United States Department of the Interior
Bureau of Land Management

Medford District Office
3040 Biddle Road
Medford, Oregon 97504

January 2004

North Fork Silver Creek

Watershed Analysis

Version 2.0 – January 2004

January 2004

Dear Reader:

The current **North Fork Silver Creek River Watershed Analysis** document (Version 1.0) was completed in October 2003 to provide an ecological context for management recommendations and post-Biscuit Fire management decisions. It focuses on the 6th field North Fork Silver Creek Watershed. Version 1.0 of the Silver Creek Watershed Analysis was completed in April 1995 by the Forest Service. It focused primarily on Forest Service administered portions of the watershed. The current watershed analysis augments this and, as noted, focuses on the Bureau of Land Management (BLM) managed portions of the watershed. This watershed analysis identifies ecosystem components in the North Fork Silver Creek River sixth field watershed and describes their interactions at a landscape scale. The analysis looks at historical and current ecological components and trends. It makes recommendations for future management actions to achieve desired ecological conditions.

Watershed analysis process is an iterative process. As new information becomes available, the watershed analysis will be updated. Furthermore, this analysis document is ***not*** a decision document. Its recommendations are designed to help launch site-specific project planning and evaluation. Some recommendations may conflict with others. Project planning, which includes the preparation of environmental assessments and formal decision records as required by the National Environmental Policy Act (NEPA), will take these conflicts into consideration. Project planning and land management actions are also designed to meet the objectives and directives of the Medford District Resource Management Plan (RMP).

Therefore, this watershed analysis will be used as a tool in land management planning and project implementation within the North Fork Silver Creek watershed on BLM administered lands.

This watershed analysis follows the format outlined in the document *Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis (Version 2.2)1995.*

If you have additional resource or social information that would contribute to our understanding of the ecological and social processes within the watershed, we would appreciate hearing about them.

Abbie Jossie
Field Manager
Grants Pass Resource Area

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

Watershed analysis is a key part of the 1994 Northwest Forest Plan (NFP) implementation. It is primarily conducted at a fifth field watershed scale. Its goal is to describe the ecological structure, functions, processes and interactions occurring within a watershed. It is a principal analysis used to meet the ecosystem management objectives of the NFP's Standards and Guidelines. It is an analytical process, ***not*** a decision making process. A watershed analysis serves as a basis for developing project specific proposals and identifying the monitoring and restoration needs of a watershed.

Watershed analysis is designed to be systematic, iterative, and dynamic in characterizing ecological watershed processes to meet specific management and social objectives. It is subject to updates and expansion as needed. In 1995, the Forest Service completed the Silver Creek Watershed Analysis, which analyzed ecological conditions on, primarily, the Forest Service administered lands in the Silver Creek watershed.

The watershed analysis undertaken here will document past and current physical and biological conditions on BLM administered lands in the Silver Creek watershed (BLM lands are primarily in the North Fork Silver Creek 6th field watershed). It will interpret data, identify trends, and make recommendations on managing this watershed to achieve desired future conditions.

The first part of this analysis addresses the core physical, biological and human ecological functions. Regulatory constraints that influence resource management in the watershed will also be identified. Identification of key issues will focus on ecosystem functions that are most relevant to the management questions, human values or resource conditions affecting the watershed.

Next, current and reference conditions of these important ecosystem functions will be described. How and why ecological conditions and processes have changed over time will be discussed during the synthesis portion of the analysis.

The final portion of the analysis provides recommendations for BLM lands in the Silver Creek watershed, taking into account land management objectives set forth in the Medford District's 1995 Resource Management Plan. These recommendations will guide management of the watershed's resources toward desired future conditions.

Two key management documents are frequently referred to throughout this analysis:

1. *The Record of Decision for Amendments to U.S. Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* and its Attachment A, entitled *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (April 13, 1994) (NFP)
2. *The Final EIS and Record of Decision for the Medford District Resource Management Plan* (June 1995) (RMP).

The Silver Creek Watershed Analysis Iteration 1.0 (April 1995) is also frequently referenced.

North Fork Silver Creek Watershed Analysis
Interdisciplinary Team Members

Dave Maurer	--	Team Leader / Soil / Water
Anthony Kerwin	--	Co-Team Leader / Wildlife
Tom Dierkes	--	Vegetation
John Schneider	--	Vegetation
Dennis Glover	--	Geographic Information Specialist
Stephanie Messerle	--	Fisheries
Lisa Brennan	--	Recreation / Cultural / Mining
Paul Podesta	--	Roads / Quarries
Linda Mazzu	--	Botany / Special Status Plants
Tim Gonzales	--	Fire / Fuels
Robin Snider	--	Wildlife
Sandra McGinnis	--	Editor

1.0 CHARACTERIZATION

The purposes of this section are: to identify the dominant physical, biological and human processes and factors in the watershed that affect ecosystem function or condition; to relate these features and processes to those occurring in the Silver Creek basin; to provide the context for identifying elements that need to be addressed in the analysis; and to identify, map and describe the land allocations, the Northwest Forest Plan objectives and the regulatory constraints that influence resource management in the watershed (*Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis (Version 2.2, RIEC 1995)).*

1.1. SETTING

The Silver Creek watershed is located within the Klamath Mountain Physiographic Province of southwestern Oregon. It is in Josephine County, approximately 25 miles northwest of Grants Pass (Appendix A, Map 1). This 5^{th} field watershed is approximately 51,593 acres in size and drains into the Illinois River. It is primarily under federal ownership. This watershed analysis focuses on the 8,486 acres of BLM lands in the upper portion of the North Fork Silver Creek 6^{th} field watershed. The Fish Hook / Galice Late-Successional Reserve (LSR) on BLM lands is approximately 7,687 acres in size while the matrix land allocation includes approximately 799 acres (Appendix A, Map 2). The North Fork Silver Creek watershed has been designated a Tier 1 Key Watershed under the Record of Decision for the Northwest Forest Plan and was deferred from ground disturbing activity for 10 years under the Medford District Resource Management Plan (USDI 1995, p. 42).

Watershed bedrock geