were instituted in response to the excesses of the late 19th century and to the continuous conflict among users over the range (Brown n.d.:41; LaLande 1980:140). Agricultural growth in the South Rogue-Gold Hill Analysis Area was evidenced by the development of major irrigation networks.

As elsewhere in the country, the Depression of the 1930s served to dampen economic development, and the timber industry slumped until the demand of the Second World War brought new growth to the industry.

New Players in the Watersheds

The early decades of this century also witnessed the arrival of another significant force to the region: the federal government, in the form of land management agencies.

Partly in response to growing national concern over environmental degradation caused by land use practices of the nineteenth century, and partly out of concern over the loss of economic resources, the federal government instituted a system of federal reserves around the turn of the twentieth century. In Oregon, the Cascade Forest Reserve stretched almost to the California border, encompassing lands within the analysis area. These lands soon became part of the Crater National Forest, precursor to the Rogue River National Forest. Eventually, management of the lands within the analysis area came under BLM's jurisdiction. In the early part of the century, the failure of the O & C Railroad to comply with terms and conditions of their land grant resulted in the return of unsold sections of their land to the government. Most of the BLM-managed lands within the analysis area returned to government management through this process.

Government management in the early days emphasized the regulation of hunting and grazing, and regeneration of the range. Fire suppression and timber management were also high priority issues. Fire suppression especially became a priority, particularly for the Forest Service, with long-term consequences to the land. The Forest Service perspective on fire suppression is documented in the following quotes from a 1936 Klamath National Forest brochure:

> "The fire-protection policy of the Forest Service seeks to prevent fires from starting and to suppress quickly those that may start. This established policy is criticized by those who hold that the deliberate and repeated burning of forest lands offers the best method of protecting those lands from the devastation of summer fires. Because prior to the inauguration of systematic protection California timberlands were repeatedly burned over without the complete destruction of the forest, many people have reached the untenable conclusion that the methods of Indian days are the best that can be devised for the present...
>
> The stock argument of those who advocate the 'light burning' of forests is that fire exclusion ultimately leads to the building up of supplies of inflammable material to such an extent that the uncontrollable and completely destroying fire is certain to occur. The

> experience of the Forest Service in California, after 15 years or more of fire fighting, does not lead to any such conclusion...
>
> Fire exclusion is the only practical principle on which our forests can be handled, if we are to protect what we have and to insure new and more fully stocked forests for the future.."

Effects Upon the Land
Land use practices in the first half of this century continued to foster changes begun in the nineteenth century, although government regulations served to improve some situations. Hunting regulations led to some regeneration of game species, and grazing regulations assisted in slowing the degeneration of the range and in regenerating some lands. However, native grasslands and meadows continued to be transformed. Among the factors affecting this transformation was the introduction of invasive weeds. Fire suppression policies began to affect the composition of local forests and to further the demise of the more fire resistant oak and pine woodlands. Water and fish resources were affected by the development of major irrigation and hydroelectric facilities.

Late 20th Century
During the second half of the twentieth century, developments in transportation and logging technology, as well as increased demand and substantial increases in prices (from $2.00 to $22.50/thousand board feet in 1951; Lawrence 1972:23) made logging possible and profitable throughout the analysis area. World War II spurred the economy and the lumber business worked at full production after 1942.

The main species targeted were sugar and yellow pine. The logging and reforestation practices differed between operators (Foley 1994:33). Some selectively cut, targeting diseased and dying or over-mature trees, leaving enough to reseed areas. Others clearcut and then left without planting, or clearcut, burned the slash, then replanted the area with two-year old seedlings, depending on the economics of the situation. Growing demand due to increasing local and distant populations also brought greater recreational development to the area, stimulated in part by access made easy by more roads. Federal land use priorities are reflected in the land use policies of the government, which continues to manage significant portions of the analysis area.

EROSION PROCESSES
Prehistoric erosion rates were much higher than present-day erosion rates. To the south, the Condrey Mountain dome (Klamath/Applegate River divide) lost 23,000 feet in elevation due to erosion during the previous 14 million years. To the north, the area around Table Rocks has eroded several thousand feet over the previous 9 million years (Orr 1992). Erosion processes that affected both of these areas were similar to erosion processes in the analysis area and have continued for several million years.

Historic erosion processes were predominately surface and channel erosion. Types of surface erosion included sheet, ravel and minor gully erosion. A large volume of sediment was likely transported to area streams via sheet erosion and raveling of materials over long periods of time. Steep and incised mountainous sideslopes and areas with Tallowbox soils (Map 8) were the most erodible terrain of the analysis area.

Historically, wildfires and floods were the main natural agents that affected rates of erosion by removing extensive soil cover. Throughout the late nineteenth and early twentieth centuries, large wildfires occurred periodically in the analysis area (see Human Uses). Large wildfires were likely detrimental to water quality and fisheries as they removed ground cover and exposed soil to subsequent surface erosion. The highest erosion rates would have occurred when an intense storm event immediately followed severe wildfires on erosive soils. Due to fire suppression over the past 70 years, topsoil loss has been reduced as fewer natural fires have exposed soils.

Stream channels can downcut during high-flow flood events and form highly incised stream channels. Streambank failures adjacent to steep slopes were likely common. Active channel erosion was also a common feature during past large floods and resulted in increased sedimentation.

Native Americans had little impact on erosional processes. Though fires were used to maintain oak groves and increase visibility around hunting and living areas, these controlled burns were of low intensity. During the latter half of the 1800s miners set fires with the intent of consuming all vegetation, so as to more easily find gold bearing strata. Compared to the fires set by Native Americans, these were of higher intensity and led to accelerated erosion (Bonnicksen 2000).

SOIL PRODUCTIVITY

In areas with minimal human disturbance, historic soil productivity conditions were much the same as they are today. Nutrient availability may have increased in some areas due to the unnaturally thick duff and litter layers resulting from fire prevention. Productivity in the analysis area varies by elevation, aspect, topography, and bedrock.

Tallowbox and Caris-Offenbacher soils are found along ridges and upper slopes. These soils are shallow and rocky. Site productivity, though good, is lower than on midslopes where Shefflein and Vannoy soils are found (Table 31). Midslope soils are older and more developed.

Table 31. Soil Productivity as Shown by the Height of a 100-year old Douglas-fir

Soil Type	Slope Position	North-facing slopes	South-facing slopes
Tallowbox	Upper slopes and ridges	100 feet tall	90 feet tall
Caris-Offenbacher	Upper slopes and ridges	110 feet tall	100 feet tall
Shefflein	Mid-slopes	115 feet tall	100 feet tall
Vannoy	Mid-slopes	110 feet tall	105 feet tall

The primary reason for the lower productivity of ridge-top soils is the natural lack of adequate soil moisture and soil development, especially the development of very thick topsoil. Drying winds and exposure to extreme cold temperatures is another reason for the low site productivity. The lack of thick soils is due to the steepness of the slope that these soils are found on, resulting in erosion of soils before soils are truly developed; Caris-Offenbacher soils have a maximum slope angle of 80 percent, whereas on the more erosive Tallowbox soils, it is only 70 percent.

LANDSCAPE VEGETATION PATTERN

The vegetation native to the South Rogue-Gold Hill Analysis Area is a result of time and the unique geology of the area. Over the last 60 million years, vegetation has migrated into this area from six different directions: the Oregon and California coast ranges via the Siskiyou Mountains (red alder, Pacific madrone and bigleaf maple); the Sierras and Cascades (baneberry, sugar pine, manzanita spp. and California black oak); the Klamath River corridor, and lowland chaparral area (mountain mahogany) (Atzet 1994).

Natural change in landscape pattern is inherent; natural succession is continuously changing the vegetation and there is no single stage of a forest that can be considered to be the only natural stage. Leiberg (1900) wrote that prior to 1855, the Native Americans were responsible for frequent, small circumscribed fires which resulted in forest stands with diverse age classes. Therefore, the Native Americans also created forest stands with various patch sizes.

After Euro-Americans arrived, the forest stands became more open (fewer vegetation stems on a unit of size basis) and the forest patch size decreased because of logging and the more frequent use of fire for various reasons. Because of the frequent disturbance, there was more vegetation in the larger size classes. Mature and old-growth fire resistant trees species, such as pine species, Douglas-fir, and incense cedar with thick bark survived the fires.

Historic vegetation patterns are difficult to confirm because only government lands were mapped. According to the 1958 forest type maps created by the Bureau of Land Management, the forests within the analysis area were predominantly composed of Douglas-fir, pine and hardwood mixtures. The historic vegetation matrix was forest land. Many forest stands had scattered old-growth Douglas-fir or pine with a younger tree understory. Understory ages ranged from 10 to 90 years. Ages 60 and 90 were the most frequent for the understories, most likely corresponding to past forest fires. Well stocked, large diameter Douglas-fir stands were few and small in size. Clearcuts were scattered across the landscape. The grasslands and shrublands were slightly larger in size.

Fire and logging were the primary processes influencing the vegetation landscape pattern. Wind damage may have been a factor in the open forests during the winter months when soils became saturated. Bark beetles and pathogens were probably less noticeable because of the lower tree stocking levels and the diversity of species making up the forest stands.

PLANT SPECIES AND HABITATS

Introduced Plant Species and Noxious Weeds

Prior to exploration and settlement by Euro-Americans, introduced plants would have had little opportunity to arrive in this area. Natural processes that facilitate long distance seed transport include wind, water, and birds. In 1841, the United States Exploring Expedition passed along the bottom edge of the analysis area and explored the area for four days. One of the duties of this party was to collect representatives of all plant species. The Expedition traversed through riparian, oak woodland, shrubland, and savannah habitats of the analysis area. Presently, these habitats bear the heaviest infestations of introduced plants and noxious weeds. The lack of collection of any introduced plants in the analysis area demonstrates the healthy and natural condition of the ecosystem at that time.

Conifer forest habitat was traversed in nearby watersheds and presumably explored while the party was in the area. Of the published list of plants collected, none of the nonnative plants were specific to the analysis area. The collection notes for one nonnative plant, *Erodium cicutarium* (redstem storksbill), state that this plant is "found throughout the interior of Oregon, common and apparently indigenous" (Wilkes 1862). While not specifically mentioned for this watershed, it is assumed to have occurred here. Most of the nonnative plants collected were associated with established forts and ports.

Special Status and Survey and Manage Plant Species and Habitats
The United States Exploring Expedition led by Lieutenant Charles Wilkes in 1841 was established for scientific purposes. This early scientific expedition included two botanists and several naturalists. These botanists collected specimens of vascular plants, fungi, mosses, algae, and lichens that were later identified by leading scientists specializing in these particular groups (Wilkes 1862; McKelvey 1956).

A review of the published species lists from 1841 showed none of the species currently on either the Special Status Species list or the Survey and Manage Species list. Specific population and distribution data for this time does not exist, but the data suggests that these species were uncommon prior to Euro-American settlement. Notably, *Cypripedium*s (orchids) were collected by Wilkes in Washington and northern California. *Cypripedium*s are some of our more widespread rare plants. Apparently, none were encountered in Oregon.

Besides the Wilkes expedition, the Hudson Bay Company party led by trapper Peter Skene Ogden in 1827, and the party that established the Applegate trail provided general descriptions of the landscape. It is generally recognized that plant communities in southern Oregon are fire maintained. These communities developed through naturally occurring summer lightning-caused fires and fires deliberately set by indigenous people usually in the late summer through autumn. The valley bottoms and foothills were covered with widely spaced, large California black oak with grasses and forbs beneath. Occasionally there would be savannahs or groves of large Ponderosa pine in these lowlands. Streams were bordered by brush, cottonwoods, and alders. The mountain forests were probably composed of large diameter, well-spaced trees.

FOREST DENSITY AND VIGOR

Core samples from ponderosa pine and Douglas-fir trees between the ages of 90 and 255 years indicate that these present day, large diameter trees were free to grow when they first became established (USDI, BLM, 2000). This growth indicates low stocking levels or more open growing conditions. Sample trees grew 2 to 5 inches per decade in diameter and the diameter growth rate gradually decreased to 1.5 inches per decade over a period of 40 to 90 years. Few sample trees were suppressed at the time of establishment. Tree diameter growth has been below 1.5 inches per decade since approximately 1920.

Historical information is somewhat misleading in regard to actual tree stocking levels early in the 1900s. Although forest mapping indicated that there were few large trees on a per acre basis, more trees were present in the understory. In places there were probably thousands of seedlings per acre. The 1958 USDI maps indicate that beneath the large diameter pine and Douglas-fir trees, there was most often a hardwood or mixed species understory. Douglas-fir was also common beneath the older pine trees.

There is evidence that much of the analysis area was once open grown black oak forest. It is common to find 20 to 40 inch black oak trees that are now in the understory beneath conifer trees. Individual tree leaf area is now small and the trees are barely alive. Dead, large diameter black oak trees are common on the forest floor. These black oaks had to be the dominant trees before 1900.

As tree growth and vigor declined in the early1900s, bark beetles probably started to become an important factor in changing the height and size class structure of the forests. The western pine bark beetle caused mortality in the large diameter ponderosa pine and the Douglas-fir bark beetle in suppressed Douglas-fir trees. Pathogens probably became more apparent as more even-aged stands became established and matured.

Forest stands are dynamic in nature and will continue to change in stocking levels and species composition over time.

FIRE AND AIR QUALITY

The historical fire regime of the South Rogue-Gold Hill Watershed Analysis Area was characterized by frequent (1 to 25 years) and widespread fires resulting from the hot, dry summers. Accounts documented by early settlers of Oregon indicate that wildfires were common, widespread, and produced substantial amounts of smoke, which impacted visibility and the health of local residents (Morris 1934). These periodic fires consumed understory and ground fuels thus leaving a large gap between the overstory and ground. This in turn reduced the probability of a crown fire. Typically, fire intensity was low because frequent fires limited the time for fuel accumulation. Consequently, the effects of individual fires on flora, fuels, and fauna were minor, creating a more stable ecosystem.

Fires maintained most valley bottomlands and foothills as grasslands or open savannas. Forests created from frequent, low intensity fires have been described as open and park-like, uneven-aged stands characterized by a mosaic of even-aged groups. Ponderosa pine, Douglas-fir, sugar pine, and white fir were the most common species. Depending on understory vegetation conditions, these species have some resistance to fire as mature trees. As saplings, ponderosa pine is the most resistant followed by sugar pine, Douglas-fir, and white fir. Frequent fires had major structural effects on young trees, favoring ponderosa pine as a dominant species and white fir as the least dominant in this forest type. Without fire, Douglas-fir and white fir became the dominant species because these species are more tolerant of understory competition than the pine species.

Wildfires were likely the primary emissions source that influenced air quality. During summer and early fall, ongoing wildfires, ignited by lightning, would flare up as weather conditions allowed causing intermittent smoke episodes throughout the region.

TERRESTRIAL WILDLIFE SPECIES AND HABITATS

Wildlife Overview

Prior to Euro-American contact, Native Americans influenced habitat conditions in much of the analysis area by burning. The natives routinely burned areas to maintain conditions suitable for the plants and animals they relied on for their subsistence, including roots, tarweed, deer, and elk.

The native burning maintained an early seral condition in the grasslands, shrublands, mountain meadows and probably some of the forested areas. Due to these habitat conditions, deer and other species preferring these early seral conditions were undoubtedly quite abundant.

Grizzly bear, gray wolf, and other large carnivores were probably found in limited numbers throughout the analysis area. Healthy populations of beaver were present in the low gradient portions of most rivers and streams in the analysis area. Beaver populations, however, were decimated in the early and mid-1800s by Euro-American trappers.

It is not feasible to discern the acreage and distribution of the various habitat types prior to the historic period, but some reasonable assumptions can be made. It seems likely that the conifer forest land base is approximately what it was prior to the historic (1850) period, but there was probably a greater proportion of old-growth forest. Oak-woodland habitat was more abundant and in better condition, e.g, better spacing, less mistletoe, etc. Grasslands were also more abundant and in better condition because introduced noxious species were not present. Early seral habitat in the shrub communities was more abundant since shrubland was burned by native Americans.

Wildlife species currently present in the analysis area were probably present in the early to mid-1800s with the exception of introduced species such as starling, Virginia opossum, ring-necked pheasant, etc. Species that were present then but have been extirpated from the analysis area include pronghorn, grizzly bear, and gray wolf.

Threatened/Endangered Species
The northern spotted owl is present in the analysis area, and was undoubtedly present prior to the historic period. However, specific reference to this species could not be found in the literature. As discussed above, old-growth conifer forest , which is primary habitat for the spotted owl, was probably more abundant in the pre-historic period, and one can reasonably infer that spotted owls were probably also more abundant.

Special Status Species
Based on the habitat associations thought to be present in the analysis area in the early to mid-1800s, all currently designated special status species were likely present at that time (see Current Conditions, Terrestrial Wildlife Species and Habitats). Since many of the threats associated with their current status were generally of no consequence prior to Euro-American presence, populations of the various species were probably greater and more stable.

Survey and Manage Species and Protection Buffer Species
As with the special status species, it can be assumed that the survey and manage species known or believed to be present in the analysis area (see Current Conditions, Terrestrial Wildlife Species and Habitats) were present in the analysis area when Euro-Americans arrived. All of these species seem to be positively associated with mature/old-growth conifer forest. Because there was a greater abundance of old-growth conifer forest and other threats to the species were minimal, populations were probably greater and more stable than today.

HYDROLOGY

Prior to the introduction of water withdrawals in the South Rogue-Gold Hill Watershed Analysis Area, summer streamflows were directly related to the amount and timing of precipitation events. Years of high rainfall resulted in summer flows that provided adequate water supplies for aquatic dependent species. Drought years produced low flows and it is likely that many streams dried up in the summer.

Water withdrawals for mining began in the 1850s and primarily took place during the winter and spring months when water was available. Irrigation withdrawals that began in the late 1850s and became more extensive by the early 1900s greatly reduced summer streamflows in the lower stream reaches of the analysis area. Historic low flows in the analysis area were associated with years of low precipitation. Drought conditions for southwestern Oregon were noted in 1841, 1864, 1869-1874, 1882-1885, 1889, 1892, 1902, 1905, 1910, 1914-1917, 1928-1935, 1946-1947, 1949, 1959, 1967-1968, 1985-1988, 1990-1992, and 1994 (LaLande 1995; NOAA 1996).

Historically, major flood events in the Rogue Valley were generally the result of rain-on-snow events. The most severe floods in southwestern Oregon took place in 1853, 1858, 1861, 1890, 1927, 1948, 1955, 1964, 1974 (Gilmore 1952:318, LaLande 1995), and 1997. The extreme flow recorded at the Rogue River gaging station at Grants Pass (below the analysis area) occurred on December 23, 1964.

Prior to the advent of Euro-American settlers, extensive wildfires were the primary upland disturbance capable of creating large openings. Starting in the late 1800s, residential and agricultural land clearing and timber harvest became major factors affecting vegetation removal in the analysis area. These disturbances could potentially have affected the frequency and magnitude of peak flows in the analysis area.

Surface disturbances such as land development and road construction that began after Euro-American settlement in the mid 1800s disrupted the hydrologic network and affected the timing, magnitude, and frequency of peak flows.

The extent of grazing in the analysis area is unknown, although it is likely that cattle grazing occurred at the lower elevations in the late 1800s and early 1900s. Heavy grazing could have resulted in soil compaction and decreased infiltration.

STREAM CHANNEL

Prior to Euro-American influences, the analysis area consisted of free flowing streams that experienced normal events of flooding and drought. Bedload materials originating from upper reaches moved downstream, or were deposited on the floodplain. The streams probably had adequate amounts of large woody material to provide channel structure and dissipate the energy of peak flows. The lower reaches of the streams contained woody material washed downstream from the headwaters. Additional woody material was contributed by streamside woodlands. The lower reaches of the streams probably had greater sinuosities, side channels, and lower width/depth ratios, than what is seen today. Floodplain and meander widths were likely somewhat wider than they are today and streams easily accessed their floodplains. Beavers occupied these streams and built dams that added woody material to systems. The woody material trapped and stored fine sediments, and reduced water velocities.

The arrival of Euro-Americans in the mid 1800s brought significant impacts to the streams that influenced the shape of the stream channels. Fur trapping, which began in the 1830s, substantially decreased the beaver population. The associated loss of beaver dams resulted in scouring of channel beds and banks and increased width/depth ratios.

Instream mining began in 1852 with the discovery of gold in Foots Creek and soon mining had a major influence on stream channels in the analysis area. By 1900 there were a number of hydraulic mines in Foots Creek, Birdseye Creek, Galls Creek, and Kane Creek. Mining scoured out channel beds and banks, redeposited gravels outside of the streambed, and released large amounts of sediment into the stream. Streams were straightened and channelized, stream elevations dropped as banks were scoured out, and pools filled in with sediment.

Logging and land clearing for agricultural use resulted in the removal of large woody material from stream channels in addition to removal of streamside trees. This depleted the existing large wood and sources for future large wood recruitment. Floods became more destructive without sufficient instream structure to slow the high stream energy. As more streambank erosion occurred and as the streams downcut, the channels became entrenched.

As the analysis area became more populated, roads were built and some streams were channelized or straightened to facilitate road construction. These channel-confining actions restricted the natural tendency of streams to move laterally. Channelization of some reaches occurred to prevent the loss of agricultural lands to flood damage. Low gradient streams in valley bottoms became entrenched and were not able to access the adjacent floodplain except during major peak flow events. Channel width/depth ratios increased and sinuosities were lowered as stream gradients increased. Stream velocity decreased along with a decrease in bedload transport capability which lead to increased sediment deposition.

WATER QUALITY

Generally, water quality in the South Rogue-Gold Hill Watershed Analysis Area was probably very good prior to Euro-American settlement: low summer water temperatures, acceptable chemical and biological parameters, and low sediment/turbidity levels. This was due to the wide, diverse riparian zones, low width/depth ratios, greater summer flows, and low sediment input. However, the historic range of natural variability included drought periods that adversely affected stream temperatures and other water quality parameters, major storm events that resulted in increased sediment being transported to streams, and major floods that caused increased erosion from channel cutting. Higher fire frequencies prior to fire suppression may have resulted in periodic episodes of sparse riparian vegetation along some stream reaches and subsequent higher stream temperatures until the riparian vegetation became established.

Land clearing activities, starting with mining in the1850s and then agricultural development in the late 1800s, resulted in a reduction of riparian vegetation allowing more solar radiation to reach the streams. Increased water temperatures were likely a result of these activities. Intense streamside livestock grazing during the turn of the century may have contributed to a loss in vegetative cover and subsequent heating of the streams. Irrigation withdrawals during this same time period lowered streamflows and contributed to increased stream temperatures. Logging in the mid-1900s contributed to increased water temperatures as trees within the riparian zones were harvested. Logging also resulted in less large woody material in the stream channels. Road construction adjacent to streams resulted in reduced riparian vegetation and channelization. Loss of large wood, stream channelization, and channel alterations associated with hydraulic mining and dredging resulted in greater width/depth ratios. Wide, shallow streams tend to have higher stream temperatures.

Ground-disturbing activities such as hydraulic mining, dredging, road building, logging, land clearing, water diversion ditch construction, agriculture, and unmanaged livestock grazing contributed sediment to streams. Sediment and turbidity levels increased substantially after extensive logging and associated road building occurred, especially on steep slopes.

Unmanaged livestock concentrations adjacent to and in streams likely resulted in increased fecal coliform levels.

RIPARIAN AREAS

The earliest description of riparian areas in the South Rogue-Gold Hill Watershed Analysis Area came from Peter Skene Ogden in 1827. He described the Rogue River as well wooded with aspen and willows (Pullen 1996:V1-2). Beaver were abundant in the streams, which meandered through the valley, hosting numerous frogs and providing good habitat for birds and raccoons. (LaLande 1984:64). William Brackenridge, a botanist on a 1841 expedition, found the banks on Galls Creek and Kane Creek "low and brushy ." The brush extended for over one quarter mile wide along the bank (Pullen 1996:VI-3).

The species composition of the riparian vegetation in the analysis area was presumably similar to what is seen today except the stream corridors had conifers in older age groups and the corridors were wider and generally continuous. The riparian vegetation of the lower reaches was primarily black oak. The forests of the higher elevations were composed of small patches of large diameter Douglas-fir, pine, and white fir. Large wood, which adds structure to the stream and is important for fish habitat would have been readily available.

The arrival of Euro-Americans in the mid 1800s brought significant impacts to the riparian corridors. Fur trapping began in the 1830s to 1840s and resulted in a substantial decrease in the beaver population. The discovery of gold in 1852 brought placer mining into riparian areas. Dredging and hydraulic mining denuded the riparian vegetation. Nearby trees were also removed to build mining equipment and cabins.

Logging began in the early 1900s, peaking in the 1940s, and many of the readily available conifers within the riparian zone were harvested. This depleted any remaining large wood and therefore sources for future large wood recruitment.

As the watershed analysis area became more populated, roads and clearing for agriculture reduced riparian width. Livestock grazing along streams probably further reduced riparian vegetation. Non-native species were introduced through various land use practices in the first half of this century. This included the introduction of Himalayan blackberries, a highly invasive species that does not provide shade, dissipate energy during high flow events, or enhance flood-water retention and ground-water recharge the way native species did in the past.

AQUATIC WILDLIFE SPECIES AND HABITATS

Before Euro-American settlement, fish habitat was optimal. Well shaded and diverse riparian zones kept water temperatures low. Streams were not channelized and could meander, providing both slow water for rest and rearing and fast water for food production. Sediment input was low, so clean spawning gravels were maintained. Surrounding forests provided large wood necessary for creating pools and adding structure to the streams. Galls Creek, Kane Creek, Birdseye Creek, and Foots Creek supported large runs of summer steelhead, at numbers much higher than today. The lower gradient valley reaches of these same streams probably supported runs of coho. Although there are few runs remaining today, historically, the Rogue basin was a substantial producer of coho. The resident species were probably the same as those present today: cutthroat trout, rainbow trout, sculpin, and dace.

Although Native Americans did harvest some fish, the steep mountainous terrain of the analysis area limited the native presence so the impact on the fish population was minimal (Olmo and Hannon 1989:4).

Gold was discovered in Foots Creek in 1852, and placer mining quickly became commonplace in most of the streams in the watershed analysis area. By the summer of 1861 all the surface placers and creek beds had been worked extensively and miners began to use hydraulic mining (Gilmore 1952). The invasive nature of mining practices probably caused severe changes in fish habitat. Large quantities of gravel were dredged from the stream and deposited into tailings, reducing spawning habitat and channelizing the streams. Miners often removed the riparian vegetation and nearby trees to build mining equipment and cabins. The reduction of shade probably increased stream temperatures. Woody material needed for pool development and structure for the stream was also reduced. Since flowing water was necessary, mining took place during the same period of time that spawning, incubation, and fry rearing take place. Any eggs or fry residing in areas directly associated with mining had little chance of survival. Mining also probably contributed a significant amount of fine sediments to local streams, which can decrease food production, and fill in spawning gravels and pools (Meehan, 1991).

Impacts from mining were only the beginning. The development of irrigation water sources began shortly after settlement. By 1900, most tributary streams in the basin were "over-allocated" for water rights, particularly for the summer and fall flows so important for rearing juvenile salmon. Irrigation diversions were rarely screened before the 1940s, which may have been a significant factor in fish declines (RVCOG 1997). Trappers had removed most of the beaver, which with their dams, had provided pools and side channels used for rearing habitat. Beaver dams also added woody material to streams, trapped and stored fine sediments, and reduced water velocities. As Euro-Americans settled into the area, they began to build dams, beginning with the Gold Ray dam in 1903. The turbine intakes of Gold Ray dam resulted in a mortality of over 20% to all species of downstream fish migrants until 1958, when dam operators agreed to shut down operation for the six week period when the bulk of migrants passed the dam.

Logging began in the mid-1900s, contributing to increased water temperatures as trees within the riparian zone were harvested. Logging, along with the road construction, probably resulted in an increase in sediment to the streams, choking spawning gravels and filling in pools.

Agriculture and grazing also began in the late 1800s and early 1900s. Agriculture required further withdrawals of water from the streams. The extent of grazing in the analysis area was unknown, but heavy grazing in the riparian areas could have caused further reduction in riparian vegetation, increased fine sediments, and contributed to bank destabilization.

As the ground disturbing activities described above increased in the 1900s, more sediment was deposited into the streams. An additional complication was that there was less woody material to trap and store it. The amount of sediment in the streams soon exceeded the stream’s capability to transport it downstream. The excess fine sediment eliminated habitat for aquatic insects, reduced the permeability of spawning gravels, filled in pools, and blocked the interchange of subsurface and surface waters (Meehan, 1991).

SYNTHESIS AND INTERPRETATION

The Synthesis and Interpretation section compares current conditions with reference conditions of specific ecosystem elements and explains significant differences, similarities, or trends and their causes.

HUMAN USES

History

Two radically different patterns have characterized land use in the South Rogue-Gold Hill Watershed Analysis Area. For thousands of years, indigenous people followed a hunting-fishing-gathering way of life, based on a small-scale, subsistence-oriented economy. Approximately 150 years ago, the advent of Euro-American settlement brought fundamentally different land use patterns based on complex technologies and an economic system connected to global markets.

Prior to this change, native people managed the land by working with natural processes, such as fire, to enhance a broad spectrum of resources important to them. Indigenous technologies combined the use of simple tools with a sophisticated understanding of the landscape to promote habitat for game animals and abundant vegetable products needed for food and materials. This way of life resulted in an open landscape, with grasslands and prairies at lower elevations, oak and oak-pine savannahs in the foothills, and meadows in the forested uplands.

This pattern of resource enhancement gave way to patterns of resource extraction, beginning with the actions of the first fur trappers in the early nineteenth century. Following the removal of native people in the 1850s, the analysis area became home to settlers who brought with them increasingly powerful technologies, as well as attitudes that hastened the transformation of the native environment through a wide variety of actions.

Mining, farming, ranching, and logging generally characterized the economy of the analysis area in the late nineteenth century, with these activities stimulated by the advent of the railroad in the late nineteenth century. Subsequent improvements in local transportation in the twentieth century have brought all parts of the analysis area into increased economic production.

Major Changes

During the last 150 years substantial changes have taken place across the landscape of the analysis area. In the nineteenth century, newcomers cleared land for ranches and for fuelwood; introduced a host of new plant (agricultural crops and weeds) and animal (farm and ranch animals) species; plowed under native meadows for farms; dammed, diverted, and channelized streams for mining and agriculture; and hunted unwanted predators (grizzly bears and wolves) and other species (antelope) to local extinction.

In the twentieth century logging expanded along with the post-World War II explosion of roads and improvements in transportation. The development of agriculture increased demand for irrigation. Successful fire suppression eliminated wildfire as a disturbance mechanism, changing the composition and character of local vegetation. Lumber mills, burning practices for frost protection in orchards, smudge pots, and wood stoves collectively degraded air quality throughout the region.

The effects of these actions are written on the land: the hydrology of the analysis area has been altered through irrigation, water withdrawals, dams, roads, channelization, and other actions such as hydraulic mining and dredging; erosion is more severe in some places than in the past; soil productivity has been affected in some areas by compaction, hot fires, and changes in vegetation patterns; vegetation patterns have been altered through agriculture, fire suppression, grazing, and other actions; topography has changed in places through the construction of quarries and roads, and stream alterations; and native species (plants and animals) have disappeared or become reduced through a number of human actions or through competition with non-native species.

Current Trends

The management of federal land in the analysis area has been profoundly affected by policy changes that began in the 1970s with congressional passage of the National Environmental Policy Act (NEPA) and the Endangered Species Act (ESA). Further changes came to the Pacific Northwest with the adoption of the Northwest Forest Plan by the BLM and Forest Service. In particular, the Aquatic Conservation Strategy and Survey and Manage components of the Northwest Forest Plan have prompted the federal agencies to focus on ecosystem health and restoration when designing projects.

Current management direction for federal land in the analysis area is being shaped by concern over the build up of hazardous fuels throughout the landscape. Forest managers are taking a landscape scale approach to timber harvest, focusing on density management and thinning from below. Although these treatments cover far more acres at one time than clearcuts or heavy partial cuts, harvests are designed to remove the smaller diameter, high density components of the forest, leaving the largest, healthiest trees behind. Harvest methods have changed as well. Logging contracts often require the use of helicopters to minimize road building and ground disturbance to sensitive areas.

The dramatic reduction in the amount of federal timber available to logging companies since the early 1990s has likely resulted in an increase of harvests on private lands. Harvest practices on private land are regulated by the Oregon State Forests Practice Act, first implemented in the early 1970s. The Act has been amended several times. Recent changes have addressed criteria for harvesting in riparian areas, snag retention, green tree retention, and restrictions on the size of clearcuts. Logging on private land is also subject to federal laws such as the Endangered Species Act of 1973. Overall, there are far fewer restrictions that apply to harvest on private land, and in general the goal of private operators remains the maximization of fiber production.

Although non-federal land, which makes up a majority of the analysis area, is not subject to the regulations that govern federal land managers, increased public awareness about resource issues is generating concern about the management of these lands as well. Non-profit environmental organizations and other concerned citizens are working with local land owners on a variety of resource issues. Grant money and federal assistance is increasingly available for landowners who seek assistance for initiating improvements on their land that will benefit surrounding lands as well.

An important influence on the condition of non-federal lands and resource use throughout the analysis area is the dramatic increase in the region's population. Although it is not known how much the population in analysis area has increased, population increases in Jackson County and the nearby towns of Rogue River and Gold Hill provide strong evidence that this population has increased significantly in the past decade. The population of Jackson County increased by 22 percent in the past decade, while the towns of Rogue River and Gold Hill saw increases of 14 percent and 29 percent respectively. New road, home and business construction is evident throughout the analysis area and is likely to continue.

Hobby farms and vineyards are increasing as large-scale agriculture, including livestock grazing, decreases. Livestock grazing continues in the analysis area, but is changing along with the demographics of the area. Although it is unknown whether or not the overall number of livestock on the landscape is increasing or decreasing, it is likely that the density of animals such as llamas, horses, emus, cows, and other animals may be increasing in some areas.

The development of an intensive road network has profoundly influenced the analysis area's landscape and future development will continue to do so. Designed primarily for access, transportation, and transport, roads have wide-ranging impacts on the ecology of the analysis area.

Natural surfaced roads contribute the greatest amount of sediment to streams in the analysis area. Roads located in unstable areas and adjacent to streams, as well as those with inadequate drainage control, minimal or no maintenance, and no surfacing are most likely to cause sedimentation of stream habitats. Stream-adjacent roads confine the channel and restrict the natural tendency of streams to move laterally. Roads crossing through riparian areas have fragmented riparian habitat connectivity. Some culverts impede or prevent fish passage.

Forest roads diminish soil productivity simply by taking the area they occupy out of timber production. Traditionally, this has been viewed as "the cost of doing business." A maintained road surface is out of production as long as it is maintained. Vegetation may fill in the road surface when maintenance is stopped, but the growth rate is far less than for undisturbed soil. Four miles of road per square mile is roughly equivalent to 16 acres per square mile that is taken out of production.

Roads affect wildlife by removing habitat and altering behavioral patterns. Construction of roads inevitably removes habitat for various wildlife species. Vehicles using roads disturb wildlife and change behavioral patterns. Habitat within varying distances of roads is not used to the extent it would be if the roads were not present. This may have a far greater impact on wildlife than the immediate loss of habitat. There is little disturbance to wildlife from roads that are totally closed to vehicles.

Roads are also a source of recreational activity as evidenced by the Back Country Byway program which appeals to the growing segment of the American population that drives for pleasure. Roads also provide the aging population, as well as the increasing segment of physically challenged, an opportunity to view some of our scenic treasures. The access provided by roads may also contribute to the illegal removal or destruction of resources. Cultural resource sites within a quarter mile of a road are at greatest risk from looting.

New road construction on federal lands has slowed in recent years as a result of the Northwest Forest Plan and other policy changes. New road construction on federal lands has slowed in recent years as a result of the Northwest Forest Plan and other policy changes. Considering the substantial percentage of federal land in the analysis area (38 percent), this could help offset the road density impacts of continued road construction on non-federal lands in the remainder of the analysis area. Impacts other than road density, such as sediment and wildlife harassment, could still be substantial from road construction on non-federal lands because of where the roads are located (near streams and midslope) and how they are designed (no surfacing, inadequate drainage, etc.).

The analysis area will continue to be a popular destination for those seeking outdoor recreation opportunities. One of biggest trends in recreation across the country and in the analysis area is a steady increase in the use of Off-Highway Vehicles (OHVs). For over 40 years, motorcycle riders and other OHV enthusiasts have utilized public and private lands in the analysis area for recreation, taking advantage of an extensive network of roads and trails. Trails used by OHVs have primarily been created through historic OHV use, rather than formal trail construction. This lack of planning has resulted in many trails with design or erosion problems. The 1995 Medford District Resource Management Plan (RMP) limited OHV use to existing roads and designated trails on most federal lands within the analysis area. However, the BLM has not yet engaged in a formal planning process to designate OHV trails, and OHV users continue to create cross-country trails. This is readily apparent on federal lands that have recently been cleared of brush during fire hazard reduction activities.

A new generation of OHVs has provided riders with more reliable, dependable machines that are capable of traveling longer distances and operating on steeper slopes. The new capability has created a demand for longer trail opportunities and has expanded the range of OHV use in the analysis area. At the same time, residential development is encroaching on areas of both historical and new OHV use. Other types of recreation such as hiking, horseback riding and mountain biking have also increased in recent years. User conflicts have been reported in the analysis area and could increase without careful management.

EROSION PROCESSES

Natural erosion rates have been altered and/or accelerated by human management and activities such as road and home building, timber harvest, OHV use, grazing, irrigation, mining, wildfire and prescribed burning.

Major storms like the one on New Year's Day 1997 increase the potential for both natural and human-influenced landslides to transport sediment to nearby streams. Events noted to date appear to be natural with past management playing only a minor role.

Non-surfaced roads, OHV trails, gravel operations, irrigation and home construction have had the greatest impact on the amount of sediment reaching streams. There have been hundreds of miles of roads and trails created in the analysis area over the last century. Many of the roads are maintained throughout the year but still yield sediments higher than natural levels.

Past timber harvesting, particularly clearcut logging, greatly increased soil erosion rates over natural levels. Although the effects of ground disturbing activities decrease rapidly the first few years after logging, it takes several years for erosion rates to return to near natural levels. This is particularly the case where logging slash is broadcast burned immediately after logging has occurred.

The increase in fuel loading due to fire suppression in the analysis area has increased the potential for a high intensity wildfire. High intensity fires can burn off the duff layers that protect soils from erosive and gravitational forces. These fires may also cause soils to become hydrophobic (soils that do not allow penetration of rainfall and snow melt), which results in much less infiltration and a higher risk for soil erosion and topsoil loss. A high intensity wildfire along the steep, stream-adjacent sideslopes would increase the potential for landsliding and severe erosion for at least one to two years following a fire.

Concentrations of cattle and sheep along streams, ponds, and other wetlands may have contributed to a loss of vegetative cover and subsequent erosion in the riparian areas. Erosion from grazing is most severe when it occurs near streams and on steep slopes. There are no active grazing allotments on federally administered lands in the analysis area. Severe problems resulting from over-grazing in this analysis area have not been documented.

Human activities have a significant influence on erosion rates in the analysis area. In the past, mining, clear-cutting, and other human activities accelerated erosion rates. In recent years, erosion has decreased to slightly above natural levels due to changes in land management policies and practices.

SOIL PRODUCTIVITY

Clearcut timber harvest methods, burning, and isolated instances of over-grazing may have contributed to diminished soil productivity by increasing erosion rates and reducing native vegetative cover and plant material that would otherwise be recycled into the soil. Timber harvest and any associated prescribed burning may have also reduced the amount of coarse woody material across the landscape.

Although site-specific soil impacts may not be significant, cumulative effects to the soil from various activities could be very limiting over a long period. Natural levels of soil productivity have been reduced where ground-based logging has occurred. Tractor logged areas with designated skid roads have soil productivity losses ranging from 5 to 10 percent, while areas with unrestricted tractor logging have soil productivity losses near 20 percent.

Road building has taken land out of timber production and has indirectly reduced soil productivity. A maintained road surface is out of production as long as it is maintained. Vegetation may fill in the road surface when maintenance is stopped, but the growth rate is far less than for undisturbed soil. On average, approximately four acres of land is taken out of production for every one mile of road built. No new roads have been built on federally administered lands for several years and most new construction is coupled with road decommissioning and restoration.

On federally managed lands coarse woody material (CWM) is being maintained at natural levels or possibly on an upward trend. Although CWM levels naturally fluctuate, the lack of fire has allowed CWM levels to rise. Change in timber harvest methods on federal land, such as the elimination of clearcutting, has also contributed to an increase in CWM levels on federal land. CWM levels on private lands are not known.

The biggest threat to soil productivity in this analysis area is the potential of an intense wildfire that would drastically reduce vegetative cover and increase soil erosion.

LANDSCAPE VEGETATION PATTERN

Fire suppression, plant succession, and logging are the main processes that have affected the landscape since the turn of the 20th century. Since fire suppression began at this time, the forest land matrix has become more contiguous and larger in size because of the lack of fire disturbance and the process of plant succession (Franklin and Dymess 1973). These two processes have allowed high stocking levels of trees and shrubs to become established. Tree species composition has also changed across the landscape. The pine and oak species and incense-cedar now compose a smaller percentage of the total forest species composition, and Douglas-fir has become the dominant species since plant succession has been unimpeded. This is not desirable because pine, oak, and incense-cedar have better drought resistant characteristics that can influence tree vigor.

Forest management selection methods and small sized patch cuts and clearcuts (less than 40 acres) have allowed for the creation of distinct patches within the forest matrix. The harvesting simulates fire in regard to maintaining even-aged forest patches in the landscape pattern, but does not lower vegetation densities in the remainder of the adjacent forest.

Although there are more non-native species present today and their abundance is greater than in historic times, these species have not influenced the vegetation pattern across the landscape to any large extent. Since these non-native species are herbaceous in form they are commonly found in the grasslands, shrublands, and agricultural areas, and may tend to maintain the openness of these areas. The effects of non-native species are more subtle. In general, natural succession of native species is usually retarded by the non-native species invading their habitat and out-competing them for nutrients, water, and light. Suitability decreases as native species decrease in abundance and decreases the quality of wildlife habitat, agricultural productivity, and recreation areas. The effects of the loss of native species is probably not yet realized.

PLANT SPECIES AND HABITATS

Introduced Plant Species and Noxious Weeds

Introduced plants and noxious weeds have greatly increased in number of species and area occupied from the reference condition to the present. A few species are considered controlled, such as *Hypericum perforatum* (St. John's wort), but most continue to spread. Active control methods are usually reserved for the more harmful noxious weeds, leaving the more benign noxious weeds and introduced plants to spread unchecked.

The natural processes that spread noxious weeds and introduced plants (usually seed transport by wind, water, birds, and animals) continue to operate. These processes tend to contribute to the expansion of established populations rather than the long distance establishment of new populations. As these populations become large, the opportunities for spread by natural processes increases.

Human actions that contribute to noxious weed and introduced plant establishment and spread continue to occur. Accidental long distance seed transport is associated with all modes of human travel. Purposeful introductions to gardens (that subsequently escape) and seedings for erosion control associated with roads, slides, and wildfires, are common actions that contribute to noxious weed and introduced plant establishment and spread. Agricultural operations, urban development, and other ground disturbing actions also contribute to noxious weed and introduced plant establishment and spread. As more humans occupy, travel, and develop the area, the opportunities for spread increases.

Invasions by noxious weeds and introduced plants alter ecosystem structure and function. Biodiversity and productivity is reduced. Water, nutrient, and energy cycles are altered. In many cases, natural (including fire) succession is stalled. Human society and human health are directly affected. Also, these noxious weeds and introduced plants threaten rare plant and animal populations and physically alter their habitat.

Special Status Plant Species and Habitats
For the special status species known to occur in the analysis area, habitat condition of hardwood and conifer forests is critical. Since Euro-American settlement, these habitats have been altered directly or indirectly. Often these alterations would be considered as having negative effects on rare plant habitat. Commonly, for plants that have very specific habitat requirements, alteration of site conditions results in an unsuitable environment.

Factors contributing directly to special status plant habitat alteration include timber harvest, vegetation conversion for agricultural uses, plant collection, woodcutting for fuel and other uses, urban and rural development, road building, rock source development, water impoundments and diversions. Factors contributing indirectly to special status plant habitat alteration include fire suppression, introduction of nonnative plants, unnatural distribution of native pollinators, plant community fragmentation, and over-grazing. Some of these habitat alterations should be considered irreversible for management purposes, such as, existing roads, quarries, water impoundments and diversions, and land converted for human uses. Habitat conditions should improve on BLM-managed lands with the proposed management objectives and recommendations, current silviculture, and prescribed fire techniques. Prescriptions designed to simulate or move a plant community toward pre Euro-American settlement conditions should be effective over time.

Survey and Manage Plant Species and Habitats
All Survey and Manage species known to occur in the analysis area are found in hardwood forests, coniferous forests, and shrublands. These habitat types have been affected by past timber harvest, fire suppression, road building, wood chip material salvage, firewood cutting, introduction of nonnative plants, decreased biodiversity, unnatural distribution of native pollinators, plant community fragmentation, and over-grazing.

Habitat conditions should improve on BLM-managed lands with proposed management objectives and recommendations and current silviculture and prescribed fire techniques. Density management, hazard reduction, uneven-age management, oak woodland restoration, patch treatments, species composition manipulation, etc. should direct the plant community to a pre Euro-American settlement condition.

FOREST DENSITY AND VIGOR

Core samples from 100 to 265 year-old Douglas-fir and trees (trees that became established in the 1700s and 1800s) show they were growing at least 1.5 inches in diameter every decade for 4 to 12 decades before a decline in diameter growth started. This indicates that these trees that are now considered to have late-successional characteristics, grew with little or no surrounding tree competition. Frequent fires kept tree stocking levels low. Some of the present day, younger tree age classes, which became established in the late 1800s or early 1900s and now predominate the landscape, grew under higher stocking conditions and do not show periods of rapid diameter growth. These trees have been growing less than 1.5 inches in diameter for the last 10 to 40 years. High tree stocking levels have been maintained since Native Americans stopped using fire across the landscape and fire suppression was initiated. As a result, the forest matrix appears to be contiguous across the landscape.

The decrease in fire frequency has also allowed natural plant succession to change the species composition and structure of grasslands, shrublands, and woodlands. Shrubs and trees have invaded grasslands, decreasing the size of these open, native grass communities. The historic, relatively open shrublands have become overstocked, more uniform in structure, and present a severe fire danger today. The open oak woodlands that were managed for acorns by the Native Americans have also changed dramatically. Shrub species have invaded the woodlands because of fire suppression. Oak trees are now multi-stemmed instead of single stemmed and Douglas-fir is prevalent in the overstory and understory. These factors have resulted in the decline of oak tree vigor and acorn production.

The conifer forests and their various stages of development are also influenced by numerous ecological and physical processes. Coarse woody material (CWM) appears to be the heart of numerous ecosystem processes and it is a vital part of forest productivity. CWM is defined as fallen trees and tree pieces, fallen branches larger than one inch in diameter, dead roots, and standing dead trees. As a general rule, CWM decreases from high to low elevations. West and south aspects have smaller amounts also because of drier conditions. In the lower elevations, CWM is usually less than 10 tons per acre. The more moist, higher elevations have approximately 10 to 20 tons of CWM per acre. The moist sites have larger diameter trees so amounts of CWM tend to be greater. Historically there was less CWM across the landscape because it was consumed frequently by fires. Where clearcutting and whole tree utilization occurs on private property, CWM remaining could be 10 tons or less.

In the historic forests, bark beetles and pathogens were probably more benign due to low tree stocking levels. The present day overstocked forests have allowed for a decline in forest growth and vigor resulting in the dramatic increase of bark beetle populations and increasing tree mortality. The various bark beetles throughout the analysis area that are causing extensive tree mortality on the drier sites are moving the forest stands to a more open condition. In cases where Douglas-firs are dying adjacent to shrublands, woodlands and on dry ridge-tops, there is an opportunity to reestablish drought tolerant species such as ponderosa pine, sugar pine and incense cedar. Dwarf mistletoe species are also causing tree mortality on a small scale.

As forest stands increase in age, there is a higher probability of some type of disturbance. Since many of the mature second growth forest stands in the analysis area are 100 years of age and older, they are currently more susceptible to disturbance. Some stands are still in the stem exclusion stage of development, but many stands are entering the understory reinitiation stage because of the ecological processes discussed (Oliver and Larson 1990). These processes are also part of the formation of late-successional forests by creating multi-cohort, multi-storied forests. Wind damage is another important process in mature forests, creating openings and the reintroducing of a new forest age class and seedlings of the desired species.

These various ecosystem processes must be monitored carefully if fire suppression across the landscape continues. Natural vegetation succession may not be desired everywhere. Without large openings in forest stands, the more shade tolerant species such as true fir species and Douglas-fir will predominate, and early seral species will continue to decline. Silvicultural methods will be necessary to maintain and manipulate the structure and species composition of the forest stands if fire does not. Reduction of vegetation stocking levels is also needed if individual tree and forest vigor is to be maintained.

In summary, a few conclusions are apparent:

1. Forests in the lower elevations where annual rainfall is below 30 inches should not be expected to develop into large continuous matrix areas of dense, lush, late-successional forests (Franklin and Dyrness 1973). These dry, low elevation forests must be maintained at lower stocking levels with drought resistant species predominating. Openings are essential for maintaining the drought resistant early seral species. If the stocking levels of the vegetation are not managed, physical and ecological processes will continue to naturally thin the vegetation and the species composition of the early seral species may continue to decline.

2. It must be recognized that mature, overstocked forest stands across the landscape are being observed at one point in time. Numerous processes will continue to affect the forest stands' stocking levels and structure. As small-scale, physical and ecological processes continue to create openings in the present day forest stands, more diverse stand structure will develop over time. With these processes and silvicultural treatments to control stocking levels, the potential exists for more vigorous forests with late-successional characteristics in the future.

3. Without vegetation stocking level management or low intensity fire, individual shrub and tree vigor will remain low and high levels of vegetation mortality may occur. Large stand replacement fires are also probable without stocking level management. Grasslands will continue to decrease in size, shrublands will remain impenetrable and present a severe fire hazard, and the vigor of the oak woodlands will remain low.

FIRE AND AIR QUALITY

Historically, frequent, low intensity fires maintained most valley bottomlands and foothills as grasslands or open savannas. Forests fashioned from frequent, low intensity fires have been described as open and park-like, uneven-aged stands, characterized by a mosaic of even-aged groups. Douglas-fir, ponderosa pine, sugar pine, and white fir were the most common species. Depending on understory vegetation conditions, these species have some resistance to fire as mature trees. As saplings, ponderosa pine is the most resistant, followed by sugar pine, Douglas-fir, and white fir. Frequent fires had major structural effects on young trees favoring ponderosa pine as a dominant species and white fir as the least dominant in this forest type.

Fire suppression over the past century has effectively eliminated five fire cycles in southwest Oregon mixed conifer forests (Thomas and Agee 1986). The absence of fire has converted open savannas and grasslands to woodlands and initiated the recruitment of conifers. Oregon white oak is now a declining species largely due to fire suppression and its replacement by Douglas-fir on most sites.

Fire-intolerant, shade-tolerant conifers have increased and species such as ponderosa pine and sugar pine have declined. This conversion from pine to true fir has created stands that are subject to stress, making them susceptible to accelerated insect and disease problems (Williams et al. 1980).

The horizontal and vertical structure of the forest has also changed. Surface fuels and the laddering effect of fuels have increased and this increases the threat of crown fires, which were historically rare (Lotan et al. 1981). Fire exclusion has caused a shift from low-severity fire regimes to a high severity regimes. This is characterized by infrequent, high intensity, stand replacement fires. Fire is now an agent of ecosystem instability as it creates major shifts in forest structure and function on a large scale.

In summary, the fire hazard for this analysis area has increased over time. Focus of fire hazard reduction projects on the low severity fire regime areas can help restore these areas. Further changes in how wildfire is managed across the landscape may be needed for maintenance. These changes may include management of wildfire for resource benefits as opposed to the current direction for full suppression. However, full suppression strategy will always be a major part of fire management within this analysis area due to the top priorities of protecting life, resources and property.

Air quality can be adversely effected by prescribed burning and wildfires. Prescribed burning conducted in compliance with federal, state, and local smoke management regulations should minimize adverse effects to populated areas. Furthermore, specific burning and mop-up strategies and tactics can be employed to reduce emissions. Fire hazard reduction projects, over time, should affect the long-term emissions from wildfires within the analysis area. This effect should be a reduction of emissions as lighter fuel loads are consumed as the fire intensities over time are reduced through fuels management.

TERRESTRIAL WILDLIFE SPECIES AND HABITATS

Wildlife - General

Vegetative conditions are the primary influence on terrestrial wildlife/animal populations and their distribution within the analysis area and across the greater landscape. A variety of processes have changed the vegetation within the analysis area over time. These include natural and human-caused disturbances and natural succession. Current conditions of the analysis area differ from reference conditions primarily due to human-caused disturbances such as timber harvest, agriculture, fire suppression, introduction of exotic plant species, and residential development.

A direct comparison of the acreage of current and reference vegetative conditions is not possible. Some generalizations, however, can be made based on some of the processes known to have taken place. Mature/old-growth habitat has declined in the analysis area due to timber harvest. Therefore, it can be assumed that populations of wildlife species preferring the structure and conditions provided by this habitat type have also declined.

The quality of the mid-seral conifer habitat has declined primarily as a result of fire suppression. Historically, much of this habitat was characterized by more open canopies (as a result of fire) and a healthy herbaceous and shrub component. This combination provided habitat for an array of species. Due to fire suppression, however, many of the mid-seral stands are now single-storied with a high degree of canopy closure and virtually no understory vegetation. In comparing wildlife use of dense-canopied, single-storied stands to more open multiple-storied stands, data in Brown (1985) suggest that approximately twice as many vertebrate wildlife species prefer multiple-storied stands versus single-storied stands.

Much of the early seral conifer habitat (grass-forb, shrub and sapling/pole) is present as a result of timber harvest. Consequently, snags and large down woody material are probably deficient in these habitats, and this condition will persist as these stands mature. Thus, populations of those species requiring or preferring snags and large down woody material have likely declined, and populations will remain suppressed until there is recruitment of these habitat features as a result of ecological processes.

The absence of fire has allowed much of the oak and oak/pine woodlands to become over-dense and has also allowed conifer and shrub encroachment at greater than historic levels. The result is increased mortality, reduced growth, and diminished mast (acorn) production, particularly in the larger oaks. Because the large oaks provide both natural cavities and generally good acorn crops, they are important to a variety of wildlife species. Populations of those species that depend on these features of the oak and oak/pine woodlands have probably declined.

Like oak-savannah habitat, the quality of shrubland habitat has also declined due to fire suppression. Fire is the primary process in the development of early seral conditions in this plant community. In the absence of fire, much of the habitat has matured and early seral habitat is deficient. As a result, populations of those species preferring early seral conditions of this plant community are probably declining.

The quality and quantity of native grass/forb/herbaceous habitat have declined rather dramatically due to the invasion of noxious weeds, the planting of non-native grasses, and the encroachment of shrubs and conifers. Practically all non-agricultural grasslands in the lower elevations of the analysis area are now fields of noxious weeds and grasses (e.g., yellow starthistle and medusahead rye). The introduction of other non-native grasses has generally occurred as a result of well-meaning projects, but nevertheless has resulted in the decline of native grasses. Encroachment of trees and shrubs has primarily been the result of fire exclusion over the past century. This decline in quality and quantity of native grassland habitat has adversely impacted herbivores in the analysis area.

Threatened/Endangered Species
Primary habitat for the northern spotted owls, a federally threatened species, is mature/old-growth forest habitat. A decrease in this habitat from historic to present levels as a result of logging is apparent. Due to the decrease in suitable habitat, it is reasonable to assume that the existing northern spotted owl population has declined from historic levels. The current population in the analysis area will likely continue to decline because future timber harvest will further decrease the abundance of mature/old-growth forest habitat.

Special Status Species
The decrease in mature/old-growth habitat is responsible for the listing of a number of the special status species found in the analysis area. These species prefer mature/old-growth mixed conifer forest for feeding, breeding, and/or sheltering, and, as in other areas, the decrease in late-successional habitat in the analysis area has likely caused a decline in the populations. These species are not expected to be extirpated from the analysis area, but recovery of the populations to pre-historic levels is not anticipated since removal of this habitat on private and public land is expected to continue.

Some species have received special status designation due to habitat loss or degradation and/or other factors not related to the loss of late-successional habitat. For example, a contributing factor in designating the western pond turtle is predation by bullfrogs, an introduced species. As with the species designated due to late-successional habitat loss, these species are not expected to be extirpated in the analysis area, but population recovery to pre-historic levels is not anticipated since the human-influenced processes that contributed to their designation will likely continue.

Other species are designated as special status simply because there is a general lack of life history data. As these data gaps are filled, it is possible these species could be removed from the special status species list.

Survey and Manage and Protection Buffer Species
All survey and manage and protection buffer species known or suspected to be present in the analysis area (see Current Conditions) are believed to be associated with and prefer late-successional habitat. Great gray owls use this habitat for nesting, but forage in meadows, agricultural land, and the early seral stages of mixed conifer forests. It is unknown how management in the analysis area has affected overall habitat conditions for the great gray owl. Populations of the various bat species listed in the Northwest Forest Plan have likely declined as many are linked with the bark fissures of old-growth trees and the snag component of these

stands. With so little understood about actual habitat requirements of many of the mollusk species, it is unknown how the change in vegetation patterns from reference to current conditions has affected these species.

The Northwest Forest Plan mandates that when survey and manage and protection buffer species are found on public lands they be afforded protective measures. This strategy should abate further major population declines on federal lands, and if employed over the long-term, populations could recover in some areas.

HYDROLOGY

The streamflow regime in the South Rogue-Gold Hill Watershed Analysis Area reflects human influences that have occurred since Euro-American settlers arrived. Adverse affects to the streamflow regime include changes in the timing and magnitude of both peak and low flows.

Potential effects of peak flows greater than bankfull flow may include channel widening, bank erosion, channel scouring, landslides, and increased sediment loads. These are normal occurrences in a dynamic, properly functioning stream system; however, increases in the magnitude and frequency of peak flows due to human-caused factors can magnify the effects. The dominant human-caused disturbances that have affected peak flow hydrologic processes in the analysis area are: extensive road building, timber harvest, and land clearing. Hydrologic processes affected include reduced infiltration (resulting from soil compaction), disruption of subsurface flow, and reduced evapotranspiration. These changes to the hydrologic regime have the potential to increase the magnitude and frequency of peak flows in the tributaries and main stem. Any increase in the magnitude and frequency of peak flows will diminish as vegetation regrowth occurs in harvested areas. Permanent road systems intercept surface runoff and subsurface flow, which prevents the streamflow regime from returning to pre-disturbance levels. Based on known vegetative cover and road densities in the analysis area, Foots Creek, Birdseye Creek, and Galls Creek analysis subwatersheds are in better condition hydrologically than the Kane Creek and Miller Gulch analysis subwatersheds.

Reduced summer streamflows are detrimental to fish and other aquatic species and have a negative impact on water quality. Water withdrawals have the greatest impact on summer streamflows in the analysis area. The majority of water rights in the analysis area are for mining followed by irrigation. It is not known to what extent water is still being used for mining. Water rights not used for a five year period are subject to forfeiture, but they are not automatically canceled by the Oregon Water Resources Department. Kane, Galls, Foots, and Birdseye Creeks are fully appropriated at both the 50 and 80 percent exceedance levels (water availability information is not available for Millers Gulch).

STREAM CHANNEL

Stream channels in the South Rogue-Gold Hill analysis area have been heavily influenced by the influx of Euro-American settlers, beginning with mining in the mid 1800s. Mining, which began with the discovery of gold in 1852, scoured out channel beds and banks, redeposited gravels outside of the streambed, and released large amounts of sediment into the stream. Streams were straightened and channelized, stream elevations dropped (incised) as banks were scoured out, and pools filled in with sediment. The gravel tailings, lower stream elevations, and channelization are still present.

As mining tapered off, logging and land clearing for agricultural use resulted in the removal of large woody material from stream channels in addition to removal of streamside trees. This depleted the existing large wood and sources for future large wood recruitment. There continues to be a lack of large wood available today. As a result, floods are more destructive without sufficient instream structure to slow the high stream energy. As more streambank erosion occurs and as the streams downcut, the channels become entrenched.

As the watershed analysis area became more populated, roads were built and some streams were channelized or straightened to facilitate road construction. The stream reaches in the valleys of the analysis area are in primarily rural residential areas. The stream channels are confined, restricting the natural tendency of streams to move laterally, even during large flood events. Some reaches have been channelized to prevent the loss of agricultural lands to flood damage. Low gradient streams in valley bottoms are entrenched and are not able to access the adjacent floodplain except during major peak flow events.

WATER QUALITY

Overall, water quality has declined in the analysis area since Euro-American settlers arrived. Changes in water quality from reference to current conditions can be attributed to riparian vegetation removal, water withdrawals, irrigation ditches, channel alterations, roads, mining, and poorly managed livestock grazing. Water quality parameters known to be most affected in the analysis area by these human-caused disturbances are temperature and sediment.

Summer water temperatures for Birdseye and Galls Creeks exceed the state temperature criteria. These streams are designated as water quality limited and are on Oregon’s 303(d) list. Lack of riparian vegetation, channel alterations, water withdrawals, and irrigation return flows have contributed to increased stream temperatures that can stress aquatic life and limit the long-term sustainability of fish and other aquatic species.

The primary human-caused disturbances affecting stream sedimentation in the analysis area are roads, skid roads, OHV trails, riparian vegetation removal, channel alterations, and irrigation ditches. Accelerated surface erosion in areas of granitic soils (i.e. the headwaters of Kane and Galls Creeks) are a particular concern for sediment delivery to streams.

Water quality is expected to improve on federal lands and remain the same on private lands. Riparian Reserves should promote the maintenance and improvement of riparian vegetation on BLM-administered lands. Protection of vegetation providing stream shade and recovery of riparian vegetation on BLM-administered lands should bring about some reduction of stream temperatures in the headwaters of Birdseye and Galls Creeks. Reduced amounts of road construction plus road stabilization, maintenance, and decommissioning on BLM-administered lands would likely decrease sedimentation from federal lands. Regulations governing private lands are not likely to bring about substantial water quality improvements. Natural surface roads and skid roads on steep slopes, especially those on granitic soil, will continue to supply sediment to stream systems. Streambank erosion caused by channel alterations and sediment contributed from irrigation ditches will be difficult to reduce and likely impossible to eliminate.

RIPARIAN AREAS

The same human impacts that influenced stream channel and aquatic habitat impacted riparian areas. Historical mining removed the riparian vegetation and riparian dependent animals and plants disappeared. Nearby trees were also removed to build mining equipment and cabins. The lack of shade on perennial streams increased stream temperatures.

Loss of beaver and their dams resulted in a loss of marshes and ponds. Western pond turtles, herons, frogs, and other pond preferring species are undoubtedly less common now that the beaver are gone. The diversity of riparian vegetation was also decreased.

Historic timber harvest in riparian areas removed many of the readily available conifers within the riparian zone. This depleted large wood and sources for future large wood recruitment. Riparian areas recovering from historic timber harvest still have few large diameter trees. Fallen logs help regulate riparian humidity, contribute nutrients, and provide habitat for many plants, insects and animals.

Riparian areas provide corridors not only for movement of riparian dependent species, but also for upland species. Currently, the biggest influence on the condition and species composition of riparian corridors in the South Rogue Gold-Hill Watershed analysis area is the developed condition of the land. The lower sections of all riparian corridors pass through developed areas of rural-residential, small farm use, and commercial land use. As a result, vegetation widths are very narrow, with little to none on intermittent and ephemeral draws (ODFW 1991, 1997). These narrow strips do not provide enough of a corridor for movement of species. Along the Rogue River, the riparian corridor is bisected by I-5 and houses have been built in the riparian corridor, leaving little remaining vegetation.

Non-native weeds were introduced through land use practices in the first half of this century. This included the introduction of Himalayan blackberries, a highly invasive species that continues to replace native vegetation in large sections of riparian areas in the analysis area. Blackberries do not provide shade, dissipate energy during high flow events, or enhance flood-water retention and ground-water recharge the way native species do. Blackberry dominated riparian areas produce fewer insects and provide less nesting habitat than areas dominated by native species such as willows.

AQUATIC WILDLIFE SPECIES AND HABITATS

The current condition of fish habitat in the South Rogue-Gold Hill watershed is a result of the influence of Euro-Americans, beginning in 1851 with placer mining. Historical mining has confined channels, encouraged channel downcutting, destroyed riparian areas, and removed trees. In the lower reaches rural residential and agricultural development has inhibited recovery from these early impacts. As a result, there is little slow water for fish to rest and juveniles to rear, inadequate shade with accompanying high temperatures, and insufficient wood debris in the streams. In the upper reaches, there is less development and riparian areas have had some time to recover. As described in the current conditions, these upper sections have more shade, some wood, and less sediment than the lower, more developed reaches.

The absence of beaver has reduced available slow water habitat and small side channels. Beaver ponds were excellent fish habitat, especially for juvenile fish. Western pond turtles, herons, frogs, and other pond preferring species are undoubtedly less common now that the beaver are gone.

The need for water has increased with agricultural and residential development. Most irrigation diversions are now screened, so fish are no longer diverted to their deaths. However, the heavy water removal for irrigation presents several problems for fish habitat. Water withdrawals result in low flows, particularly during the summer and fall when adequate flows are so important for rearing juvenile steelhead. As described in the hydrology section, irrigation return flows have contributed to increased stream temperatures that stresses aquatic life and limits the long-term sustainability of fish and other aquatic species. The over-allocation of water is a basin-wide problem not likely to diminish.

Throughout the analysis area, barriers to fish migrations such as dams, irrigation diversions, push up dams, and culverts block anadromous fish from additional spawning habitat. They also prevent resident fish from accessing upstream spawning habitat or being able to move downstream for winter refuge. In addition, fish are prevented from repopulating the area above the barrier.

Lack of woody material continues to be a problem throughout the analysis area. The large developed sections of streams, primarily in the lower sections, have little to no wood available. Riparian areas recovering from historic timber harvest still have few large diameter trees with the potential to fall into streams.

Sediment continues to exceed the streams capability to transport it downstream. Roads, skid roads, bank erosion, off-highway vehicle trails, irrigation ditches, and grazing all create sediment that ends up in the stream. Excess sediment eliminates habitat for aquatic insects, reduces the permeability of spawning gravels, fills in pools, and blocks the interchange of subsurface and surface waters (Meehan, 1991).

The net result of all these impacts is fewer fish. The loss of fish is not only a threat to the survival of the species, but the loss of nutrients released by decaying anadromous carcasses has an impact on the aquatic and terrestrial ecosystems.

MANAGEMENT OBJECTIVES AND RECOMMENDATIONS

The Management Objectives and Recommendations section details the conclusions reached by the Watershed Analysis Team. These objectives and recommendations will be used to help guide future planning for BLM-administered land in the South-Rogue Gold Hill Watershed Analysis Area.

PRIORITY RECOMMENDATIONS

Although all of the recommendations identified below are priorities, the team identified three areas of particular concern. These areas of concern, discussed below, include illegal dumping on public land, forest health and fire hazard reduction concerns, and the need for a management plan for the John's Peak/Timber Mountain OHV Area.

Illegal Dumping

There is a significant problem with the illegal dumping of household waste and other trash in the Anderson Butte area.. Illegal dumping is not only visually unappealing, but toxins and hazardous waste are often introduced to the environment. The BLM needs to take measures to stop the prolific dumping of trash on public land.

Forest Health and Fire Hazard Reduction

Recommendations identified below under Fire and Silviculture are strongly correlated. High vegetation densities are not only detrimental to individual tree vigor, but also present a high fire hazard. Although the dense young forests in the analysis area contain thousands of trees per acre, they are still relatively vigorous and have a diverse species composition. In order to maintain this diverse species composition (sugar pine, ponderosa pine, incense cedar, Douglas-fir, madrone and California black oak) and stand vigor, the forests should be precommercially treated now. Reducing vegetation densities across the landscape not only improves individual tree vigor, but also reduces fire hazard.

John's Peak/Timber Mountain OHV Area

The 1995 Medford District RMP created the John's Peak/Timber Mountain OHV area in order to provide for and manage OHV use. For over 40 years motorcycle riders and other OHV enthusiasts have utilized public and private lands in the analysis area for recreation, taking advantage of an extensive network of roads and trails. Trails used by OHVs have primarily been created through historic OHV use, rather than formal trail construction. This lack of planning has resulted in hundreds of miles of trails with design or erosion problems. Many of these trails traverse Riparian Reserves, sometimes paralleling and crossing fish bearing streams. Although the 1995 Medford District RMP limited OHV use to existing roads and designated trails, trails have never been formally designated and OHV users continue to create cross-country trails. Other types of recreation such as hiking, horseback riding and mountain biking have also increased in recent years. User conflicts have been reported in the area of concern and will likely continue to escalate without careful planning. In order to address these issues, the BLM needs to develop a management plan for this area in the immediate future.

MANAGEMENT OBJECTIVES AND RECOMMENDATIONS FOR BLM-ADMINISTERED LANDS

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
HUMAN USES			
Economic Development	Encourage opportunities for local contractors to compete effectively on contracts for projects in the analysis area.	1. Promote small-scale projects in forest, range, riparian, and other resources suitable for local administration and contractors.	High
	Produce a sustainable timber supply and other forest commodities on Matrix lands to provide jobs and contribute to community stability.	1. Conduct timber harvest and other silvicultural activities in that portion of Matrix lands with suitable forest lands.	High
	Maintain and develop opportunities for special forest products to facilitate community economic development consistent with other resource objectives.	1. Work with local groups to develop opportunities to harvest and sell special forest products.	Medium
Public Involvement	Maintain and promote contacts with local groups, landowners, community leaders, tribal and public agencies to facilitate continuing dialogue on the management of public lands in the South Rogue-Gold Hill Watershed Analysis Area.	1. Maintain and expand contacts with local groups.	High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Public Involvement	Provide opportunities for public and private entities to exchange information and develop consensus concerning land management actions within the analysis area, and to enhance awareness of local public concerns and issues affecting management of the analysis area's ecosystem.	1. Utilize local avenues of communication, such as local newspapers, local newsletters and bulletin boards. 2. Identify and incorporate tribal representation into all public involvement, and keep them informed of land management activities in the analysis area.	High High
Archaeology	Assess archaeological sites to determine their scientific and heritage values and protect or recover those values as necessary.	1. Work through partnerships with Southern Oregon University and the Southern Oregon Historical Society and other local groups to promote appreciation and understanding of the analysis area's cultural resources. 2. Define the types of historic and American Indian archaeological sites that are likely to occur within the analysis area.	High Medium
	Conserve and protect archaeological/historical sites within the analysis area.	1. Use careful land use planning to avoid impacts to these resources. 2. Protect the Indian Rock Art site from impacts of developing the Bristol Silica mine and any other project. 3. Monitor resources to control threats (such as erosion, vandalism) to them.	High High Medium
	Consider the concerns of Native American groups regarding cultural resources, including traditional cultural properties, within the watershed.	1. Consult concerned Native American groups early in the planning stages of any project in the analysis area.	High
Transportation	Manage the transportation system to serve the needs of the users and meet the needs identified under other resource programs.	1. Implement the Transportation Management Plan (TMP). 2. Implement Transportation Management Objectives (TMOs) for individual roads. a. Maintain the road closure system. b. Maintain all roads for the target vehicles and users. c. Provide for initial fire suppression access. d. Maintain a safe transportation system by removing hazards (e.g., hazard trees).	High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Transportation	(Continued) Maintain a transportation system that meets the Aquatic Conservation Strategy and Riparian Reserve objectives. Landings and skid roads are not part of the transportation system but should be maintained to meet the Aquatic Conservation Strategy and Riparian Reserve Objectives.	(Continued) 1. Implement the Northwest Forest Plan Standards and Guidelines for Roads Management (USDA and USDI 1994a:C-32-33). 2. Follow the Best Management Practices for Roads in the Medford District Resource Management Plan (USDI, BLM 1995a:155-165). 3. Assess all roads and trails, especially in Riparian Reserves, and identify those in unstable and slide-prone areas, those with potential erosion/drainage problems, and those that are encroaching on a stream channel. Update the TMOs based on the findings. 4. Develop and implement plans for decommissioning, obliterating, upgrading (i.e., improve drainage, surface and stabilize) or rerouting the roads identified in recommendation #3 to protect Riparian Reserves, stream channels and water quality and meet TMOs. Replant obliterated road corridors to native tree and other native plant species. 5. Prioritize watershed restoration projects for roads and trails in Riparian Reserves and areas where roads accelerate landslides and erosion, especially where they contribute large amounts of sediment to streams. 6. Minimize soil compaction due to existing roads or skid trails in meadows and wetlands by decommissioning or obliterating roads and ripping skid trails. Where it is not feasible to close these roads, they should be improved to restrict traffic to the road prism. 7. Close natural surface roads during the wet season. 8. Maintain a minimum of four inches of rock surfacing on all BLM-maintained roads open for administrative access during the wet season. 9. Provide vegetative cover (native grass and conifers) on natural surface roads that are closed year-round. 10. Ensure that road stream crossings and cross drains are functioning as designed, especially following major storm events. Replace culverts that are improperly designed. 11. Minimize any increases in road mileage.	High High High High High High High High High High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Transportation	(Continued)	(Continued) 12. Use an interdisciplinary team to perform a project level, site-specific analysis for any proposed road or trail construction. Avoid new road construction, trails, or landings within Riparian Reserves, wetlands, and unstable areas unless approved by an interdisciplinary team that includes a fisheries biologist, hydrologist, and soil scientist. 13. Maintain a natural stream bed for fish passage wherever feasible and economical. 14. Identify skid roads and landings that are not critical for future management activities and decommission or obliterate them. Skid roads and landings in Riparian Reserves or unstable areas should be the highest priority for removal.	High High High
	Maintain or enhance current native terrestrial wildlife populations and distribution.	1. Close roads during critical periods (generally October 15 to April 15) in subwatersheds where densities are greater than 1.5 miles per square mile of land. 15. Close roads that are not needed for administrative access or management activities.	High High
	Restore land that has been taken out of production.	1. Consider decommissioning or obliterating roads based on TMOs in order to put land back into plant production.	Medium
Road Rights-of-way	Cooperate with individuals, companies, counties, the state, and federal agencies to achieve consistency in road location, design, use, and maintenance.	1. Maintain and implement reciprocal road right-of-way agreements. 2. Implement road use and maintenance agreements. 3. Evaluate and provide road right-of-way grants. 4. Obtain road easements for the public and resource management. 5. Work with other parties to stabilize roads and remove unneeded roads.	High High High High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Other Rights-of-way and Authorizations	Coordinate with individuals, companies, nonprofit groups, counties, state, and other federal agencies on all inquiries/applications for non-road rights-of-way, leases, permits, and exchanges on federally managed lands.	1. Review each request on its own merits. 2. Respond to all requests in a timely manner. 3. Ensure consistency, fairness, and legal/environmental compliance in all decisions. 4. Monitor implementation of rights-of-ways and authorizations.	High High High High
Grazing	Manage livestock in a manner that maintains or improves Riparian Reserves to meet the goals of the Aquatic Conservation Strategy.	1. Stress the importance of properly functioning riparian areas in the issuance of grazing authorizations. 2. Implement Best Management Practices (USDI, BLM 1995:172) and the Northwest Forest Plan (USDA and USDI 1994a:C33-34) to ensure movement toward land use objectives.	High High
	Continue to provide livestock forage on designated allotments to meet societal needs, without compromising the ecological integrity of the uplands.	1. Develop management strategies in consultation with the permittee to resolve resource conflicts that arise. 2. Update allotment plans as needed. 3. Control noxious weeds. 4. Maintain a list of vacant allotments, including specific management constraints and concerns, for future inquiries.	High High High Medium
Minerals	Continue to coordinate with individuals, companies, counties, state, and other federal agencies on all inquiries/applications for mineral exploration and development.	1. Respond to all inquiries/applications in a timely manner.	High
	Rehabilitate areas disturbed due to past mineral activity. On disturbed sites, ensure public safety and enhance other resources values such as riparian or fisheries habitat.	1. Evaluate and prioritize known disturbed areas for rehabilitation. 2. Develop rehabilitation plans including a budget for targeted areas. Do this through an interdisciplinary effort. 3. Implement plans in a timely manner.	Medium Medium Medium

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
	(Continued) Provide for federal and public use of mineral materials consistent with National Environmental Policy Act (NEPA) requirements.	(Continued) 1. Monitor pit development use during extraction. 2. Coordinate with local watershed councils and state agencies in developing new rock sources in the analysis area. 3. Prepare, or where existing, update long-term rock quarry management plans to ensure quality rock material is economically available for the future. 4. Develop mineral sources as necessary for public use	High Medium Low Low
	Reduce sediments and pollutants from rock quarries.	1. Avoid developing rock quarries in Riparian Reserves. 2. Rehabilitate abandoned rock sources to reduce sediments and pollutants.	High Medium
Recreation	Maintain dispersed recreational opportunities. Utilize public input for planning priorities.	1. Continue to encourage dispersed recreational opportunities that are compatible with other resource values within the analysis area. 2. Implement Off-Highway Vehicle designations contained in the Medford District Resource Management Plan. The possibility of future OHV facilities (parking areas, staging areas, and signing), will be analyzed and determined as part of the John's Peak OHV plan EIS, which will be started after this watershed analysis is complete.	High High High
Unauthorized Use	Minimize and/or reduce unauthorized use including dumping on BLM-managed lands.	1. Continue coordination with state/county agencies to ensure that resource needs on adjacent public lands are considered and accommodated in private actions. Utilize law enforcement resources when appropriate. 2. Review and prioritize backlog cases and take steps to resolve in a timely manner. 3. Work with law enforcement to eliminate illegal dumping in areas such as Kane Creek.	High Medium Medium

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
EROSION PROCESSES			
Erosion	Protect active and potentially active landslides and severely eroding areas.	1. Designate Riparian Reserves to include unstable and potentially unstable landslides. Buffer unstable and potentially unstable landslide areas from management activities that could cause further instability. The size of the buffer will be based on site specific analysis to ensure further movement does not occur. 2. Restore active landslides and eroded terrain that contribute sediments to streams by planting conifers, installing retaining structures or other stabilizing material. 3. Rehabilitate active landslides and eroded terrain that contribute sediments to streams by planting appropriate native species, installing retaining structures or other stabilizing material. 4. Inventory all BLM-administered unstable lands to identify and prioritize potential restoration projects. 5. Avoid regeneration harvest treatments in steep, unstable sideslopes adjacent to Riparian Reserves.	High High High High High
SOIL PRODUCTIVITY			
Soil Productivity	Minimize the effects of fire to the soil.	1. Avoid prescribed burning in areas where severe erosion and/or landslides may occur. 2. Implement cool prescribed burns to maintain 50 percent duff and litter on site. Consider aspect, slope steepness, soil depth, and duff/litter cover when writing burn plans.	High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
	(Continued) Minimize soil productivity losses due to compaction.	(Continued) 1. Limit tractor skid roads to less than 12 percent of the harvest area with less than 6 percent loss in soil productivity. 2. Accomplish skidding when soil moisture levels are low (less than 15 percent) in areas with fine-textured soils or areas that have fine-textured soils with high rock content where mitigation efforts are difficult. Skidding could be accomplished during the winter when a minimum 12 inch snowpack exists and temperatures are below freezing the entire day.	High High
	Minimize loss of topsoil.	1. Maintain a vegetative cover on the soil across the landscape throughout most of the year. 2. Minimize and mitigate bare soil areas caused by logging, road building, burning, and overgrazing.	High Medium

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
PLANT SPECIES AND HABITAT			
Non-Native Plant Species and Noxious Weeds	Prevent or discourage the spread of non-native plant species and noxious weeds. Prevent or discourage any increase in abundance of these species where they currently exist in the analysis area.	1. Emphasize prevention activities: a. Minimize ground disturbing activities in the analysis area. b. Use native species from local gene pools when plant materials are needed for project use. If the native species are unavailable or unsatisfactory, use non-invasive or non-persistent non-native species. c. Clean vehicles and equipment after being in known noxious weed infestation areas. d. Clean vehicles and equipment prior to site disturbance and prior to arrival at project area to avoid spreading noxious weeds.	High
		2. Use integrated pest management and appropriate research recommendations for control and/or eradication of noxious weeds. (See recommendations for noxious weed prevention listed under Vegetation).	High
		3. Continue cooperation with Oregon Department of Agriculture for species identification and tracking.	High
		4. Promote cooperation with local landowners and other government agencies.	High
		5. Use grazing systems and best management practices designed to encourage native grasses and discourage non-native annual grasses on upland ranges.	Low
		6. Increase public awareness of noxious weed species and their management.	Medium
		7. When native seed is not available, consider the use of sterile and/or adapted competitive grass species on disturbed sites to prevent the encroachment of noxious weed species, especially on low elevation sites. These grasses should improve nutrient cycling and reduce noxious weed seeds in the soil. As appropriate, convert these sites to native species.	High
		8. In areas where nonnatives are established, begin restoration efforts. Plant native seedlings.	Medium

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Special Status Plant Species and Habitats	Manage special status plant species and their habitats so as not to contribute to the need to list as threatened or endangered with the U. S. Fish and Wildlife Service and manage federally listed plants and their habitat so as not to jeopardize their continued existence.	1. Mitigate impacts of management activities to special status and federally listed plants. 2. Monitor impacts of management activities and effectiveness of mitigation measures on special status and federally listed plants. 3. Survey the entire analysis area for special status and federally listed plant occurrence. 4. Develop and implement conservation strategies for Federal listed, candidate, and Bureau sensitive plant species. 5. Work with other agencies, universities, and private groups on monitoring and research projects for special status and federally listed plants.	High High Medium Medium Medium
	Maintain and enhance special status and federally listed plant populations, habitats, distribution and viability.	1. Identify and map potential habitat for special status and federally listed plants found in the analysis area. 2. Identify important habitat characteristics of special status and federally listed plants found in the analysis area and design management activities that will duplicate these characteristics. 3. Monitor special status and federally listed plant populations to gain data on biology, phenology, demography, and ecology.	Medium Medium High
	Preserve, protect, and restore species composition and ecological processes of natural plant communities.	1. Control noxious weeds and other exotic species. 2. Develop a sustainable and economical local native seed source for future reseeding efforts. 3. Use, when available, native species for all vegetation and revegetation projects. 4. Avoid the use of native species from non-local sources that may be a threat to local genetic diversity.	High High High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Survey and Manage Plant Species and Habitats	Maintain and enhance survey and manage populations, habitats, distribution and viability.	1. Implement survey protocols and management recommendations as they are developed. 2. Maintain adequate down coarse woody material, an important habitat component for survey and manage fungi and bryophytes. 3. Minimize soil compaction and humus layer disturbance, important site characteristics for survey and manage fungi. 4. Monitor known sites to assess compliance with management guidelines and evaluate impacts of management actions. 5. Monitor populations of survey and manage species to address identified data gaps.	High High High High High Medium
VEGETATION			
Seedlings through Poles, Mid-Seral, and Mature/Old Growth Vegetation Classes	Increase growth, quality, and vigor of individual trees to prevent mortality of additional trees. Manage the stocking level of all tree species in the Interior Valley Zone.	1. Reduce timber stand densities when the stands have a relative density index of 0.55 or greater by using appropriate silvicultural prescriptions to decrease the number of trees per acre (or basal area), to a relative density index of approximately 0.30 to 0.40. 2. Manage for species composition by aspect (pine on south, west and some east aspects; Douglas-fir on east and north, etc.). 3. Use pruning as an option for improving wood quality in fast-growing pole stands.	High High Low

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Seedlings through Poles, Mid-Seral, and Mature/Old Growth Vegetation Classes	Design and develop a diverse landscape pattern and contiguous areas of multi-layered, late-successional forest (timber stands with diversified stand structure in regard to tree height, age, diameter classes, and species composition through uneven-aged management) over time. To meet the retention requirement on federal forest lands (USDA and USDI 1994a:C-44), no less than 15 percent would be in a late-successional class (Appendix I). Additional late-successional stands will be present outside of Riparian Reserves and areas of connectivity, most likely as isolated pockets of refugia. The remainder of the forest lands would be in earlier stages of seral development.	1. Prescribe silvicultural treatments that promote contiguous areas of mature and late-successional forest land. 2. Use single tree selection, group selection, irregular uneven-aged and intermediate cutting treatments (thinning and release) methods, in combination or singly, when necessary to create diversified stand structure of varying seral stage development and create late-successional stand characteristics. 3. Commercial thin even-aged, single-story canopy stands that are within the designated 15 percent late-successional retention areas. 4. Consider selective harvest where dwarf mistletoe infestations have killed moderately sized patches of trees within the retention areas.	High High High High
	Treat low elevation pine stands selected to meet the 15 percent late-successional retention requirement as soon as possible to restore pine species as the dominant species.	1. Use the single tree selection and group selection methods to establish pine species regeneration on dry, ponderosa pine sites. Douglas-fir should be the species targeted for harvest from these sites. 2. Create open park-like pine stands over time that have diverse stand structure (many different age classes and canopy layers).	High High
	Create openings and suitable seedbeds to promote the establishment and growth of pine species (especially sugar pine), incense cedar, and Douglas-fir. Increase the species composition of these species in forest stands where they are under represented.	1. Use the group selection method to create openings of 0.25 to 2.0 acres. Approximately 5 to 20 percent of the commercial forest lands would receive the group selection method of harvest with a random pattern of group distribution across the landscape. 2. Create favorable seedbed conditions for ponderosa pine through prescribed burning or other methods that would reduce the thickness of the soil duff layer, especially around the pine trees. Plant trees in the openings to ensure adequate stocking of pine species.	High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Seedlings through Poles, Mid-Seral, and Mature/Old Growth Vegetation Classes	(Continued) Assure survival of individual trees with late-successional characteristics by reducing vegetation competition in second growth timber stands. This also preserves genetic material.	(Continued) 1. Reduce competition in Matrix lands by removing second growth trees that surround trees with late-successional characteristics. Create an approximate 25-foot crown space between the old tree and the remaining second growth trees. Cut only trees that are not associated (crowns entwined) with the late-successional tree.	High
	Design silvicultural prescriptions to manage dwarf mistletoe infestations (for Matrix lands, but may be applied to late-successional areas).	1. Use selection method, pruning, and prescribed burning methods to control the rate and intensity of the parasite. Keep the mistletoe in draws and off of ridges.	High
	Reduce the fire hazard of the timber stands by decreasing the ladder fuels while meeting the needs identified under other resource programs (for Matrix lands, but may be applied to late-successional areas).	1. Decrease the ladder fuels in forest stands by precommercial thinning dense patches of suppressed tree regeneration and shrub species, and the pruning of tree limbs. These treatments should eliminate fire fuels to a height of 6 to 12 feet above ground level. Cut tree limbs that extend into the pruning height area. 2. Form a mosaic of vegetative patterns by leaving untreated patches of vegetation scattered throughout the landscape.	High High
	Retain at least 15 percent of all project areas, distributed throughout the landscape in an untreated condition. Untreated areas should be a minimum of 2.5 acres in size and can be in any combination of vegetation condition classes.	1. Use landscape design to maintain designated patches of untreated vegetation in strategic locations (e.g., Riparian Reserves; critical habitat; wildlife corridors; areas between existing tree plantations, shrublands, woodlands, etc.).	High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Seedlings through Poles, Mid-Seral, and Mature/Old Growth Vegetation Classes	(Continued) Provide for well distributed coarse woody material (CWM is any large piece of woody material on the ground having a diameter greater than 4 inches and a length greater than 39 inches) across the landscape for maintaining the ecological functions of the species dependent on coarse wood (USDI, BLM 1994). Protect the largest coarse woody material already on the ground from management activities to the greatest extent possible.	(Continued) 1. Leave a minimum of 120 linear feet of class 1 and 2 logs per acre greater than or equal to 16 inches in diameter at the large end and 16 feet in length in regeneration harvest areas as prescribed in the Standard and Guidelines for CWM listed in the Northwest Forest Plan (NFP) (USDA and USDI 1994a; USDI, BLM 1994). 2. Modify amounts of CWM in areas of partial harvest to reflect the timing of stand development cycles that provide for snags and subsequent CWM from natural suppression and overstocking mortality. Assess the advantages of treatment to improve habitat conditions beyond natural conditions. The amount of CWM to leave should fall within a range of the average natural distribution. For projects in the analysis area, no less than 15 to 20 percent ground cover of CWM or less than 4.5 tons/acre will be acceptable. Smaller log pieces may be counted when they meet designated standards (USDI, BLM 1996). Leaving green trees and felling to provide a source of CWM well distributed across the landscape after harvesting should be part of the partial harvest prescription. 3. Exceed the standards and guidelines of the NFP for CWM where forest stands are experiencing mortality and excess large CWM (16 inches or greater in diameter at the large end) is available. Girdle large diameter green trees in healthy stands to provide large diameter CWM for wildlife habitat and/or soil productivity. 4. Perform surveys to determine average amounts of coarse woody material over the landscape for the commercial timber land base. 5 Leave all trees that are providing shade for CWM that is 20 inches in diameter at the small end and a minimum of 8 feet long. 6. Recruit CWM levels gradually over time in partial harvest areas that are appropriate for the site (for each respective vegetation zone). It may take two to three stand entries to acquire desired amounts of CWM especially in regard to large end log diameter requirements. 7. Avoid consumption of CWM during prescribed burning activities.	High High High High High Medium Medium

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Early Seral and Seedlings Vegetation Classes	Enhance structural diversity of existing, young even-aged forest stands.	1. Enhance the structural diversity of these vegetation classes by precommercial thinning treatments at staggered intervals and favoring trees of different heights and species at the time of treatment. 2. Perform release treatments as needed.	Medium Medium
Hardwood Vegetation Class	Maintain or improve the natural functions and processes of the native grass/oak woodlands plant associations where appropriate.	1. Manipulate vegetation species as necessary to maintain the natural functions and processes of the native grass/oak woodland plant associations. 2. Discourage high stocking densities of conifers by using manual treatments and prescribed burning. 3. Manage the abundance of shrub and noxious weed species. 4. Reduce the density of hardwoods to increase water and nutrient availability to the hardwoods for mast production where necessary. 5. Use prescribed burning and mechanical methods to accomplish recommendations 1 through 4. 6. Seed native grass species into areas of exposed, disturbed soil before noxious weeds become established. Under certain circumstances, desirable non-native grass species will be seeded (See Appendix J) where feasible.	High High High High High High
	Introduce a younger age class into the oak woodlands.	1. Cut suppressed and intermediate crown class trees to induce sprouting. Manage the sprout clumps to favor growth of the dominant sprouts. After the vigor is restored to the oak trees, acorn crops should provide for more natural regeneration. 2. Plant oak trees where appropriate.	Medium Low
Shrub Vegetation Class	Maintain the integrity of the shrublands.	1. Manage the density and species composition of the shrubs. 2. Concentrate density reduction efforts on the extremely dense shrublands on the south facing slopes and where there is big game habitat. 3. Control or retard the spread of non-native species, especially noxious weeds (see Non-native Noxious Weed recommendations).	High High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Shrub Vegetation Class	(Continued)	(Continued) 4. Use prescribed burning and mechanical methods to accomplish recommendations 1 through 4. 5. Seed native grass species into areas of exposed, disturbed soil before noxious weeds become established. Under certain circumstances, desirable non-native grass species will be seeded where feasible (see Appendix J). 6. Manage tree species to maintain the dominance of the desired shrub species.	High High Medium
Grass Vegetation Class	Maintain and/or improve the species composition of the native grasslands.	1. Treat tree and shrub species with prescribed fire to maintain the dominance of native grasses. 2. Seed native grasses on recently disturbed areas to prevent the establishment of noxious weeds. Under certain circumstances, desirable non-native grass species will be seeded where feasible (see Appendix J). 3. Control or retard the spread of non-native species especially noxious weeds (see Non-native Noxious Weed recommendations). 4. Develop a native grass propagation program for grasses found in the analysis area.	High High High Medium
FIRE AND AIR QUALITY			
Safety	Provide for firefighter and public safety in all fire management activities (including wildfires) across the landscape. This objective is mandated by the Department of Interior as the first priority in every fire management activity.	1. Treat high and moderate hazard areas around the rural interface areas. Reduce canopy closures, ground and ladder fuels in order to increase protection of private lands and structures. Treatment of fuels on private lands within the rural interface is mostly dependent on factors outside the control of the BLM. 2. Retain fire access routes based on transportation management objectives. These routes are needed to allow quick response times to wildfire starts and escape routes for the public and firefighters.	High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
Safety	(Continued)	(Continued) 3. Coordinate with adjacent private landowners to treat hazardous fuels on private lands.	High
Resource Protection	Promote long-term resistance of the lower and mid-elevation areas to stand replacement wildfires by reducing the fuel hazard.	1. Develop a landscape strategy to reduce high and moderate fuel hazard. Coordinate this effort with federal, state, county, city, and private landowners. 2. Treat areas of continuous high and moderate hazard fuels in order to help reduce the size and intensity of wildfires. High priority areas would be adjacent to the rural interface area and adjacent to high values at risk (listed in Table 19, Current Condition section). Treatments should include thinning of overstocked timbered stands and the reduction of ground and ladder fuels in both commercial and noncommercial timber lands. Utilize mechanical and manual methods in conjunction with prescribed burning to achieve these objectives. 3. Utilize prescribed burning to maintain plant communities such as grasslands and oak woodlands. Fire will not only maintain these communities but also reduce the fuel hazard of these areas.	High High High
Air Quality	Minimize adverse impacts to air quality from fire management activities and wildfires.	1. Conduct fire management activities in compliance with all federal, state, and local smoke management regulations. 2. Monitor particulate matter levels produced from fire management activities and wildfires to further refine smoke emission mitigation practices.	High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
TERRESTRIAL WILDLIFE SPECIES AND HABITAT			
Terrestrial Wildlife Species and Habitat	Maintain or enhance current native terrestrial wildlife populations.	1. Develop and maintain an appropriate quantity and distribution of seral stages of the various plant communities found in the analysis area. 2. Identify, protect, and where appropriate, enhance the special habitats identified in the Medford District Resource Management Plan (USDI, BLM 1995), such as caves/mines, talus, wetlands, and meadows. 3. Maintain adequate numbers of snags and amounts of coarse woody material (see Vegetation recommendations) for those species that require these special habitats for breeding, feeding, or sheltering. 4. Maintain or improve dispersal conditions within the analysis area and between adjacent watersheds. 5. Implement the Transportation recommendations that are specific to terrestrial wildlife. 6. Restore oak/pine woodlands through prescribed fire and appropriate silvicultural methods. 7. Rehabilitate/rejuvenate shrublands by using prescribed fire or other efficacious method. 8. Restore native grasslands.	High High High High High High High High
	Ensure management activities do not lead to listing of Bureau Sensitive or Bureau Assessment species as threatened or endangered.	1. Inventory for Bureau Sensitive and Assessment species suspected but not known to occur in the analysis area. 2. Protect, maintain, or improve habitat conditions for those Bureau Sensitive and Assessment species found in the analysis area.	High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
HYDROLOGY			
Hydrology	Maintain and enhance instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. Protect the timing, magnitude, duration, and spatial distribution of peak, high, and low flows (Aquatic Conservation Strategy Objective #6; USDA and USDI 1994a:B-11).	1. Follow Transportation recommendations. 2. Reduce upland fire hazard to minimize potential for catastrophic wildfires. 3. Encourage spring protection and minimize surface/groundwater diversions on public lands to ensure attainment of the Aquatic Conservation Strategy Objectives. 4. Require compliance with State regulations and permit limitations for water diversions, ditches, and pipelines on public lands.	High High High High
	Maintain and enhance the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands (Aquatic Conservation Strategy Objective #7; USDA and USDI 1994a:B-11).	1. Follow interim Riparian Reserve widths identified in the Northwest Forest Plan Standards and Guidelines for wetlands greater than one acre (USDA and USDI 1994a:C-30-31). Designate Riparian Reserve widths of 100 feet slope distance from the outer edge of wetlands less than one acre. 2. Follow Transportation recommendations that pertain to meadows and wetlands.	High High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
STREAM CHANNEL			
Stream Channel	Maintain and enhance the natural channel stability by allowing streams to develop a stable dimension, pattern, and profile such that, over time, channel features are maintained and the sediment regime under which aquatic ecosystems evolved is maintained and enhanced.	1. Follow Transportation recommendations. 2. Follow Riparian Areas recommendations.	High Medium
	Maintain and enhance the physical integrity of the aquatic system, including stream banks and bottom configurations (Aquatic Conservation Strategy Objective # 3; USDA and USDI 1994a:B-11).	1. Promote growth of conifer and hardwood trees within Riparian Reserves, using silvicultural methods if necessary, to reach late-successional characteristics (where capable) for future large wood recruitment (see Riparian section). 2. Minimize activities that adversely affect streambanks and riparian vegetation.	High High
		3. Maintain or enhance the streams' ability to dissipate the energy from high stream flows. Assess need for energy dissipators in stream channels and consider adding energy dissipators such as large woody material or boulders, and riparian vegetation where appropriate.	Medium
	Maintain and enhance the sediment regime under which the aquatic ecosystem evolved (Aquatic Conservation Strategy Objective # 5;USDA and USDI 1994a:B-11).	1. Follow Transportation and Erosion Processes recommendations. 2. Reduce the potential for altering the timing, magnitude, duration, frequency, and spatial distribution of peak flows (see Hydrology section). 3. Assess for eroding stream banks and stabilize where appropriate.	High High Medium

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
WATER QUALITY			
Water Quality	Maintain and enhance water quality necessary to support healthy riparian, aquatic, and wetland ecosystems (Aquatic Conservation Strategy Objective # 4; USDA and USDI 1994a:B-11). Achieve the principal water quality objectives in the South Rogue-Gold Hill Watershed Analysis Area by increasing summer flows and reducing summer stream temperatures, sedimentation, and bacteria.	1. Apply appropriate Best Management Practices (BMPs) (USDI, BLM 1995:149-177) to minimize soil erosion and water quality degradation during management activities.	High
		2. Follow Hydrology recommendations 4 and 5 to increase summer flows.	High
		3. Plant or maintain native species (from local genetic stock) in riparian areas and wetlands to provide adequate stream shading.	High
		4. Protect riparian vegetation that provides stream shading as specified in the Riparian Areas recommendations.	High
		5. Follow Transportation and Erosion Processes recommendations to reduce stream sedimentation.	High
		6. Survey and stabilize actively eroding landslide areas that are contributing sediment to streams.	High
		7. Manage livestock grazing to avoid livestock concentrations in riparian areas.	High

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
RIPARIAN AREAS			
Riparian Reserves	Decrease fragmentation within Riparian Reserves and maintain or enhance connectivity between Riparian Reserves.	1. Follow Transportation recommendations. 2. Determine weaknesses in connectivity and plan management activities that enhance riparian habitat.	High Medium
	Give the highest priority for restoration to Riparian Reserves most impacted by road development and/or roads located in unstable upland and landslide bench terrain.	1. Follow the interim Riparian Reserve widths outlined in the Northwest Forest Plan (USDA and USDI 1994a:C-30-31). 2. Change or discontinue management activities that may prevent or retard restoration and/or enhancement of Riparian Reserve habitat. 3. Use an interdisciplinary process to design site-specific Riparian Reserve treatments if necessary to maintain and enhance riparian vegetation condition.	High High High
	Maintain and enhance the species composition and structural diversity of plant communities in riparian areas and wetlands. Supply amounts and distribution of large woody debris sufficient to sustain physical complexity and stability. Protect ground water flow. Protect riparian-dependent special status species.	1. Give Riparian Reserves located adjacent to fish-bearing streams the highest priority for restoration to late-successional characteristics. Implement riparian silviculture (density management) in Riparian Reserves to increase the large conifer component in fish-bearing streams, with early and mid-successional stands. 2. Implement riparian silviculture to reduce fire hazard especially where there are mid and-late successional conifer components within the Riparian Reserves of fish-bearing streams that are at risk of damage (or elimination) due to fire. 3. Identify specific grazing problems in Riparian Reserves, especially along wetlands and streambanks, and institute appropriate restoration measures.	High Medium Medium

RESOURCE	OBJECTIVES	RECOMMENDATIONS	PRIORITY
AQUATIC WILDLIFE SPECIES AND HABITAT			
Aquatic Wildlife Species and Habitat	Maintain viable anadromous and resident salmonid fish and other aquatic wildlife populations with individuals of all life stages throughout their habitat.	1 Ensure that management activities on BLM-managed lands meet the Aquatic Conservation Strategy (ACS) Objectives (USDA and USDI 1994a:B-11), and the management actions/direction in the Medford BLM Resource Management Plan (USDI, BLM 1995), and Best Management Practices (USDI, BLM 1995:149-177).	High
	Restore and protect aquatic habitat for all anadromous and resident fish and other aquatic resources. Restore and protect spatial and temporal connectivity within and between watersheds.	1. Restore and/or diversify fish habitat and floodplain connectivity to maintain pool habitat, fish cover, spawning gravels, and bank stability.	High
		2. Promote future large wood recruitment in Riparian Reserves.	High
		3. Improve water quality and increase water quantity. Adhere to Water Quality and Hydrology recommendations.	High
		4. Avoid activities that degrade streambanks and riparian areas. Adhere to Riparian Area recommendations.	High
		5. Follow Transportation and Erosion Processes recommendations.	High
		6. Work with ODFW to make sure all irrigation ditches are screened.	Medium
		7. Replace culvert on Birdseye Creek at crossing of Rd. 37-4-4 and 37-4-4.1 in 37S-4W-4 and on Kane Creek at 37S-3W-11 at road crossing 37-3-11.	

LANDSCAPE PLANNING OBJECTIVES AND RECOMMENDATIONS FOR BLM-ADMINISTERED LANDS

Recognizing that the landscape of the South Rogue-Gold Hill Watershed Analysis Area is a complex web of interacting ecosystems, the watershed analysis team blended individual resource information to develop a landscape picture for BLM-administered lands. The team looked at the current condition of the terrestrial and aquatic components of the landscape and synthesized the information to formulate landscape level objectives and recommendations. These landscape level objectives and recommendations provide valuable information for planning projects and making management decisions. Map 22 shows areas across the landscape that need special consideration prior to project planning.

LANDSCAPE AREA	OBJECTIVES	RECOMMENDATIONS
Riparian Reserves	Maintain and enhance Riparian Reserve habitat to support well-distributed populations of native plants, invertebrate, and vertebrate riparian-dependant species, especially taking into consideration long-term plant community changes.	1. Follow the interim Riparian Reserve widths identified in the Northwest Forest Plan (USDA and USDI 1994a:C-30-31) until site specific analysis occurs at the project level. 2. Follow Riparian Reserve module (USDA et al. 1997) to change boundary widths when necessary to meet management objectives. 3. Use an interdisciplinary process to design site-specific silvicultural treatments as needed to meet Aquatic Conservation Strategy Objectives (USDA and USDI 1994a:B-11). 4. Evaluate roads, skid trails, landings, and OHV trails within Riparian Reserves and determine appropriate action, such as stabilize, improve drainage, decommission, etc. 5. Manage Riparian Reserves to improve riparian vegetation, stabilize streambanks, and reduce sediment.

LANDSCAPE AREA	OBJECTIVES	RECOMMENDATIONS
Unstable Areas	Protect unstable and potentially unstable areas.	1. Designate Riparian Reserves to include unstable and potentially unstable landslide areas. 2. Buffer management activities near unstable and potentially unstable landslides. The size of the buffer and extent of management activities will be based on site specific analysis.
John's Peak/Timber Mountain OHV Area	Develop a management plan for the Timber Mountain/John's Peak area to provide for OHV use as specified in the 1995 Medford District RMP.	1. Ensure that the analysis area for the management plan is large enough to sufficiently address expanding OHV use and the associated cumulative effects. 2. Broaden the scope of the management plan to address different types of recreation, including hiking, horseback riding, and bicycling. 3. Involve adjacent landowners in the planning process. 4. Improve, re-locate, or decommission poorly located or designed trails with erosion problems, and trails that cross intermittent or perennial streams.
15 Percent Late-Successional Retention Areas	Over time, meet or exceed the 15 percent late-successional retention requirement on federal forest lands (USDA and USDI 1994a:C-44) to provide habitat to function as refugia for old-growth associated species that have limited dispersal capabilities such as fungi, lichens, bryophytes and vascular plants (see Appendix I). It must be remembered that natural succession will change tree stocking levels and size classes with time. There will be periods with more than 15 percent, and periods with less than 15 percent.	1. Reserve late-successional stands off of ridgetops, most preferably in riparian areas. 2. Ensure that retained stands are distributed across the landscape, preferably in Riparian Reserves and not on ridgetops. 3. Identify and treat target stands to speed development of late-successional or old-growth habitat that will support a more connected network of continuous habitat than currently exists. 4. Treat reserve stands where necessary to maintain and create late-successional components, such as canopy cover, snags, and class I and II coarse wood (see Management Objectives and Recommendations, Vegetation, for coarse woody material amounts). 5. Prescribe silvicultural treatments aimed at restoring and preserving late-successional pine characteristics in pine associated stands that have been identified for retention, but are overstocked with Douglas-fir and other species.

LANDSCAPE AREA	OBJECTIVES	RECOMMENDATIONS
Matrix	Maintain the isolated (landlocked) parcels of matrix land in a mature/late-successional seral stage when possible, helping to meet the 15% late-successional retention requirement.	1. Use intermediate (commercial thinning) and selection harvest methods to achieve desired stand structure and species composition. 2. Consider regeneration harvest or defensible fuel profile zones (DFPZ) as an option when appropriate stand structures are retained: 16 to 25 large green trees per acre, and a minimum of 40 percent canopy closure (USDI, BLM 1995).
	Manage the larger, accessible parcels of matrix lands in a variety of vegetative seral stages according to Medford District Resource Management Plan (USDI, BLM 1995) guidelines.	1. Manage by appropriate trees series zones to provide for a variety of stand structures (early through late-successional seral stages) while maintaining all native species. A variety of silviculture prescriptions can be applied.
Matrix	Provide general connectivity (along with other land use allocations such as Riparian Reserves) between late-successional reserves.	1. Provide a renewable supply of large live trees and snags well distributed across the land in a manner that provides habitat for cavity using birds, bats, and other species. Regeneration harvest is an option when appropriate stand structures are retained, 16 to 25 large green trees per acre, and a minimum of 40 percent canopy closure (USDI, BLM 1995). 2. Leave a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16-feet long. Retain coarse woody material already on the ground and protect it from disturbance during treatment.

LANDSCAPE AREA	OBJECTIVES	RECOMMENDATIONS
High And Moderate Fire Hazard Areas	Treat all vegetation condition classes in strategic locations, especially commercial forest stands, to ensure their survival from insects and fire, and enhance seral and structural development of the condition classes (see Map 19 for high and moderate fire hazard areas).	1. Develop prescriptions that reduce fire hazard and improve vegetation health to protect natural resources or sites of cultural value from biotic disturbances (fire and wind). 2. Manage vegetation density of all vegetation condition classes to accomplish this objective. 3. Develop a landscape strategy to reduce high and moderate fuel hazard. Coordinate this effort with federal, state, county, city, and private landowners. 4. Create DFPZs on ridgetops in strategic areas. 5. Use selection silvicultural harvest methods to create or enhance the development of late-successional forests. 6. Treat pine series forest in the commercial base to create open park-like structure. 7. Target Douglas-fir stands for density management adjacent to shrublands or woodlands on south and west slopes, or on ridges that receive sunlight for most of the day.
Roads of Concern	Reduce road density and road-caused erosion, stabilize roads that are unstable, and reduce wildlife disturbance.	1. Review roads of concern listed in Appendix K and consider stabilizing, closing, or decommissioning.

DATA GAPS

This section identifies information that was not available for the South Rogue-Gold Hill Watershed Analysis Area during the analysis. Items under each ecosystem element/subelement are listed in priority order if funding should become available for data collection.

Human Uses

Unauthorized Use

1. Property lines in locations where unauthorized use is suspected.

Transportation

1. Road condition surveys.
2. OHV trail inventory analysis and recommendations.

Grazing

1. Potential cooperative livestock related projects on private lands within the analysis area.

Archaeological Sites

1. Systematic archaeological survey.
2. Formal evaluation of known archaeological sites.

Erosion Processes

1. Field inventory and GIS mapping of all recent and active landslides and severely eroded terrain on BLM-administered lands.
2. Quantification of landslide and erosion rates accelerated by BLM-administered land (i.e., roads and clearcut harvesting) versus natural erosion rates.

Soil Productivity

1. Duff thickness for various vegetation types within the analysis area.
2. Extent of soil productivity reduction caused by wildfire.
3. Quantification of disturbance effects on long-term soil productivity.
4. Amount of coarse woody material (by decay class) across the landscape.

Plant Species and Habitats

Special Status Plant Species and Habitats

1. Inventory of special status plants.
2. Inventory and population data of non-native plant species, including noxious weeds.
3. Demographic data on known populations.
4. Species response to management practices.

Survey and Manage Plant Species and Habitats

1. Inventory for Survey and Manage lichens, bryophytes, and fungi.
2. Species distribution data.

Forest Density and Vigor

1. Comprehensive data on drought tolerance for tree and shrub species (in bars of water tension).
2. More statistical data regarding the historic range, frequency, and distribution of vegetation over the landscape (should include all pine species, incense cedar, oak species, black cottonwood, red alder, and Oregon ash).

Fire and Air Quality

1. Exact acreage and location of existing and past high hazard, medium hazard, and low hazard areas.
2. Data regarding the range, frequency, distribution, and interaction of insects, animals, vegetation and fire intensities.
3. Wildfire intensities and consumption rates over the landscape during differing climatic conditions through time.
4. Cultural understanding of fire use during prehistoric times.
5. Complete fire start information (e.g., location, cause, time) prior to 1969.
6. Classification of land by plant association within and outside fire regimes.
7. Utilizing above data to predict wildfire severity potential within the watershed through predictive models such as RERAP, and FARSITE.
8. Information regarding past and present trends in air quality due to fire management and wildfire activities.
9. Data regarding changes in populations of fire dependant plant and animals species.

Terrestrial Wildlife Species and Habitats

1. Prehistoric, existing and desired relative abundance and patch size distribution of the vegetation condition classes found in the analysis area.
2. Occurrence, distribution, and population data for special status, survey and manage, and protection buffer species found in the analysis area.
3. Snag and coarse woody material abundance by vegetation condition class.

Hydrology

1. Field surveys to identify stream categories for nonfish-bearing streams (permanently flowing or intermittent).
2. On-the-ground wetland inventory.

Stream Channel

1. Sediment source locations in stream channels and upland areas, including roads.
2. Physical stream characteristics of stream reaches that have not been surveyed.

Water Quality

1. Dissolved oxygen, pH, fecal coliform, and turbidity data for Kane, Galls, Foots, and Birdseye Creeks (this data collection is a low priority for BLM).

Riparian Areas

1. Amount of large woody material in riparian areas.
2. Amount, diversity, and age of riparian vegetation.

Aquatic Wildlife Species and Habitats

1. Distribution and relative abundance of non-salmonid fish species.
2. Upstream distribution and relative abundance of all native fish species.
3. Habitat requirements of non-salmonid native fish species.
4. Species composition, distribution and relative abundance of macroinvertebrates and amphibians.
5. Habitat condition including percent of shading along streams, geomorphology, pool/riffle/ratios, pool depth, and substrate composition in non-surveyed tributaries.

MONITORING RECOMMENDATIONS

The following monitoring recommendations are made in order to gain a better understanding of the watershed processes and conditions within the South Rogue-Gold Hill Watershed Analysis Area. Items under each ecosystem element are listed in priority order if funding should become available for monitoring.

Human Uses

1. Monitor cultural resource site conditions (looting and natural deterioration),
2. Monitor cultural resource effectiveness of past survey strategies to locate sites.
3. Monitor changing public opinions, values, and expectations regarding land management issues.

Transportation

1. Monitor roads to ensure that drainage structures are functioning as designed.
2. Monitor culverts on fishery streams to ensure that passage is adequate.
3. Monitor road blocks to ensure that they are effective.

Soil Productivity

1. Survey duff thickness for various vegetation types in the analysis area prior to and after management actions.
2. Survey the analysis area for coarse woody material (CWM), especially in various ecological and vegetative types, in order to adjust amount of CWM needed across the landscape.

Special Status Plant Species and Habitats/ Survey and Manage Plant Species and Habitats

1. Population demographic monitoring to determine species biology, life history, ecological requirements, and population trends.
2. Monitor pre and post management to determine microclimate changes and effectiveness of mitigation design.
3. Long term monitoring to determine impacts of management actions.

Forest Density and Vigor

1. Monitor commercial forest stands for vigor by using relative density as an index.
2. Measure individual tree growth in commercial forest stands.
3. Analyze canopy closure before and after vegetation treatment.
4. Monitor amounts of coarse woody material before and after timber harvesting operations.
5. Monitor the number and quality of snags (and perhaps how the trees were killed: insects or pathogens).
6. Monitor acorn crops after oak woodland treatments.
7. Monitor the survival of individual pine trees after release treatments.
8. Measure humidity, air and soil temperatures for pre-treatment and post treatment areas across the landscape to learn the effects of timber harvest on natural regeneration establishment.

Fire and Air Quality

1. Monitor changes in fire hazard over time as landscape fuel hazard reduction treatments are completed.
2. Monitor smoke emissions and impacts from wildfire and fuels management activities.
3. Monitor changes in populations of fire dependant plant and animal species over time.

Terrestrial Wildlife Species and Habitat

1. Monitor site occupancy, reproductive status and reproductive success of threatened/endangered species found in the analysis area.
2. Monitor habitat use and population trend of the special status and other priority species found in the analysis area.
3. Monitor rate of recruitment/loss of snags and coarse woody material.
4. Monitor rate of seral stage change in the vegetative communities found in the analysis area.

Hydrology

1. Monitor changes in road density and soil compaction.

Stream Channel

1. Establish permanent monitoring monuments to determine changes in channel morphology resulting from specific stream improvement projects.
2. Monitor changes in channel stability and condition by conducting periodic physical stream surveys (such as10-year intervals).

Water Quality

1. Continue monitoring summer stream temperatures at existing sites.

Riparian Areas

1. Assess the ability of the Aquatic Conservation Strategy and BLM Medford District Resource Management Plan's management direction to provide the anticipated level of protection to interim Riparian Reserves.
2. Monitor riparian habitat (i.e., large woody material, shading, microclimate) before and after implementing management prescriptions designed to improve riparian habitat.
3. Assess riparian species composition, age, density and health prior to and in conjunction with return intervals for timber harvest.

Aquatic Wildlife Species and Habitats

1. Monitor changes in aquatic/riparian habitats, stream temperatures, water quality and fish populations by conducting periodic physical stream surveys and population inventories (i.e. 10-year intervals).
2. Continue to collect baseline data on aquatic macroinvertebrate populations to determine the biotic integrity of stream habitat and trends in the analysis area.
3. Collect baseline data on amphibians such as foothill yellow-legged frog populations to determine the biotic integrity of stream habitat and trends in the analysis area.
4. In conjunction with ODFW, continue spawning surveys to provide data used to measure trends in spawning habitat use.
5. Establish upper limits of fish use and periodically revisit streams to see if it changes.

RESEARCH RECOMMENDATIONS

The following research recommendations would provide additional understanding of ecosystem processes in the South Rogue-Gold Hill Analysis Area. Items under each ecosystem element are listed in priority order should funding become available.

Plant Species and Habitats

Special Status Plant Species and Habitats

1. Determine ecological requirements.
2. Determine the effects of micro-climate changes due to management activities on individuals and the population.

Survey and Manage Plant Species and Habitats

1. Determine ecological requirements.
2. Determine the effects of micro-climate changes due to management activities on individuals and the population.
3. Determine relationship of stand age to population viability.
4. Determine the forest tree density level required to sustain population viability.

Forest Density and Vigor

1. Research the soil carbon/nitrogen ratios for various soils in the analysis area.
2. Study the available trace elements in the various soils of the analysis area and the requirements for the tree species.
3. Perform more comprehensive studies on the ecological requirements of Oregon white and California black oak to produce acorn crops, including optimum tree density (stems/acre), impact of competing vegetation (how much and which species can grow around the oaks?), and the occurrence, frequency, and intensity of fires needed to return nutrients to the soil to maintain healthy, productive oak woodlands.
4. Research how long conifer and hardwood trees can live on low elevation, drought-prone sites.
5. Determine the evapotranspiration rates for all endemic tree and shrub species (in inches of water).
6. Determine how many old-growth trees are needed on a per-acre basis to maintain ecosystem functions of late-successional forests.
7 Determine what the coarse woody material requirements of the analysis area are in order to maintain site productivity.

Terrestrial Wildlife Species and Habitat

1. Determine ecological requirements for the special status, survey and manage, and protection buffer species present in the analysis area.
2. Determine the optimum mix and distribution of seral stages of the vegetative communities found in the analysis area that would maximize the probability of persistence of all special status, survey and manage, and protection buffer species.

Stream Channel

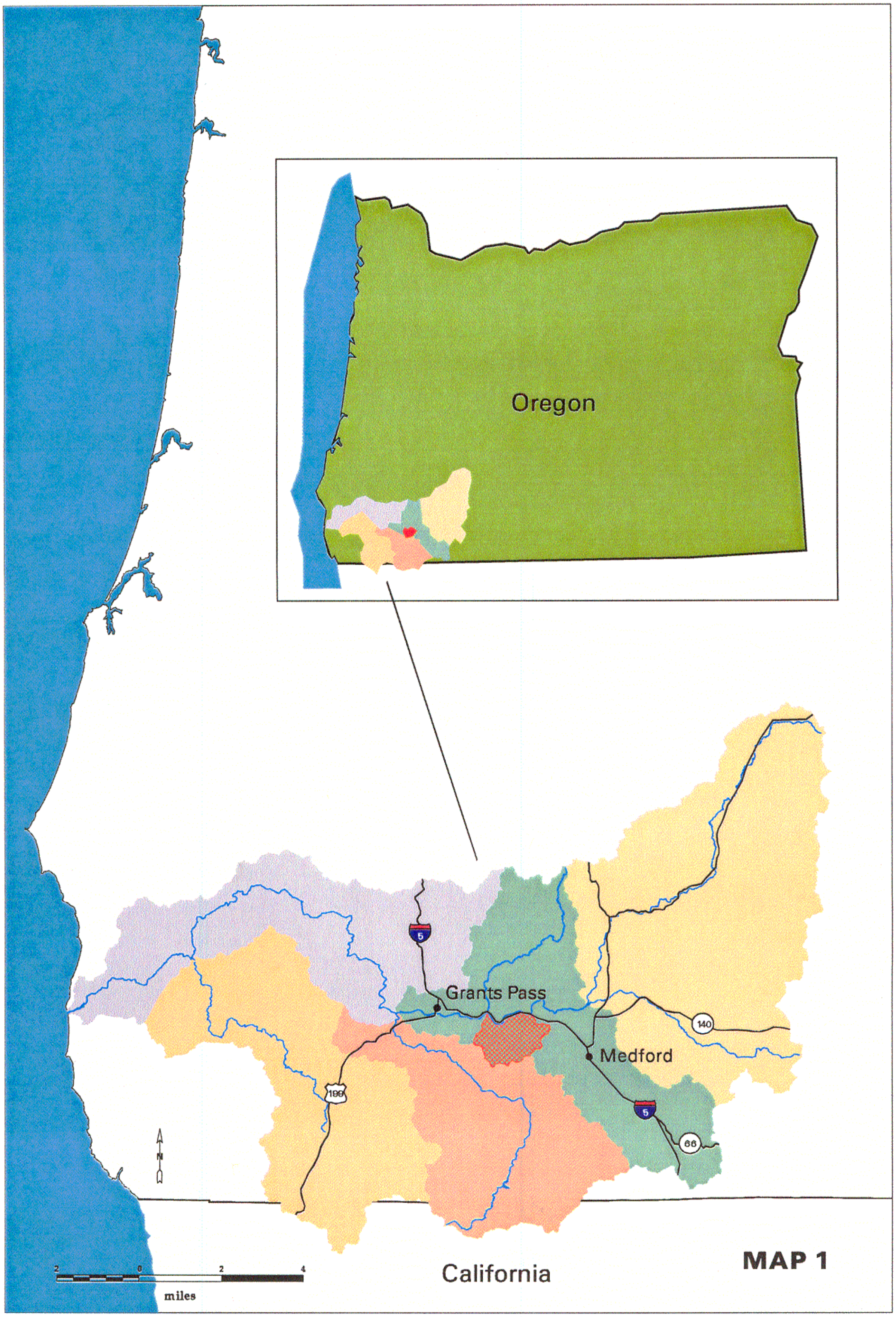
1. Determine amounts of large woody material needed in steep headwater channels.

Aquatic Wildlife Species and Habitats

1. Repeat the summer steelhead population study on the Rogue River (methodology outlined in the Everest, 1973) to compare current population with numbers found from 1968-1971.
2. Determine impact of flow alteration and withdrawals on native fish habitat and populations.

MAPS

South Rogue-Gold Hill Watershed Analysis Area
Watershed Analysis Area Location



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- Upper Rogue
- Middle Rogue
- Applegate
- Illinois
- Lower Rogue
- Pacific Ocean
- South Rogue-Gold Hill Watershed Analysis Area
- Stream
- Highway

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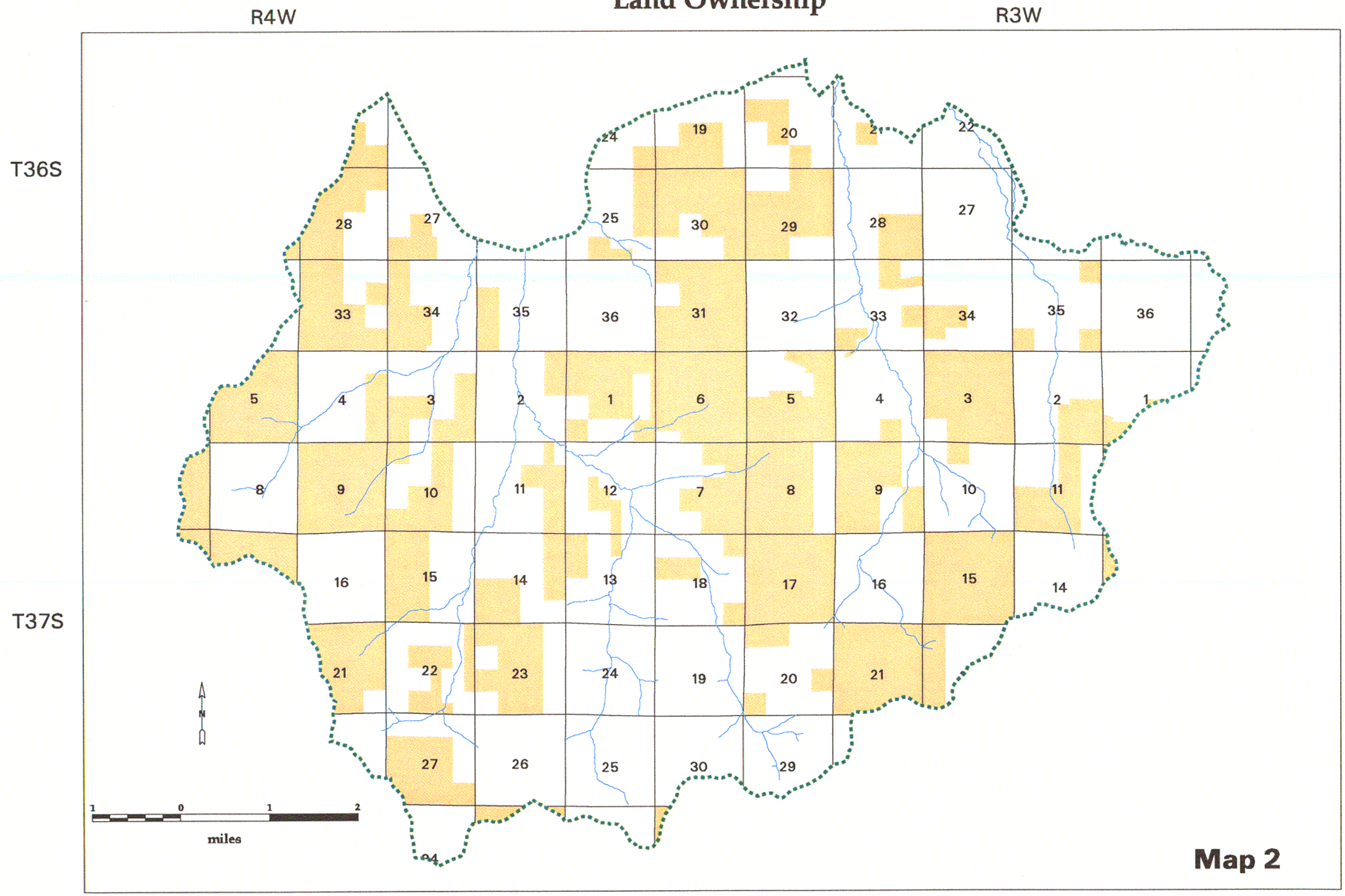
South Rogue-Gold Hill Watershed Analysis Area
Land Ownership



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BLM, Medford District
Private
Stream
South Rogue-Gold Hill Watershed Analysis Area

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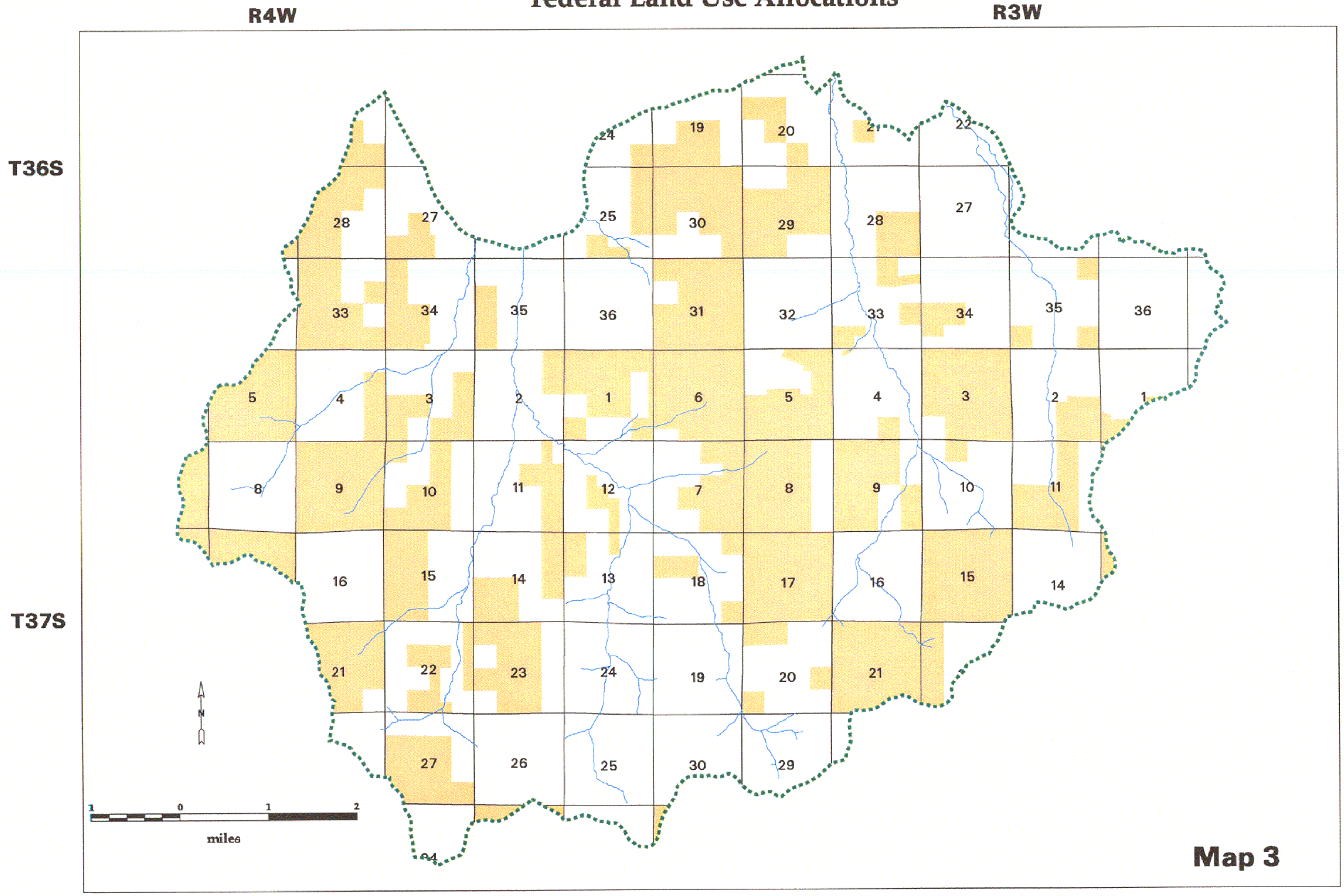
South Rogue-Gold Hill Watershed Analysis Area
Federal Land Use Allocations



Matrix
Private
Stream
South Rogue-Gold Hill Watershed Analysis Area

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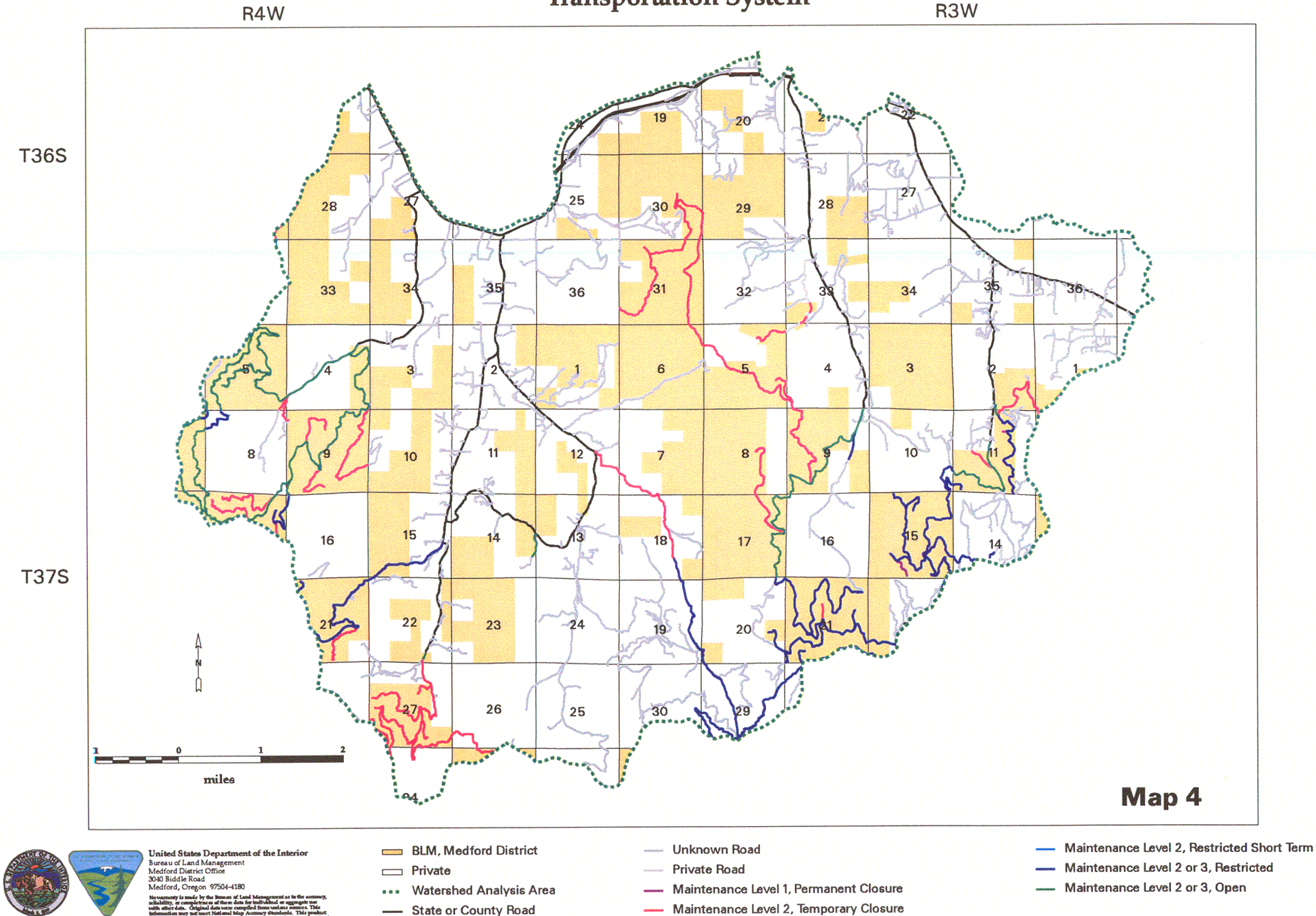
South Rogue-Gold Hill Watershed Analysis Area
Transportation System



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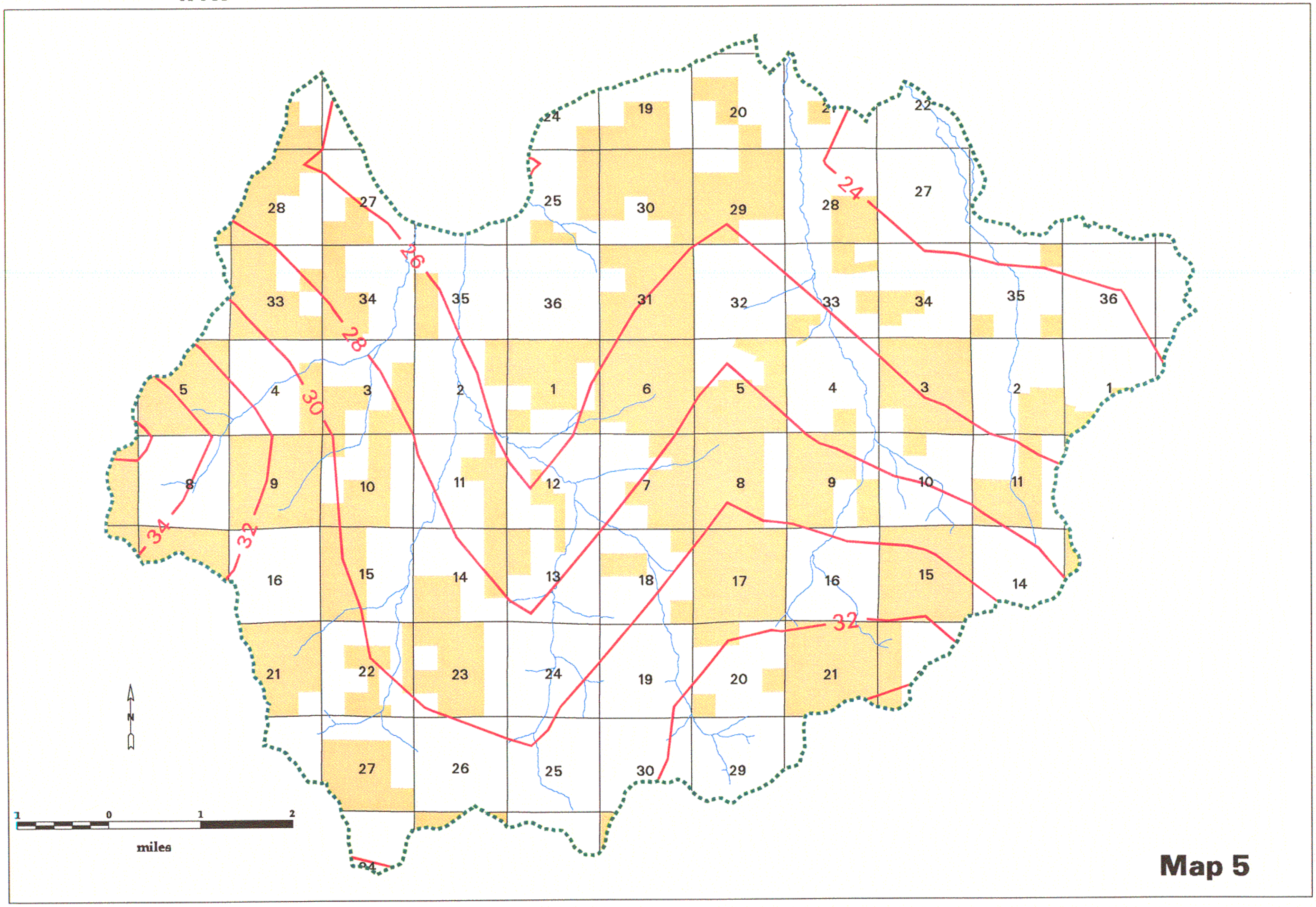
South Rogue-Gold Hill Watershed Analysis Area
Average Annual Precipitation



BLM, Medford District
Private

Stream
South Rogue-Gold Hill Watershed Analysis Area
Average Annual Precipitation Isoline (inches)
Source: Oregon Climate Services 1995

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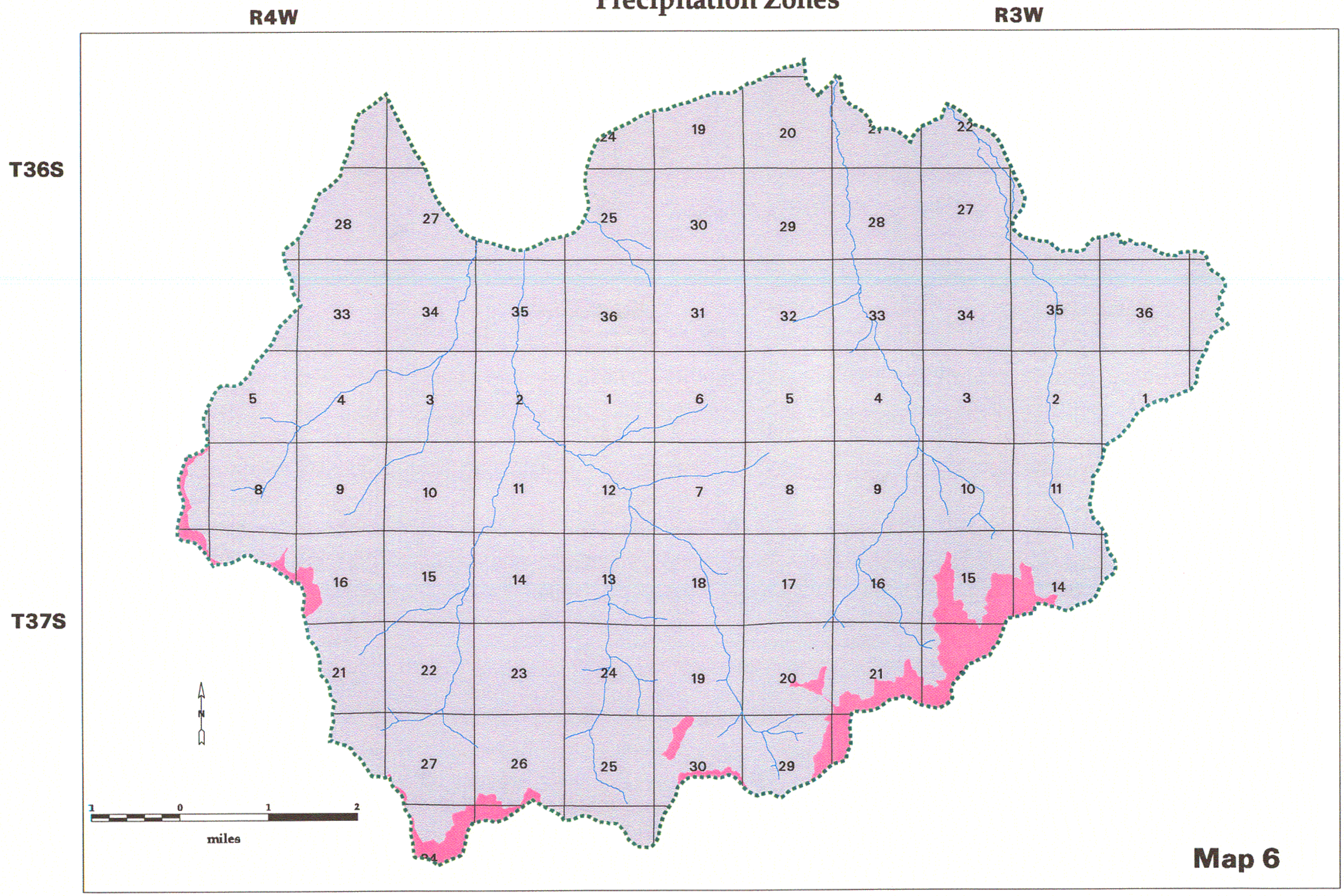
South Rogue-Gold Hill Watershed Analysis Area
Precipitation Zones



Rainfall Zone <3500 Ft
Rain-on-Snow Zone 3500-5000 Ft
Stream
South Rogue-Gold Hill Watershed Analysis Area

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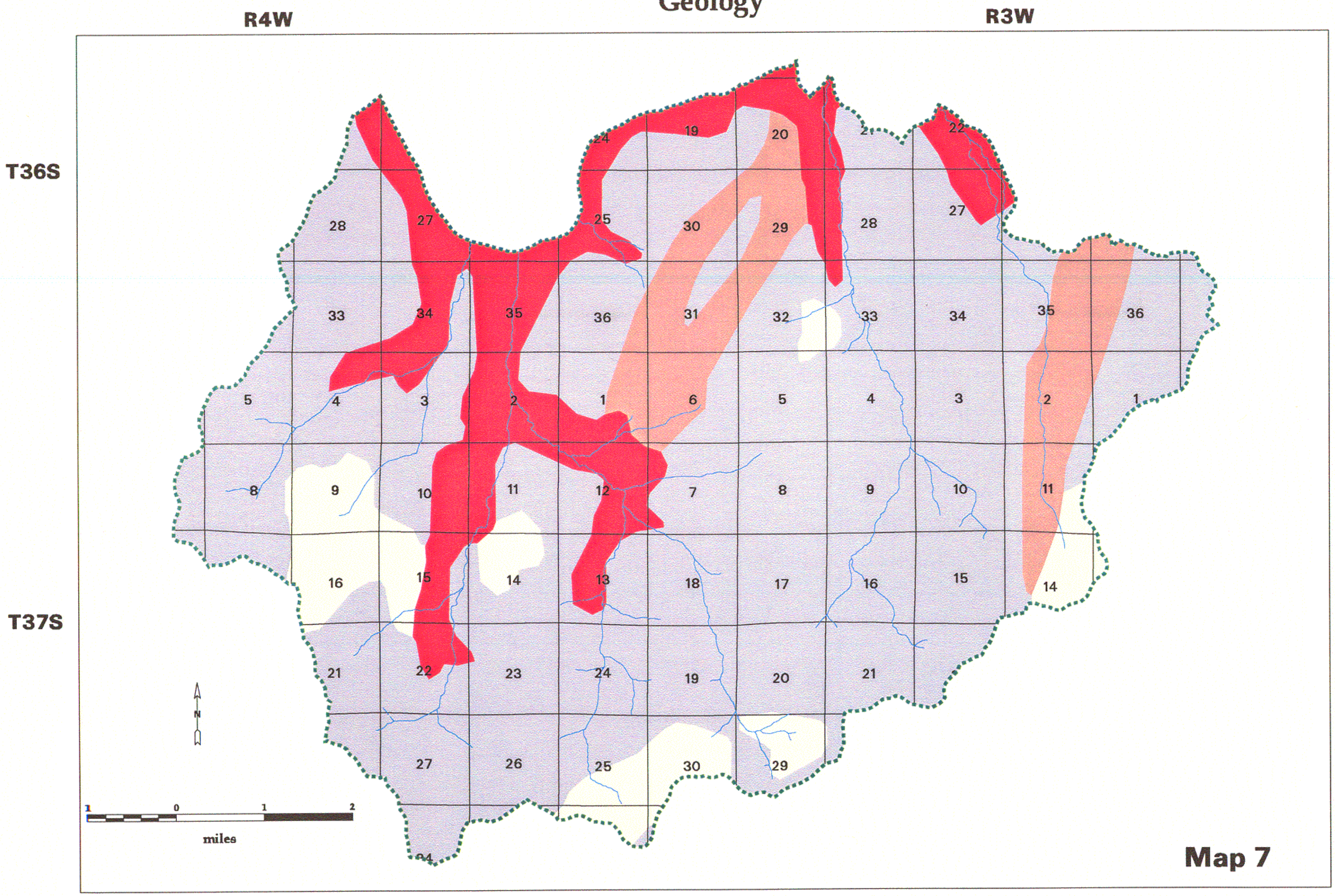
South Rogue-Gold Hill Watershed Analysis Area
Geology



KJg
Qal
TRPv
TRPzs

Stream
South Rogue-Gold Hill Watershed Analysis Area

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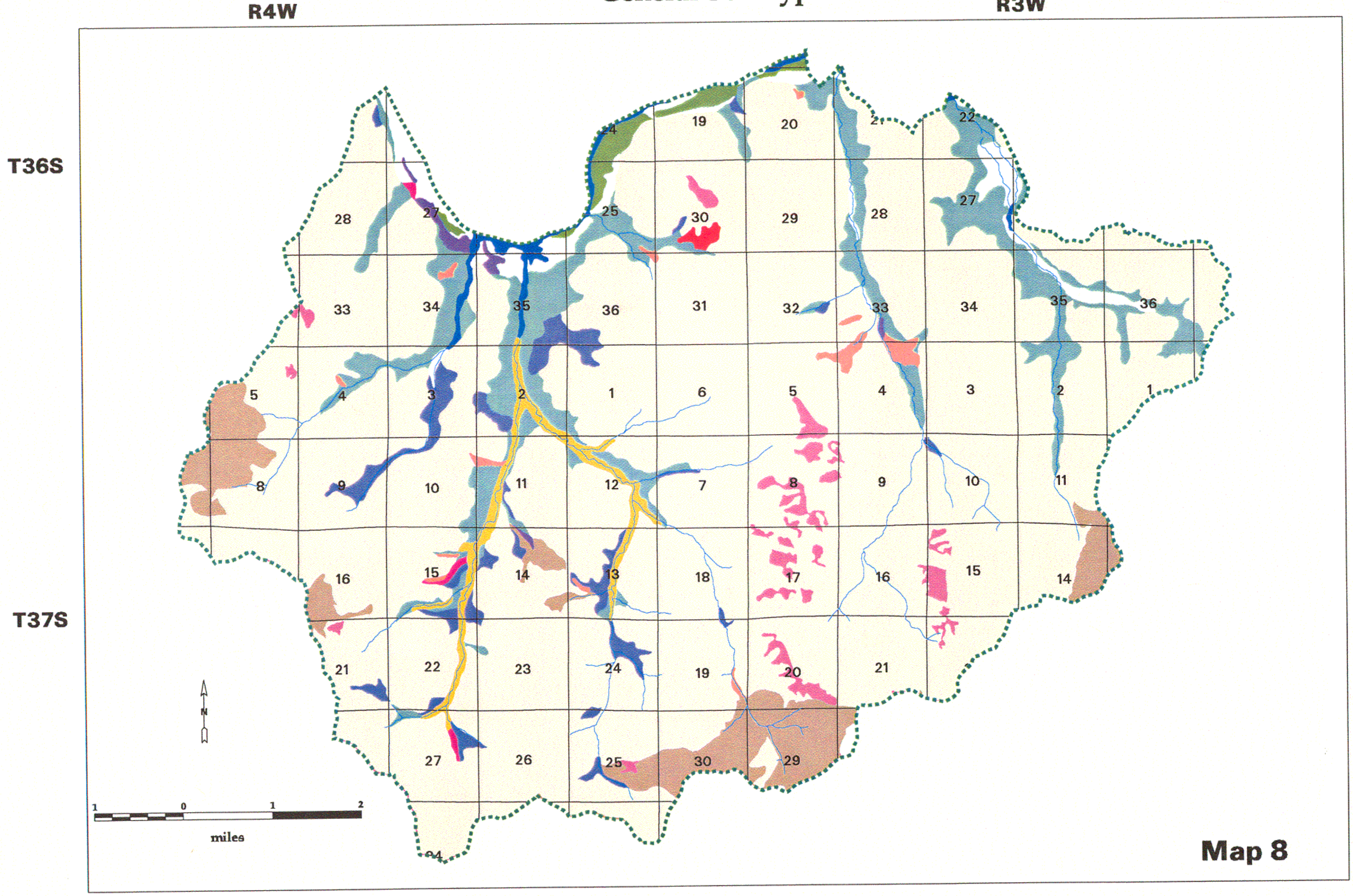
South Rogue-Gold Hill Watershed Analysis Area
General Soil Types



- Abegg Soil
- Camas Soil
- Vannoy Caris Offenbacher
- Manita Soil
- McMullin Rock Outcrop
- Medford Soil
- Gravel Pit
- Ruch Soil
- Selmac Soil
- Shefflein Tallowbox Soil
- Takilma Soil
- Dump Complex
- Stream
- Watershed Analysis Area

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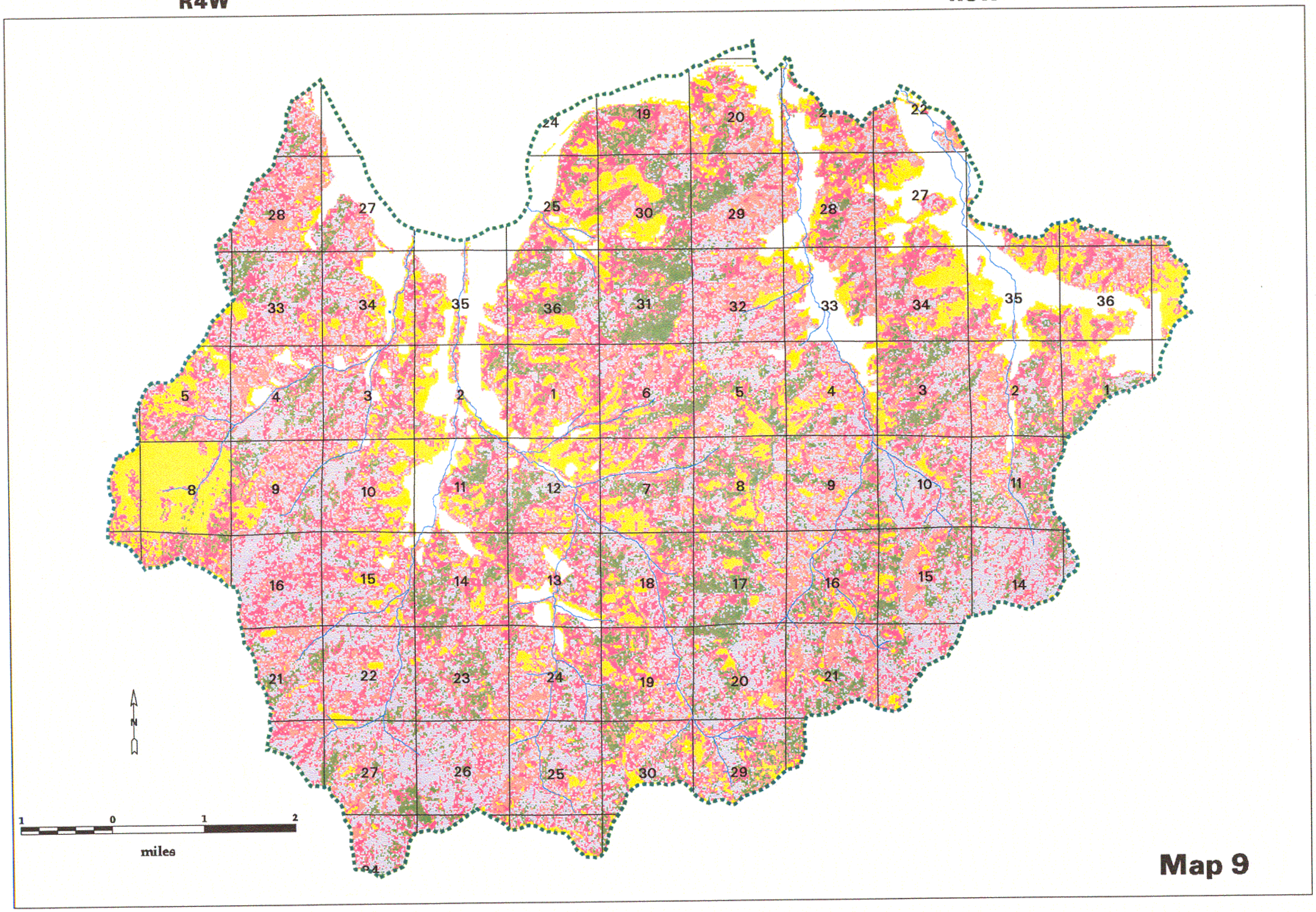
South Rogue-Gold Hill Watershed Analysis Area
Vegetation Condition Classes



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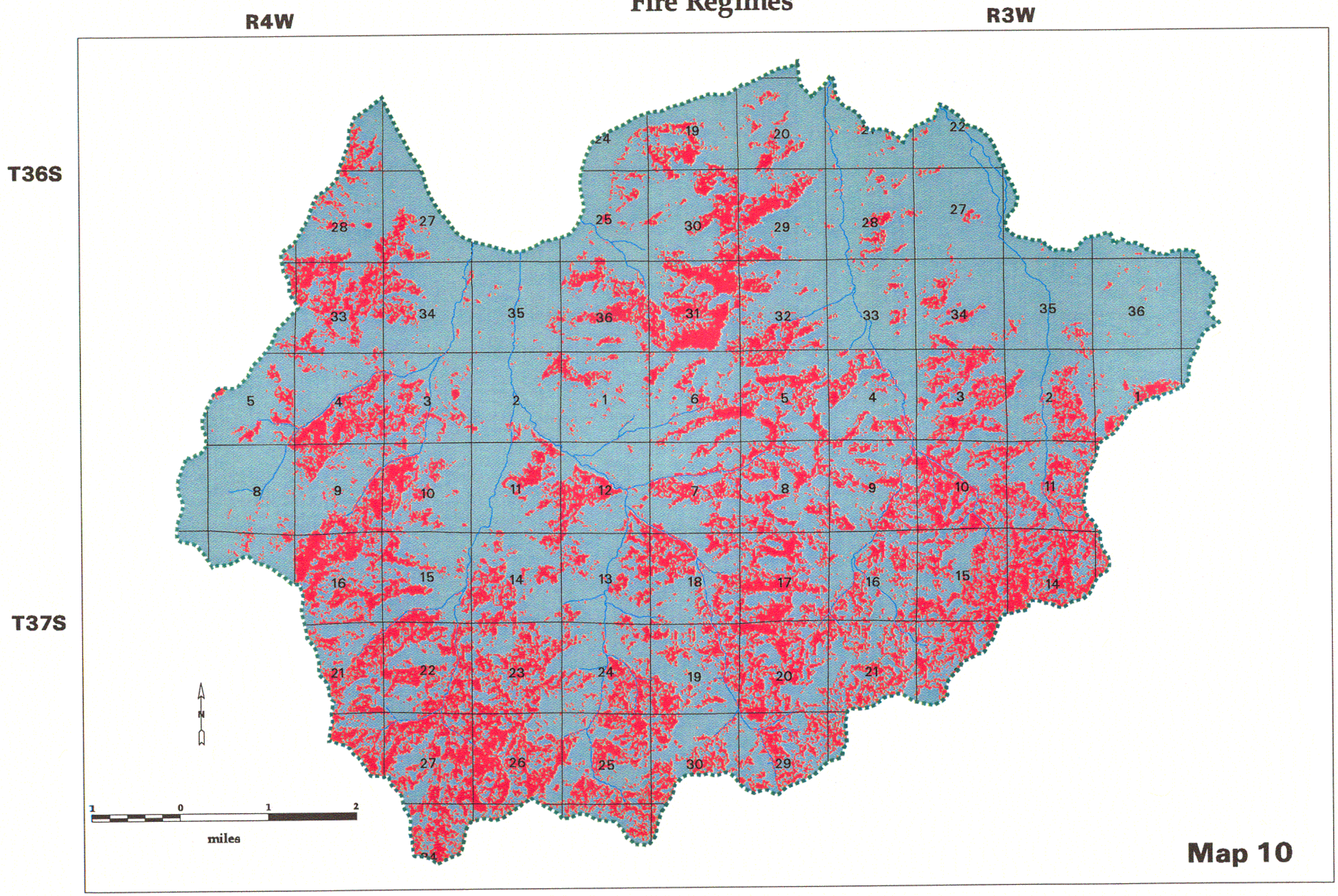
South Rogue-Gold Hill Watershed Analysis Area
Fire Regimes



Low Fire Regime
Moderate Fire Regime
Stream
South Rogue-Gold Hill Watershed Analysis Area

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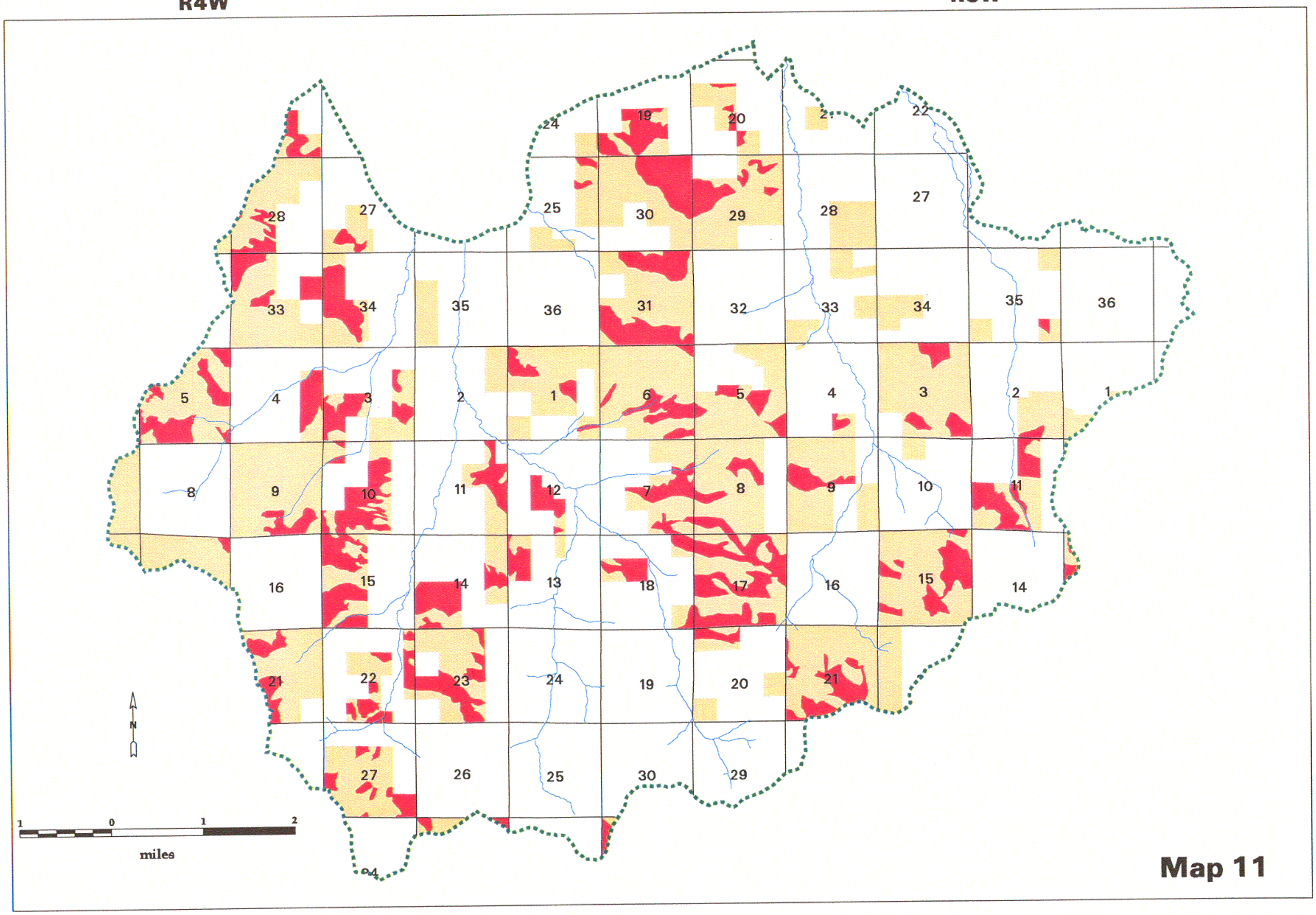
South Rogue-Gold Hill Watershed Analysis Area
Spotted Owl Suitable Habitat



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BLM, Medford District
Private
Spotted Owl Suitable Habitat
Stream
South Rogue-Gold Hill Watershed Analysis Area

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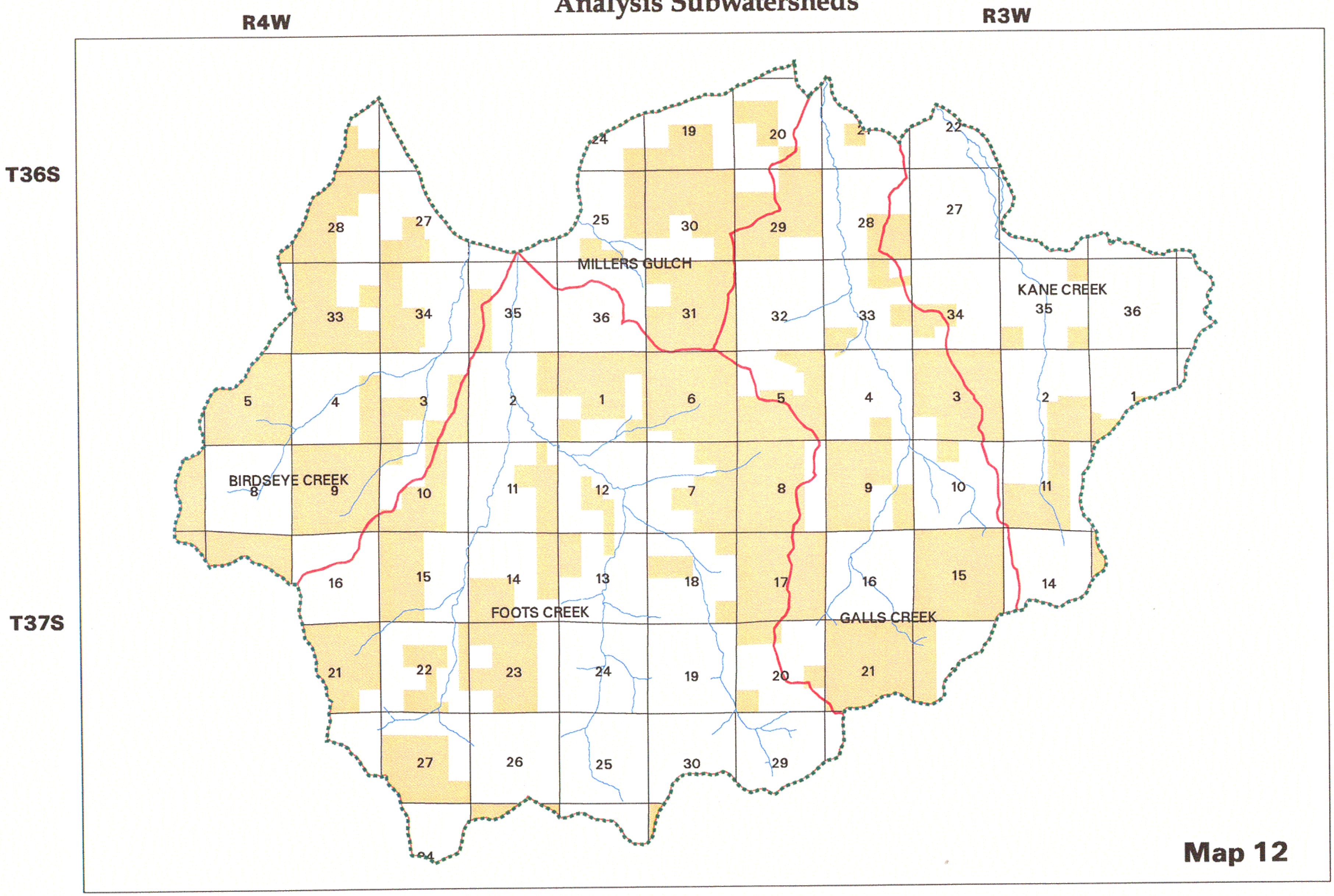
South Rogue-Gold Hill Watershed Analysis Area
Analysis Subwatersheds



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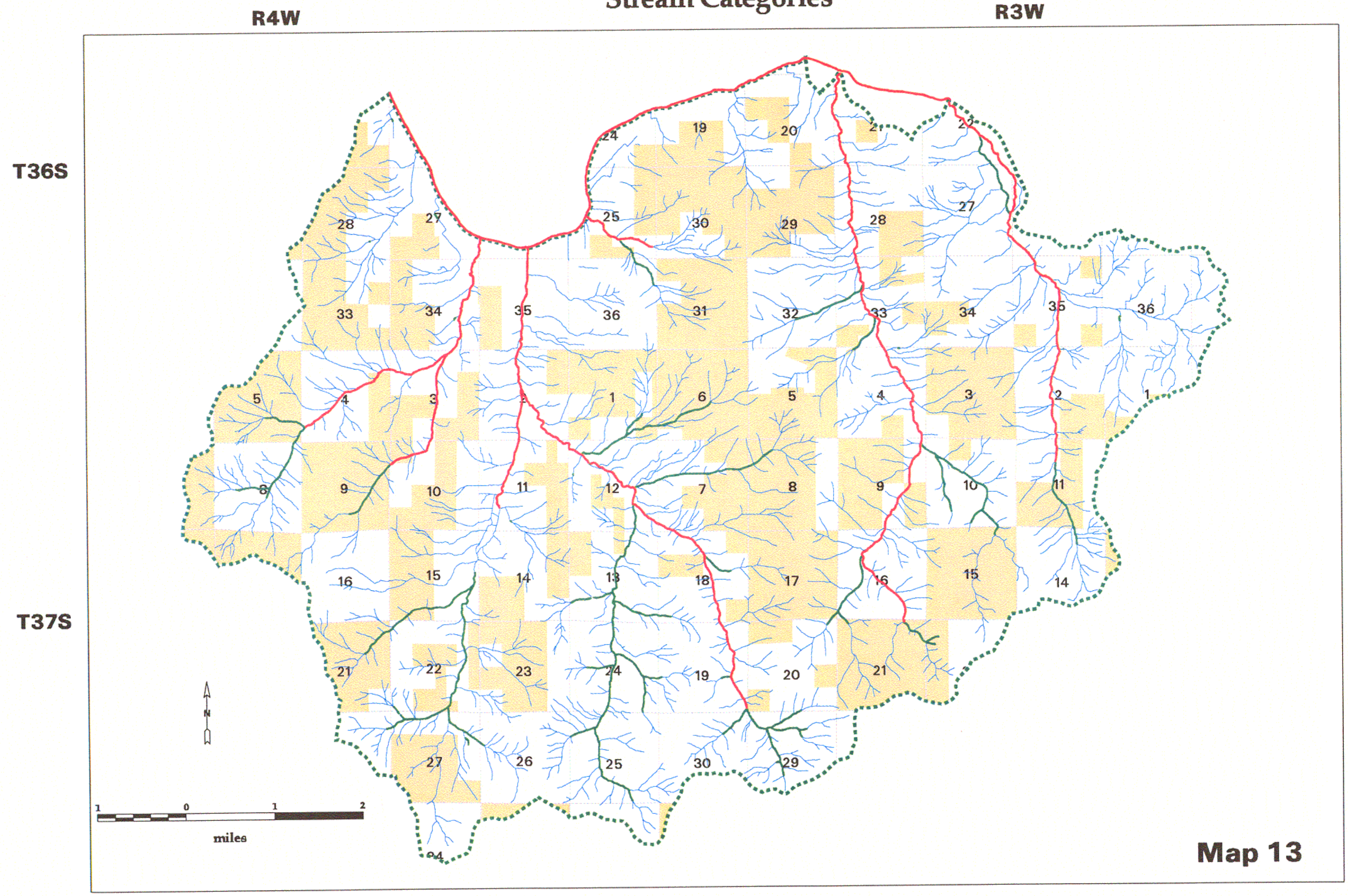
BLM, Medford District
Private
Analysis Subwatershed
South Rogue-Gold Hill Watershed Analysis Area
Stream

South Rogue-Gold Hill Watershed Analysis Area
Stream Categories



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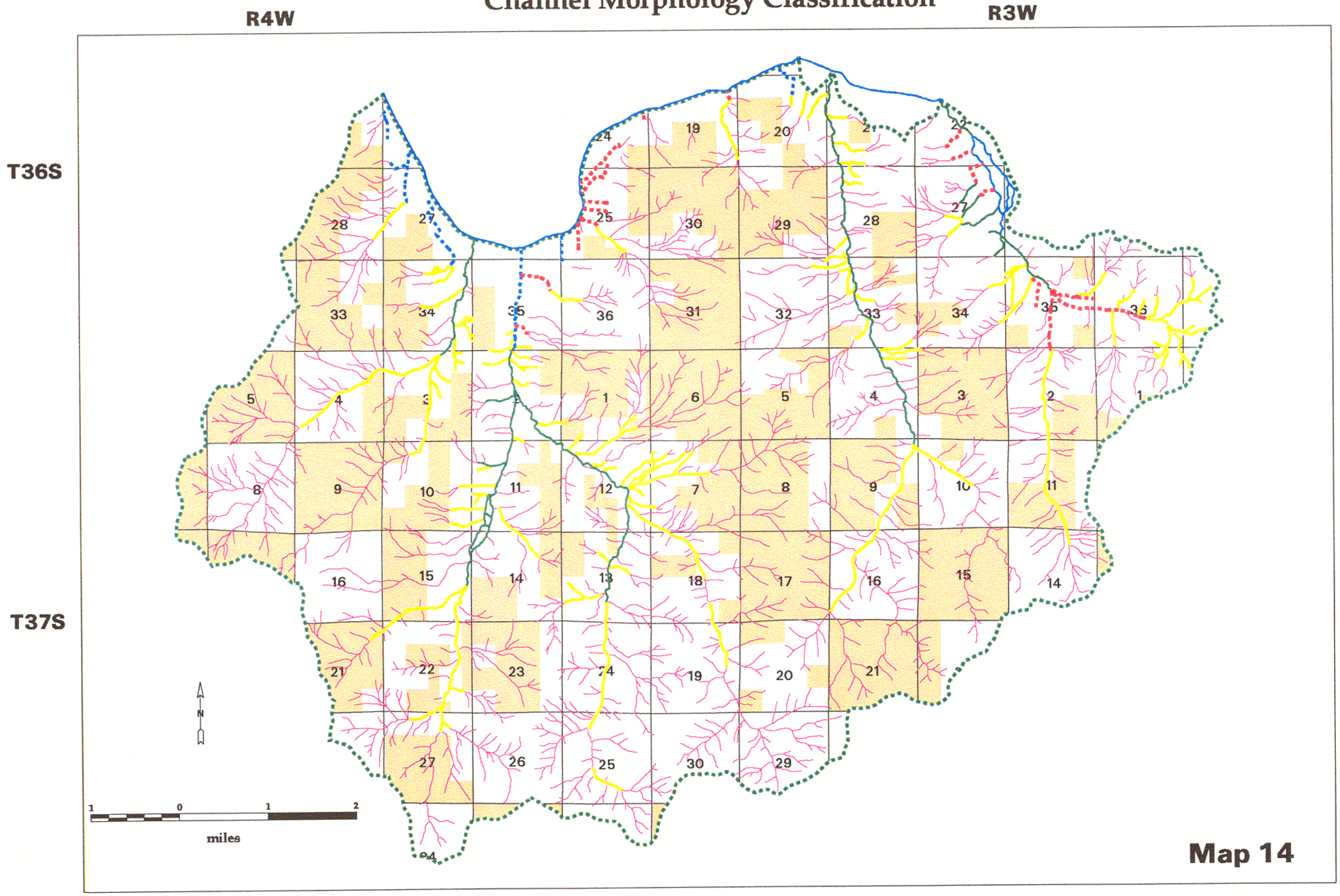
- BLM, Medford District
- Private
- South Rogue-Gold Hill Watershed Analysis Area
- Fish-Bearing Stream
- Perennial Nonfish-Bearing Stream
- Intermittent Stream

South Rogue-Gold Hill Watershed Analysis Area
Channel Morphology Classification



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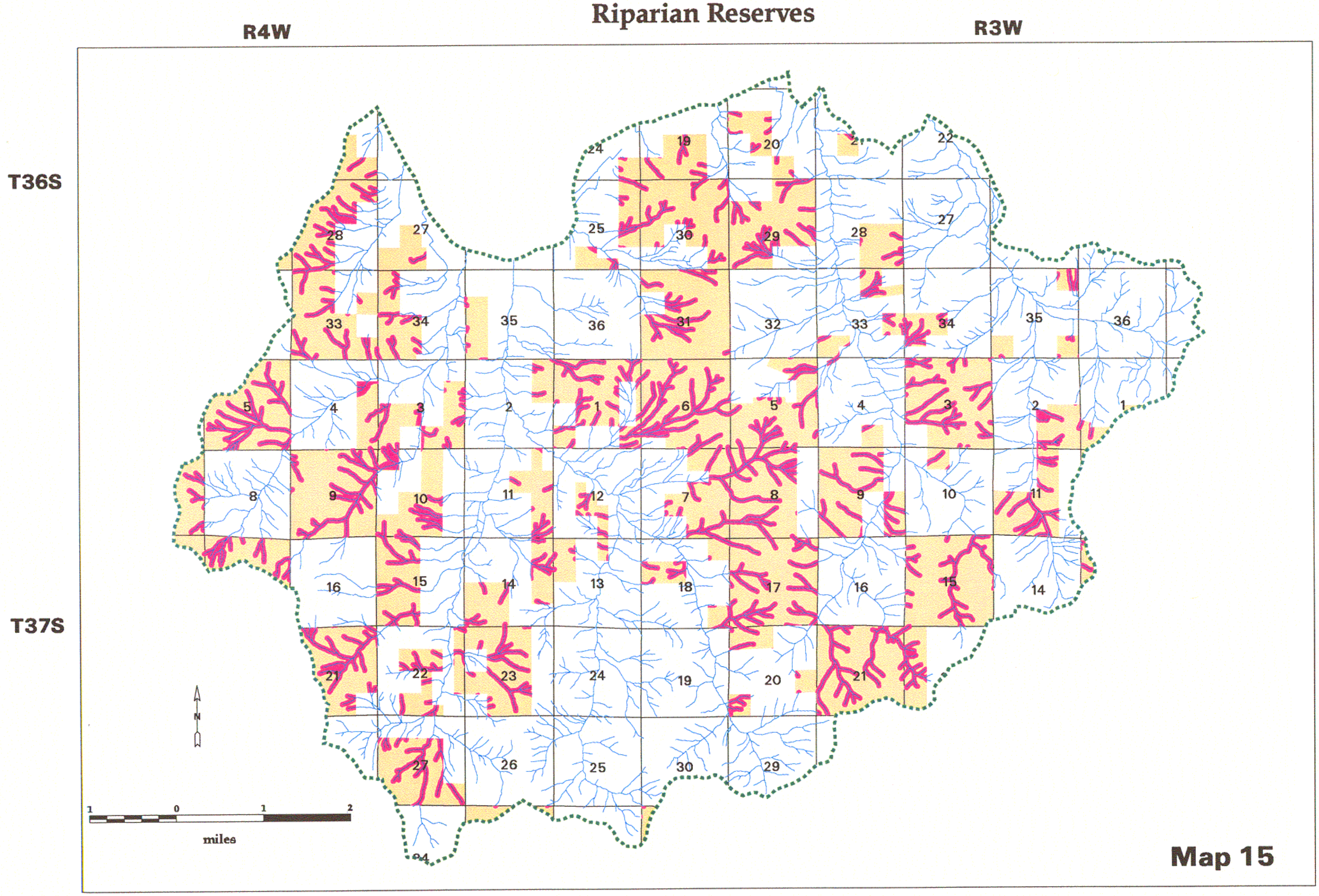
- BLM, Medford District
- Private
- South Rogue-Gold Hill Watershed Analysis Area

Stream Channel Types (Rosgen 1996)

- Aa+
- A
- B
- C
- F
- G

South Rogue-Gold Hill Watershed Analysis Area
Riparian Reserves



BLM, Medford District
Private
Riparian Reserve
Stream
South Rogue-Gold Hill Watershed Analysis Area

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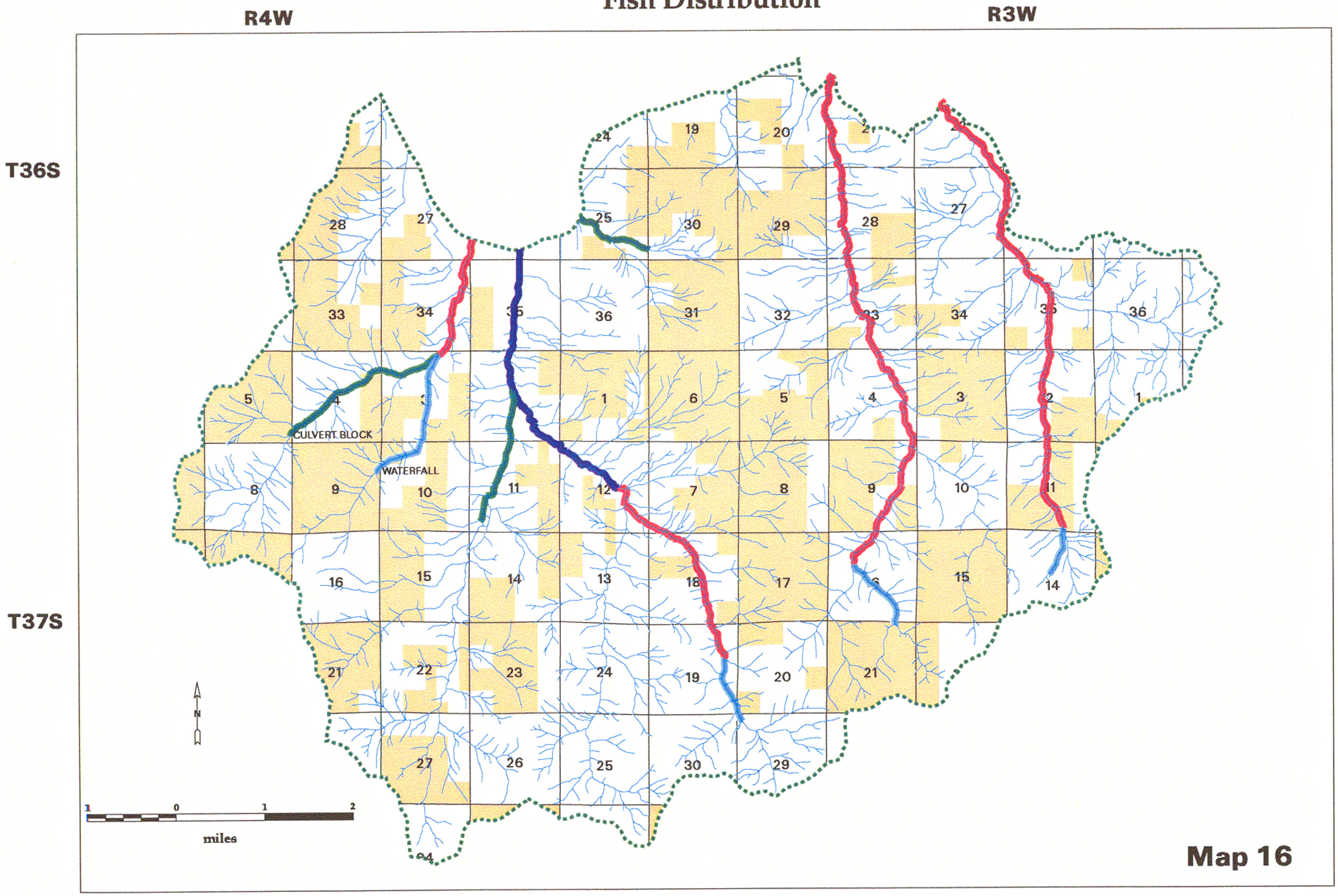
South Rogue-Gold Hill Watershed
Fish Distribution



BLM, Medford District
Private
South Rogue-Gold Hill Watershed Analysis Area
Stream

Coho Salmon, Steelhead, and Cutthroat Trout Stream
Steelhead and Cutthroat Trout Stream
Steelhead Stream
Cutthroat Stream

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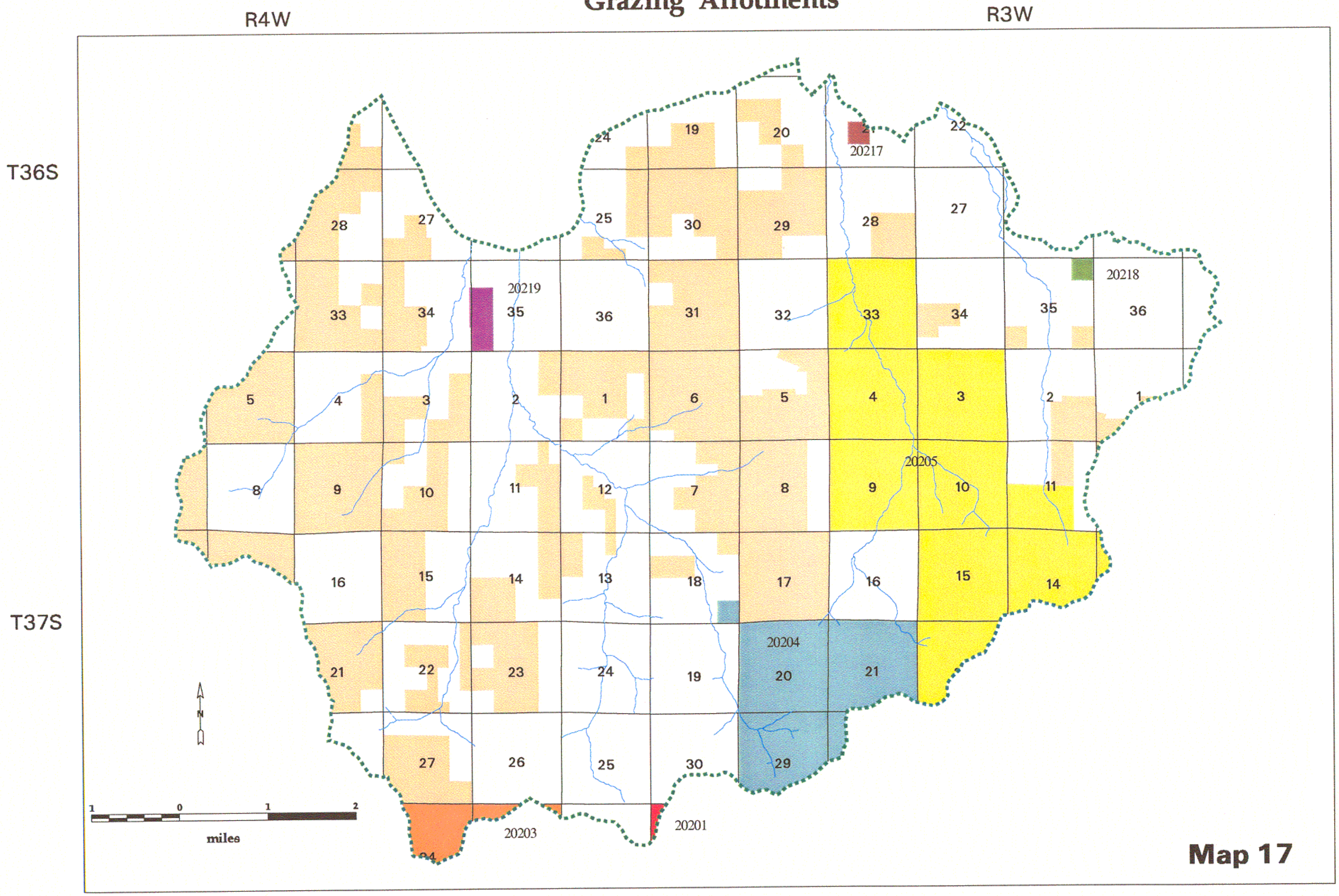
South Rogue-Gold Hill Watershed Analysis Area
Grazing Allotments



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- Private
- Stream
- South Rogue-Gold Hill Watershed Analysis Area

- 20201 Applegate Allotment
- 20203 Billy Mountain Allotment
- 20204 Timber Mountain Allotment
- 20205 Sardine & Galls Creek Allotment
- 20217 Ecker Allotment
- 20218 Stage Road Allotment
- 20219 Foots Creek Allotment

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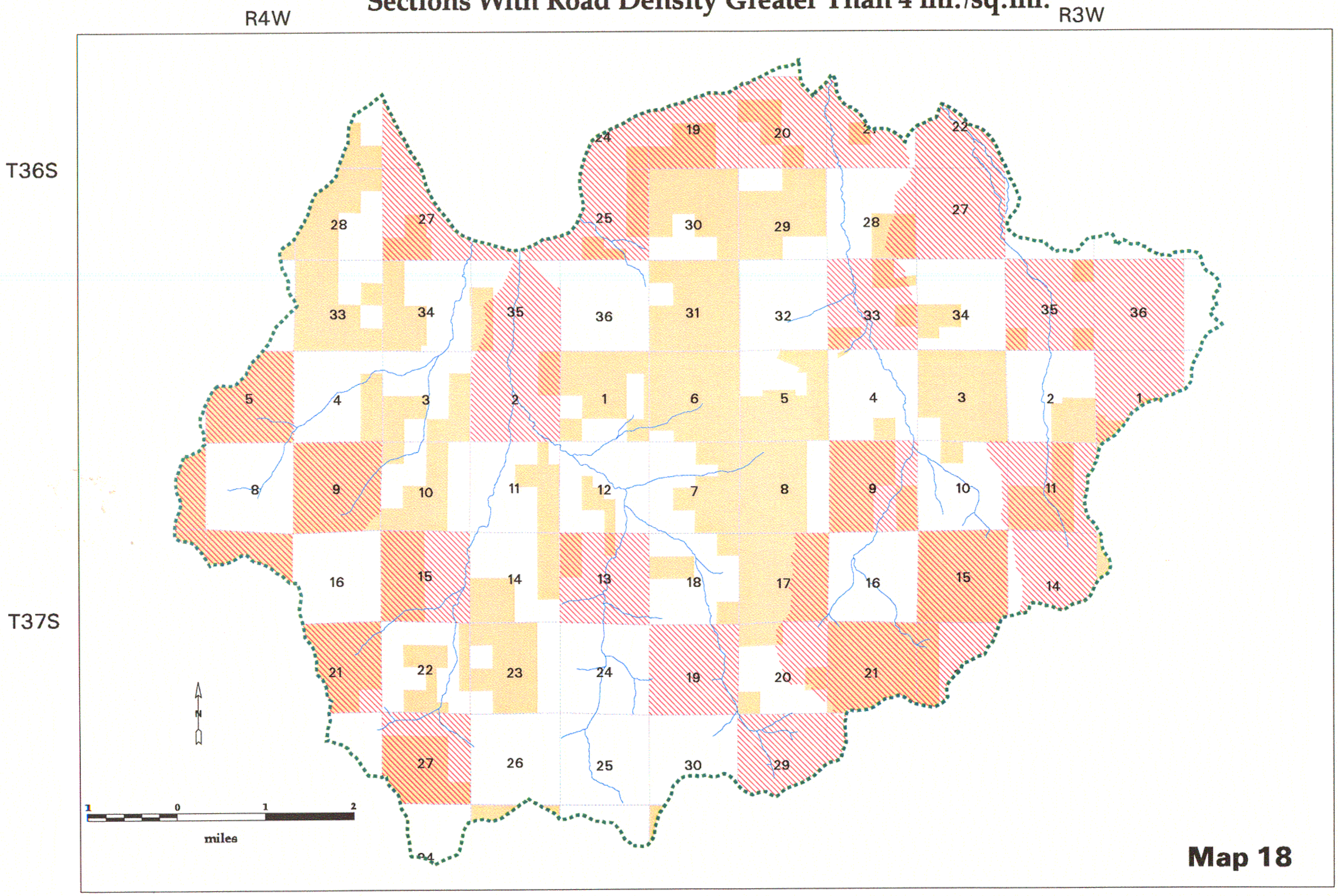
South Rogue-Gold Hill Watershed Analysis Area
Sections With Road Density Greater Than 4 mi./sq.mi.



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Private
ROAD DENSITY 4+ MI/SQ MI
Stream
South Rogue-Gold Hill Watershed Analysis Area

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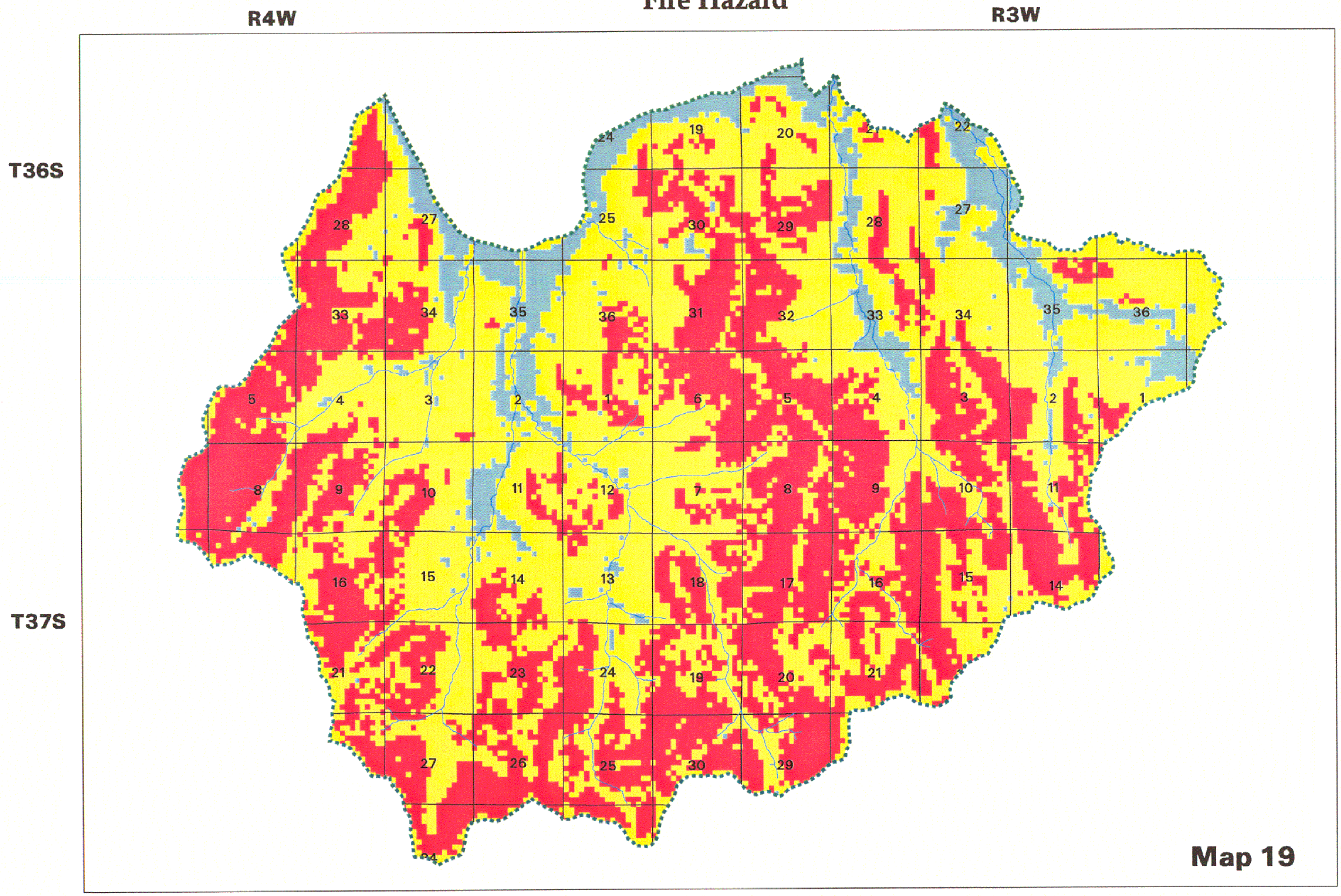
South Rogue-Gold Hill Watershed Analysis Area
Fire Hazard



Low Hazard Rating
Moderate Hazard Rating
High Hazard Rating
Stream
South Rogue-Gold Hill Watershed Analysis Area

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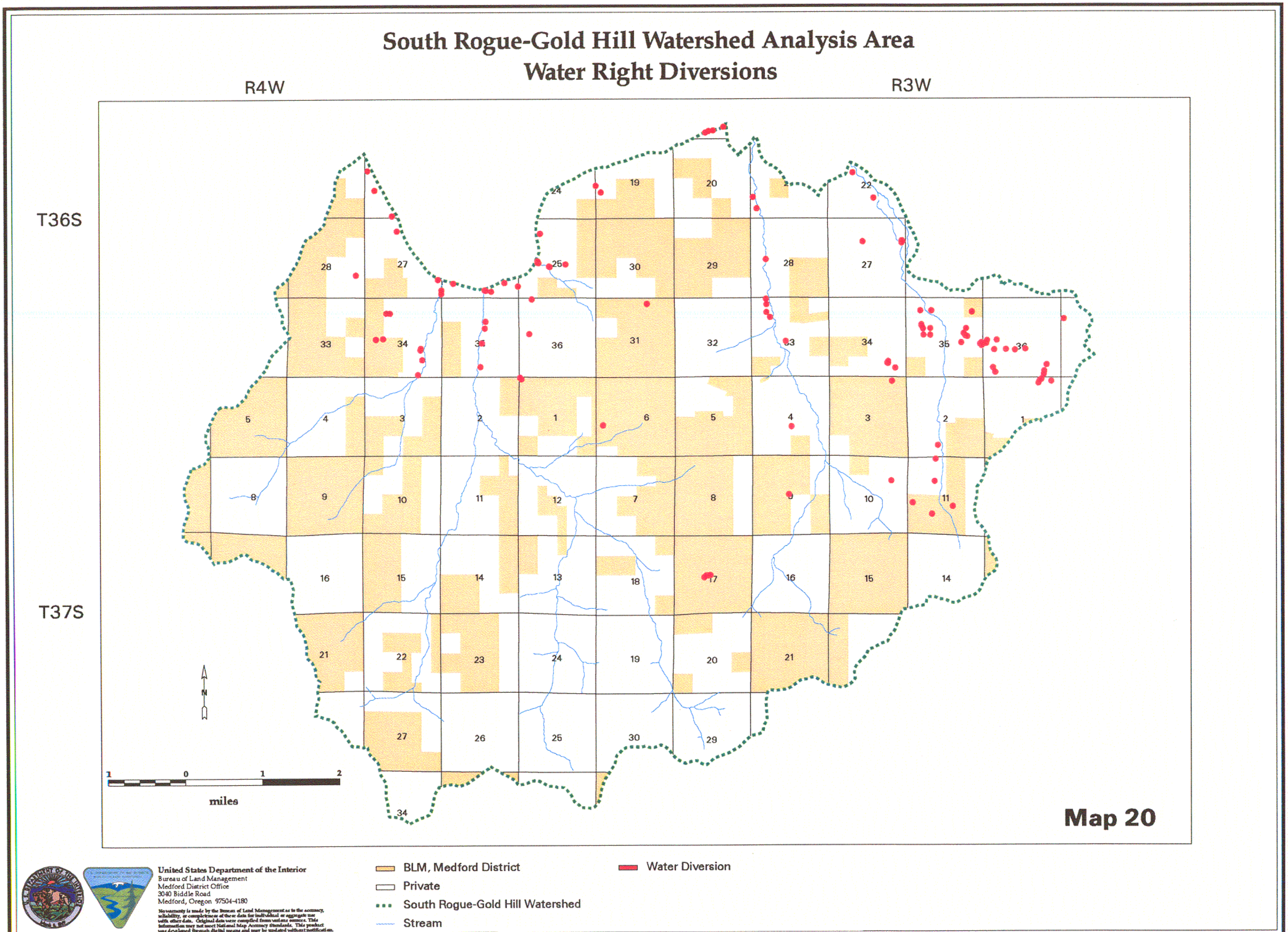
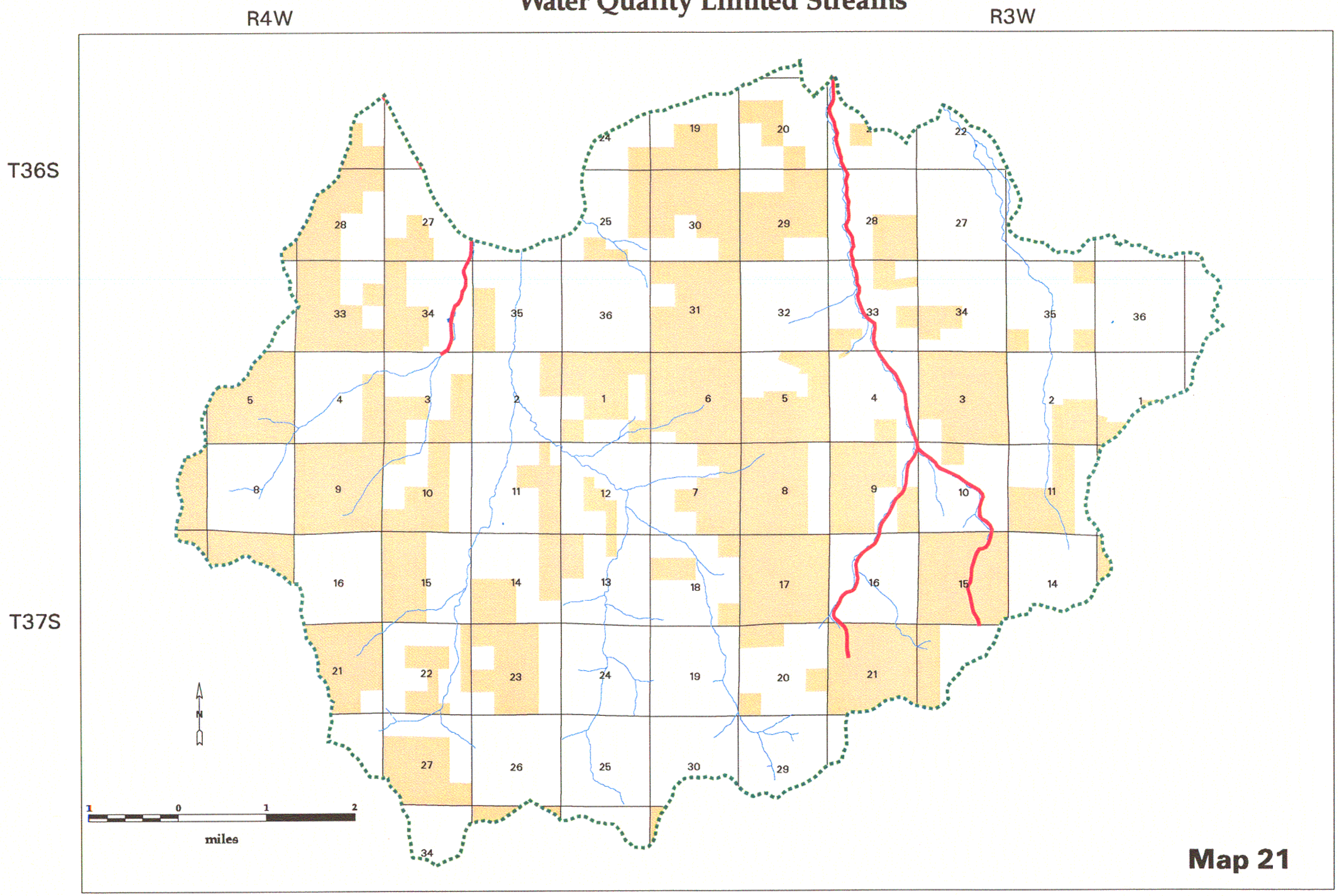
South Rogue-Gold Hill Watershed Analysis Area
Water Right Diversions



South Rogue-Gold Hill Watershed Analysis Area
Water Quality Limited Streams



BLM, Medford District
Private
Rogue-Gold Hill Watershed Analysis Area
Stream
Water Quality Limited Stream (Temperature)
Source: Oregon Department of Environmental Quality

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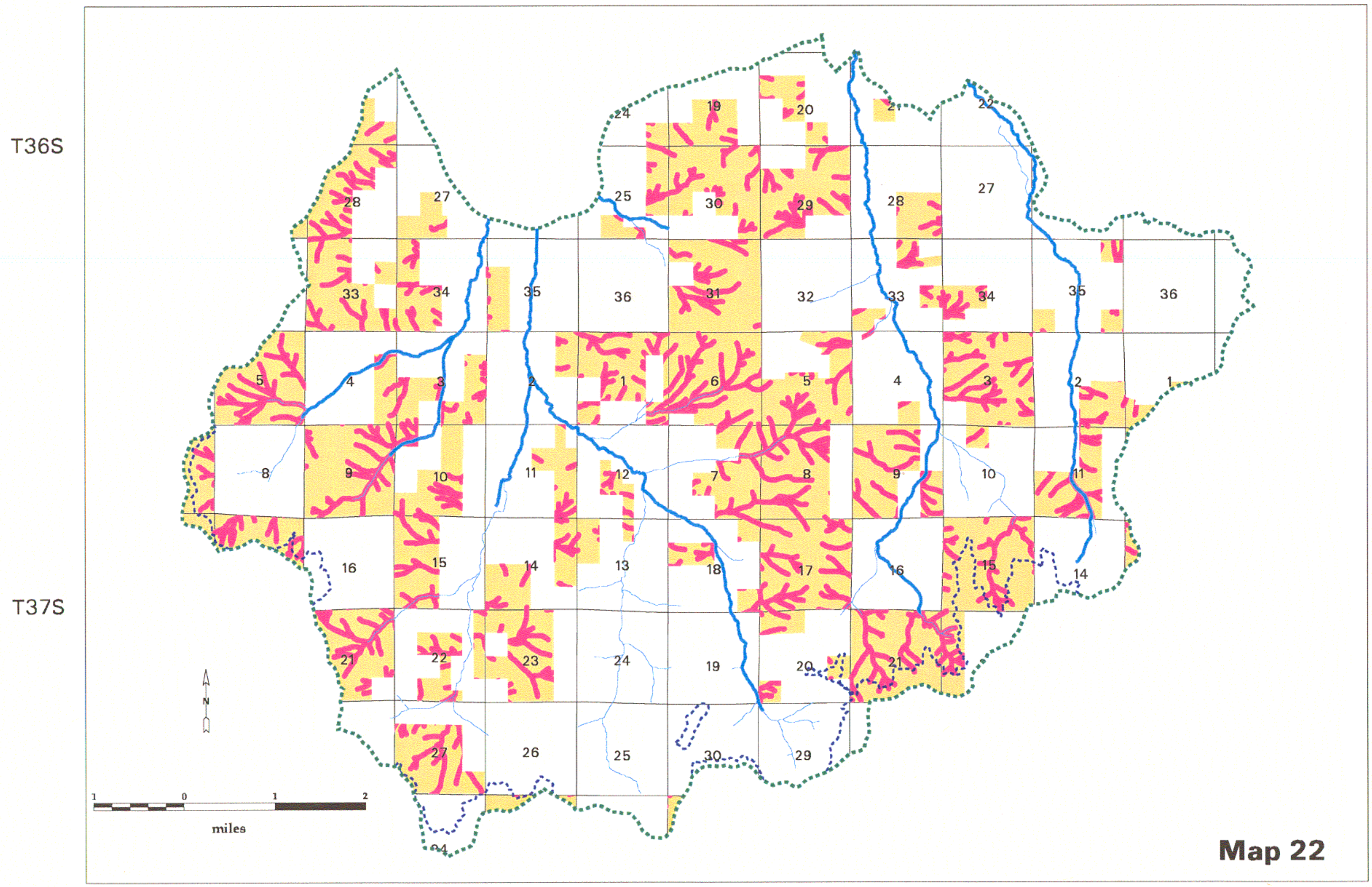
South Rogue-Gold Hill Watershed Analysis Area
Landscape Planning



Matrix
Private
Riparian Reserve
Transient Snow Zone
Stream
Fish Stream
South Rogue-Gold Hill Watershed Analysis Area

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Joe Hoppe	Facilities, Lands, and Minerals
Greg Chandler	Fire and Air Quality
Mark Prchal	Geology, Erosion Processes, and Soil Productivity
Tim Westfall	Grazing
Scott Haupt	Landscape Vegetation Pattern and Forest Density
Brad Tong	Plants and Special Areas, Non-native Plants, and Noxious Weeds
Fred Tomlins	Recreation
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Support Team Members	
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Ken Brown	Logging Information

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APPENDICES

APPENDIX A
Public Comments

Summary of Public Comments

Approximately 400 fliers were sent to residents and interested parties in the West Bear Creek and South Rogue-Gold Hill Watershed Analysis Areas announcing dates and places for open house meetings. The fliers also invited the recipients to send written comments to the BLM concerning issues and management direction.

The open house meeting for the South Rogue-Gold Hill Watershed Analysis was held at Patrick Elementary School in Gold Hill on March 13, 2001. Twelve individuals registered at the meeting, although approximately the same number of people attended without registering. BLM employees were also available to receive comments and answer questions about the South Rogue-Gold Hill Watershed Analysis at the West Bear Creek Watershed Analysis open house at the Naval Reserve Center. BLM staff members recorded comments at both meetings, but attendees were encouraged to send written comments to BLM if additional issues and concerns came to mind.

Comments specific to the South Rogue-Gold Hill analysis area at the open houses concerned public access to BLM lands for mushroom picking and hiking, the Bristol-Silica mine, BLM plans for roads (whether the roads would be left open or closed), rare plants, general history of the area, and questions related to the watershed analysis process.

In addition to comments received at the open house, BLM received 16 letters with comments concerning the South Rogue-Gold Hill Watershed Analysis Area. Most of the comments discussed roads and off-highway vehicle (OHV) use. Fourteen letters favored keeping roads and trails open to OHV use or even the development of new trails for this form of recreation. Among these comments, there was a high level of encouragement for BLM to cooperate with user groups to maintain and improve the existing trails and designate new trails. Two respondents requested that the BLM only close roads and trails after consulting with the user groups and/or exploring cooperative mitigation efforts. Trail designation and signing was also requested. One respondent referred to only being able to access the area by OHV due to a physical handicap.

Other recreation uses referred to were snow sledding, remote control gliders, hunting, and remote control trucks.

Written comments were received about fish use and habitat in Foots Creek, public property access, current and historic mining use, firewood availability, small salvage sales, forest health, and prescribed fire.

The BLM appreciates those who took the time to write or to attend the open houses. Public comments were shared with the team members who developed this document and were taken into consideration during the analysis period.

APPENDIX B
Description of Symbols Used on Geology Map (Map 7)

Map Symbol	Description of Map Units
KJg	Granitic rocks (Cretaceous and Jurassic) -- Mostly tonalite and quartz diorite but lesser amounts of other granitoid rocks.
Kc	Clastic sedimentary rocks (Cretaceous) -- Locally fossiliferous sandstone and conglomerate; marine fossils indicate early cretaceous age.
Qal	Alluvial deposits (Holocene) - Sand, gravel, silt and thin peat beds forming flood plains and filling channels of present streams.
Qf	Alluvial fan deposits (Holocene and Pleistocene) - Sand, gravel and silt in individual and coalescing fan-shaped deposits along valley margins. Typically occur where stream gradient decreases abruptly.
Qt	Terrace, pediment and lag gravels (Holocene and Pleistocene) – Unconsolidated deposits of gravels, cobbles and boulders intermixed and locally interlayered with clay, silt and sand. Mostly on terraces above present flood plains
Tn	Nonmarine sedimentary rocks (Eocene) -- Continentally derived conglomerate, pebble conglomerate, sandstone, siltstone, and mudstone containing abundant biotite and muscovite. Dominantly non-volcanic; clastic material derived from underlying older rocks.
TrPv	Volcanic rock, partly metamorphosed (Triassic and Permian) – Includes porphyritic andesite flows containing hornblende, pyroxene and plagioclase; breccia, agglomerate, tuff, and locally, some basalt flows and dacitic tuffs.
TrPzs	Sedimentary rock, partly metamorphosed (Triassic and Paleozoic) – Includes shale, mudstone, volcanoclastic sandstone, greywacke, conglomerate, tuff, and minor radiolarian chert and marble.

APPENDIX C
General Soils Map Interpretations

Soils formed in material weathered from sedimentary and igneous rock and mixed alluvium on fan terraces, ridges, knolls, hillslopes and alluvial fans.

Brader-Debenger-Langellain

Shallow and moderately deep, well drained and moderately well drained soils that have a surface layer of loam; on ridges and knolls

The native vegetation on this map unit is mainly hardwoods and some conifers and an understory of grasses, shrubs, and forbs. Slopes generally are 1 to 40 percent. Elevation is 1,000 to 3,500 feet. The mean annual precipitation is about 18 to 40 inches, the mean annual temperature is 48 to 54 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 35 percent Brader soils, 20 percent Debenger soils, and 15 percent Langellain soils. The remaining 30 percent is Shefflein soils on alluvial fans; Kerby, Medford, and Gregory soils on stream terraces; Carney, Selmac, and Coker soils on concave slopes.

Brader and Debenger soils formed in colluvium derived from sedimentary rock. Brader soils are shallow and well drained. The surface layer and subsoil are loam. Debenger soils are moderately deep and well drained. The surface layer is loam. The subsoil is clay loam. Langellain soils are moderately deep and moderately well drained. The surface layer is loam. The subsoil is clay. This unit is used mainly for hay and pasture or for livestock grazing. A few areas are used for home site development or wildlife habitat.

The main limitations in the areas used for hay and pasture or for livestock grazing are wetness in winter and spring, the depth to bedrock, restricted permeability, droughtiness, and compaction. The slope also is a major limitation in some areas. The Langellain soils remain wet for long periods in spring. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock. In summer, irrigation is needed for maximum forage production. Because of the layer of clay in the Langellain soils and the depth to bedrock in the Brader soils, over-irrigation can result in a perched water table.

Carney-Coker

Moderately deep and very deep, moderately well drained and somewhat poorly drained soils that have a surface layer of clay or cobbly clay, - on alluvial fans and hillslopes

The native vegetation on the Carney soils in this map unit is mainly scattered hardwoods and an understory of grasses, shrubs, and forbs. That on the Coker soils is mainly grasses, sedges, and forbs. Slopes generally are 0 to 35 percent. Elevation is 1,200 to 4,000 feet. The mean annual precipitation is about 18 to 35 inches, the mean annual temperature is 45 to 54 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 55 percent Carney soils and 10 percent Coker soils. The remaining 35 percent is Brader and Debenger soils on knolls; Heppsie and McMullin soils on hillslopes; Padigan and Phoenix soils on concave slopes; Cove soils in drainageways; and Darow, Medco, and Tablerock soils.

Carney soils formed in alluvium and colluvium derived from igneous rock. Coker soils formed in clayey alluvium derived from igneous rock. Carney soils are moderately deep and moderately well drained. The surface layer is clay or cobbly clay. The subsoil is clay. Coker soils are very deep and somewhat poorly drained. The surface layer and subsoil are clay.

This unit is used mainly for tree fruit, hay and pasture, homesite development, livestock grazing, or wildlife habitat. The main limitations in the areas used for hay and pasture or for tree fruit are the high content of clay, a slow rate of water intake, wetness in winter and spring, droughtiness in summer and fall, and the slope. The Coker soils remain wet for long periods in spring. Grazing should be delayed until the soils are firm enough to withstand trampling by livestock. In summer, irrigation is needed for the maximum production of forage crops and tree fruit. Because of very slow permeability, water applications should be regulated so that the water does not stand on the surface and damage the crops. Because of the slope in some areas, sprinkler and trickle irrigation systems are the best methods of applying water. The high content of clay severely limits tillage. The soils are well suited to permanent pasture. The more sloping areas of this unit are used for livestock grazing. The main limitations affecting livestock grazing are compaction, erosion, droughtiness, and the slope.

Soils formed in material weathered from Granodiorite on alluvial fans, ridges, and hillslopes.

<u>TaBowbox-Shefflein</u>

Moderately deep and deep, somewhat excessively drained and well drained soils that have a surface layer of gravelly sandy loam or loam and receive 25 to 40 inches of annual precipitation

This . map unit is on hillslopes, ridges, and alluvial fans. Th . e native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 2 to 70 percent. Elevation 1,000 to 4,000 feet. The mean annual precipitation about 25 to 40 inches, the mean annual temperature 46 to 54 degrees F, and the average frost-free period 100 to 160 days.

This unit is about 55 percent Tallowbox soils and 30 percent Shefflein soils. The remaining 15 percent is Barron soils on alluvial fans, Clawson soil on concave slopes, and Rogue soils at elevations of more than 4,000 feet. Tallowbox soils are moderately deep and some excessively drained. The surface layer and subsoil gravelly sandy loam. Shefflein soils are deep and well drained. The surface layer is loam. The subsoil is clay loam and sandy clay loam.

This unit is used mainly for timber production or wildlife habitat. A few of the more gently sloping are of the Shefflein soils are used for hay and pasture o homesite development. The main fimitations affecting timber production are erosion, compaction, plant competition, and the slope. Seedling mortality also is a major management-concern, particularly on southfacing slopes.

Management minimizes erosion is essential when timber is harvested. Site preparation is needed to ensure adequate reforestation. High-lead or other cable systems should be used on the steeper slopes.

Soils formed in material weathered from igneous rock on plateaus and hillslopes

Vannoy-Caris-Offenbacher
Moderately deep, well drained soils that have a surface layer of silt loam or gravelly loam

This map unit is on hillslopes. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. Slopes generally are 12 to 80 percent. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is about 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.

This unit makes up about 15 percent of the survey area. It is about 35 percent Vannoy soils, 25 percent Caris soils, and 10 percent Offenbacher soils. The remaining 30 percent consists of Camas, Evans, and Newberg soils on flood plains; Abegg and Ruch soils on alluvial fans; Selmac soils on concave slopes; Manita and Shefflein soils on alluvial fans and gently sloping hillslopes; Dubakella soils, which formed in material derived from serpentinitic rock; McMullin soils on ridges and steep hillslopes; Tallowbox and Voorhies soils; and Jayar soils at elevations of more than 4,000 feet.

Vannoy soils have a surface layer of silt loam. The subsoil is clay loam, gravelly clay loam, and extremely gravelly clay loam. Caris soils have a surface layer of gravelly loam. The subsoil is very gravelly clay loam and extremely gravelly loam.

Offenbacher soils have a surface layer of gravelly loam. The subsoil is loam.

This unit is used mainly for timber production or wildlife habitat. A few of the more gently sloping areas of the Vannoy soils are used for pasture or homesite development.

The main limitations affecting timber production are erosion, compaction, plant competition and the slope. Seedling mortality also is a major management concern, particularly on southfacing slopes. Site preparation is needed to ensure adequate reforestation. The large number of rock fragments in the Caris soils increases the seedling mortality rate. High-lead or other cable logging systems should be used on the steeper slopes.

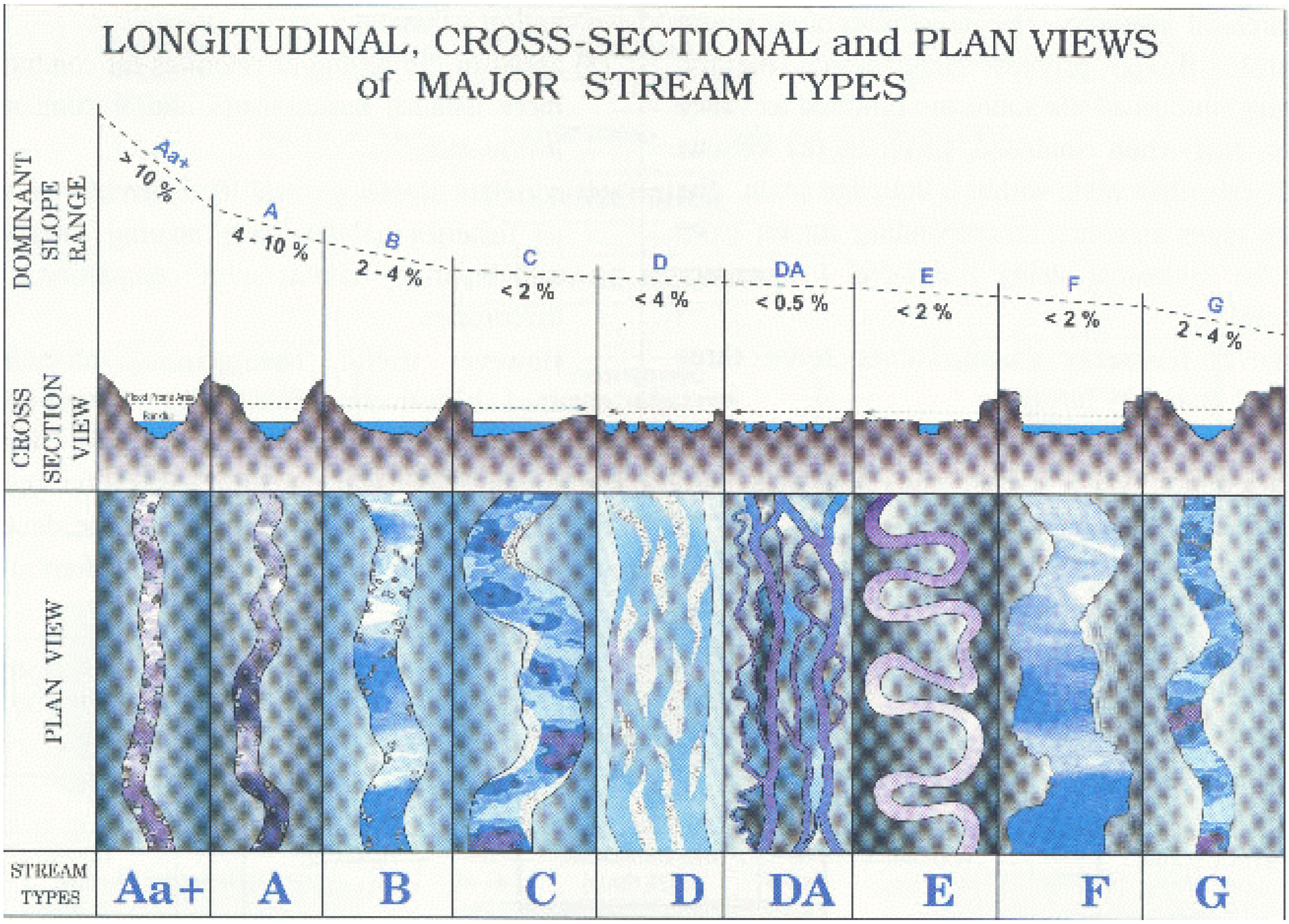
APPENDIX D
Introduced Plant Species and Noxious Weeds

Scientific Name	Common Name	Noxious Weed List
Anthriscus caucalis	burr chervil	
Arrhenatherum elatius	tall oatgrass	
Bromus diandrus	ripgut brome	
Bromus hordeaceus	soft brome	
Bromus tectorum	cheatgrass	
Capsella bursa-pastoris	shepard's purse	
Centaurea solstitialis	yellow starthistle	Target
Cerastium glomeratum	sticky chickweed	
Cichorium intybus	chicory	
Cirsium vulgare	bull thistle	B
Convolvulus arvensis	field bindweed	B
Cynosurus echinatus	bristly dog's-tail grass	
Dactylis glomerata	orchard grass	
Dipsacus fullonum	Fuller's teasel	
Erodium cicutarium	redstem filaree	
Hedura helix	English ivy	B
Hypericum perforatum	St. Johnswort	B
Hypochaeris radicata	hairy cats ear	
Lactuca serriola	prickly lettuce	
Lythrum salicaria	purple loosestrife	B
Myosotis discolor	forget-me-not	
Phleum pratense	timothy	
Plantago lanceolata	narrowleaf plantain	
Poa bulbosa	bulbous bluegrass	
Rubus discolor	Himalayan blackberry	
Rubus laciniatus	cut-leaved blackberry	

Scientific Name	Common Name	Noxious Weed List
Rumex acetosella	common sheep sorrel	
Rumex crispus	curly dock	
Stellaria media	common chickweed	
Taeniatherum caput-medusae	medusahead	B
Taraxacum officinale	common dandelion	
Torilis arvensis	field hedge-parsley	
Tragopogon dubius	yellow salsify	
Trifolium pratense	red clover	
Trifolium repens	white clover	
Verbascum blattaria	moth mullein	
Verbascum thapsus	common mullein	
Vulpia myuros	rat-tail fescue	

APPENDIX E
Channel Morphology Classification

Broad-Level Stream Classification Delineation (Rosgen 1996)



APPENDIX F
Recent BLM Timber Sales

Sale Name	Date	Location (Township, Range, Section)	Unit	Harvest Type /1	Harvest Method	Acres	Volume Removed MBF /2
Sugar Willy	3/28/85	37S, 3W, Sec. 2, 12	1,2,3	SC	Cable	115	1324
Savage Fire Salvage	1/28/88	37S, 4W, Sec. 7	7-21	CC	Cable	49	670
Birdseye Fire Salvage	4/28/88	37S. 3W. Sec. 5, 7, 9, 17	5-3, 6, 7; 9-1; 17-1B	MS	Cable	108	1111
Birdseye Fire Salvage	4/28/88	37S. 3W. Sec 5,7, 9, 17	7-22; 17-1A, 1C, 3, 6	CC	Cable	107	2820
Pikes Peak	8/31/89	37S. 3W. Sec. 1, 2, 5, 8, 9, 11, 15, 17	1, 2, 3, 4, 5	SC	Cable	67	298
Pikes Peak	8/31/89	37S. 3W. Sec. 1, 2, 5, 8, 9, 11, 15, 17	6, 7, 8	CC	Cable	75	1737
Kane Forest	5/24/90	Entire Watershed	All	MS	Aerial	2890	8250
Kane Forest	5/24/90	Entire Watershed	All	MS	Cable	202	282
Bluefoot	9/27/90	37S, 3W, Sec. 21, 27, 35	3, 5	SC	Aerial	20	680
Bluefoot	9/27/90	37S, 3W, Sec. 21, 27, 35	6, 9A	SC	Cable	39	698
Bluefoot	9/27/90	37S, 3W, Sec. 21, 27, 35	9B	SC	Tractor	2	30
Bluefoot	9/27/90	37S, 3W, Sec. 21, 27, 35	7, 8, 10, 11, 13	OR	Cable	83	670
Birdseye Rogue	11/21/91	36S, 3W, 19, 29, 30, 31 36S, 4W, 33	1, 3, 4B, 5B,	MSW	Aerial	228	1043
Birdseye Rogue	11/21/91	36S, 3W, 19, 29, 30, 31 36S, 4W, 33	2	MS	Aerial	78	143
Birdseye Rogue	11/21/91	36S, 3W, 19, 29, 30, 31 36S, 4W, 33	4A, 5A	MSW	Cable	57	250
Birdseye Rogue	11/21/91	36S, 3W, 19, 29, 30, 31 36S, 4W, 33	6	SC	Cable	25	136
Birdseye Rogue	11/21/91	36S, 3W, 19, 29, 30, 31 36S, 4W, 33	10	SC	Aerial	22	182
Ferris Lane	8/31/95	37S, 3W, Sec. 1, 2, 11, 12	9, 10, 11A, 11B	CT	Cable	39	106
Isabelle	10/22/98	37S,3W, Sec. 21, 31	20A & B, 23	DM	Tractor	31	244
Isabelle	10/22/98	37S, 3W, Sec. 31	23	DM	Cable	10	100

1/ Harvest Type Codes:MS=Mortality Salvage; CC=Clearcut; SC=Select Cut; MSW=Modified Shelterwood
CT=Commercial Thin; DM=Density Management
2/MBF = thousand board feet

APPENDIX G
Grazing Use on BLM-Administered Lands

South Rogue-Gold Hill Watershed Analysis Area
Allotment Summaries for BLM-Administered Lands

Allotment (Name and Number)	Percentage of Allotment in Analysis Area	Portion of Allotment in Analysis Area (BLM Acres)	Total Permitted Use (AUMs[1])	Season of Use
Foots Creek 20219	100	116	12	5/1 to 6/30
Applegate 20201	100	25,518	294	Vacant
Timber Mtn. 20204	100	1,720	70	Vacant
Stage Road 20218	100	40	4	Vacant
Sardine and Galls Creek	50	1,410		Cancelled
Ecker Allotment 20217	100	40	386	Vacant

APPENDIX H
Road Densities > 4.0 mi/sq. mi. and/or Road/Stream Intersections > 10/sq. mi.

Township	Range	Section	Road Density (mi./sq. mi.)	Stream Crossings (Number)	BLM Road Miles (%)	Granitic Soils in Section? (Y/N)
Kane Creek Analysis Subwatershed						
36S	3W	22	4.4	5	0.0	N
36S	3W	27	7.1	37	0.0	N
36S	3W	28	9.5	5	21.1	N
36S	3W	35	6.8	37	0.0	N
36S	3W	36	4.2	21	0.0	N
37S	3W	1	5.4	17	0.0	N
37S	3W	2	3.6	14	38.9	N
37S	3W	10	7.0	0	0.0	N
37S	3W	11	7.5	27	56.2	Y
37S	3W	14	8.0	15	0.0	Y
Galls Creek Analysis Subwatershed						
36S	3W	20	5.8	10	0.0	N
36S	3W	21	6.0	8	0.0	N
36S	3W	28	3.6	15	3.4	N
36S	3W	33	6.0	25	13.8	Y
37S	3W	4	2.8	18	0.0	N
37S	3W	9	4.6	19	63.8	N
37S	3W	15	4.9	7	100	N
37S	3W	16	1.9	14	0.0	N
37S	3W	17	5.4	8	100	N
37S	3W	20	4.5	13	11.1	N
37S	3W	21	6.9	20	100	N
37S	3W	22	6.6	0	12.1	N
Millers Gulch Analysis Subwatershed						
36S	3W	19	7.9	14	0.0	N

Township	Range	Section	Road Density (mi./sq. mi.)	Stream Crossings (Number)	BLM Road Miles (%)	Granitic Soils in Section? (Y/N)
36S	3W	20	5.5	14	12.5	N
36S	3W	30	3.8	15	39.5	N
36S	4W	24	12.8	5	0.0	N
36S	4W	25	5.7	20	4.4	N
Foots Creek Analysis Subwatershed						
36S	4W	35	4.8	10	0.0	N
37S	3W	19	7.1	21	0.0	N
37S	3W	29	7.9	34	0.0	Y
37S	4W	1	4.3	16	48.8	N
37S	4W	2	7.1	27	0.0	N
37S	4W	11	3.2	17	0.0	Y
37S	4W	12	4.0	19	0.0	N
37S	4W	13	4.2	12	4.8	N
37S	4W	14	2.8	13	17.9	Y
37S	4W	15	4.1	12	14.6	Y
37S	4W	21	4.7	14	93.9	Y[1]
37S	4W	22	2.8	14	17.2	Y[1]
37S	4W	24	3.1	11	0.0	N
37S	4W	25	2.5	20	0.0	Y
37S	4W	27	7.5	24	65.3	N
Birdseye Creek Analysis Subwatershed						
36S	4W	22	6.5	5	0.0	N
36S	4W	27	5.7	10	12.8	N
36S	4W	28	1.7	11	0.0	N
37S	4W	4	2.8	15	48.1	Y[1]
37S	4W	5	6.7	15	100	N
37S	4W	7	5.9	4	100	Y
37S	4W	9	4.7	17	100	Y
37S	4W	17	10.2	15	100	Y[1]

1/ Granitic soils are only found along the section's edge.

APPENDIX I
Fifteen Percent (15%) Late-Successional Retention Areas

The Northwest Forest Plan (NFP) recognizes the value of remnant late-successional (mature/old-growth) forest stands for their biological and structural diversity and for their function as refugia for old-growth related species. The 15 percent Standard and Guide (S&G) in the Record of Decision (ROD) for the NFP addresses the retention of these forest stands on a 5th Field Watershed scale (USDA and USDI 1994a:C-44). The S&G basically states that at least 15 percent of the forested landbase in the watershed should be comprised of late-successional forest. The NFP federal executives, with the assistance of the Regional Ecosystem Office (REO), developed a process to assess what action(s), if any, should be taken to meet the 15 percent S&G.

As part of the Third Year Review of the Medford District Resource Management Plan (RMP), all 5th Field watersheds in the district were assessed using the process developed by the NFP federal executives. For the analysis of the 5th Field Rogue River-Gold Hill Watershed, which includes the South Rogue-Gold Hill Watershed Analysis Area, and other watersheds within the administrative boundary of the Ashland Resource Area, late-successional forest was defined as that which is greater than 80 years old and provides suitable habitat for northern spotted owls. Suitable northern spotted owl habitat provides for nesting, roosting, or foraging by owls, and generally has the following attributes: high degree of canopy closure (approx. 60%+), multilayered canopy, presence of large snags and coarse woody debris.

The results of the late-successional forest analysis for the Rogue River-Gold Hill Watershed (5th Field) follow:

Federal Ownership	Forested Landbase (Acres)	Existing Late-Successional Forest (Acres)	Late-Successional Forest Available for Harvest (Acres)	Late-Successional Forest that is Reserved (Acres)	Percent of Forested Landbase Comprised of Late-Successional Forest that is Reserved
BLM	22,089	6,619	3,959	2,660	12

As shown in the table above, there are 22,089 acres in the federal forested landbase in the watershed, and of that, 6,619 acres are existing late-successional forest. Of the 6,619 acres of existing late-successional forest, 3,959 acres are available for future timber harvest on BLM managed lands. Only 12 percent (2,660) of the existing forested landbase is comprised of late-successional forest that is reserved under existing land-use allocations; therefore, in the Rogue River-Gold Hill Watershed, additional late-successional forest needs to be retained to meet the 15% S&G. This is being done in the North Rogue-Gold Hill portion of the watershed which is managed by the Butte Falls Resource Area.

Although the 15 percent S&G is applicable at the 5th Field scale, for informational purposes the same analysis used for the 5th Field watersheds was applied to the South Rogue-Gold Hill

Watershed Analysis Area to evaluate the 15 percent late-successional S&G at that scale.

The results of the late-successional forest analysis for the South Rogue-Gold Hill Watershed Analysis Area follow:

Federal Ownership	Forested Landbase (Acres)	Existing Late-Successional Forest (Acres)	Late-Successional Forest Available for Harvest (Acres)	Late-Successional Forest to be Reserved (Acres)	Percent of Forested Landbase Comprised of Late-Successional Forest to be Resrved
BLM	10,396	4,031	2,047	1,984	19

As shown in the table, there are 10,396 acres in the federal forested landbase in the watershed analysis area, and of that, 4,031 acres are existing late-successional forest. Of the 4,031 acres of existing late-successional forest, 2,047 acres are available for future timber harvest. Nineteen percent (1,984 acres) of the existing forested landbase is comprised of late-successional forest that is reserved under existing land-use allocations.

APPENDIX J
Guidelines for Use of Native/Non-Native Grass for Site Restoration

The retention of native vegetation types within watersheds should be regarded as a long-term management priority. These sites should be carefully managed to retain native species. Management should embrace two guidelines: (1) to reduce ground disturbing activity of native species habitats to prevent invasion by non-native species, and (2) to promote aggressive integrated weed control programs to prevent encroachment into native species habitat.

The West Bear Creek Watershed Analysis Area occurs in what is termed a Mediterranean climate. These climates are characterized by cool, wet winters and hot, dry summer months. The lower elevation sites often contain heavy clay soils with high shrink/swell characteristics. Introduced noxious weed species from countries with Mediterranean climates are often “superior competitors” when introduced into native habitats previously not exposed to aggressive competition for moisture and nutrients.

A major portion of the low-elevation habitats in southwestern Oregon are no longer considered native habitats. It is unlikely that these sites will be reclaimed and converted back to native species in the near future, if ever. Higher elevation native habitats should be protected from invasion by limiting ground disturbance and possible exposure to non-natives through aggressive integrated noxious weed control.

Although reclamation using native species is preferred, some sites invaded by non-native species may require intermediate steps in the reclamation process prior to attempting to plant native species. These “site-adopted” non-native grasses would act as an “organic pump” to restore nutrient and soil productivity as well as prevent the “banking” of noxious weed seed in the soil. The long-term goal would be conversion from productive introduced grasses to native species when and wherever feasible.

APPENDIX K
BLM Roads of Concern

Objectives: To reduce wildlife disturbance, road density, compacted area, peak flows, sedimentation, and/or roads adjacent to or in Riparian Reserves.

Recommendation: Waterbar and block or decommission the following roads.

<u>Road Numbers</u>
37-3-4.0
37-3-21.3
37-3-21.5
37-3-33
37-4-5.0
37-4-9.0
37-4-17.1
37-4-21.0
37-4-27.0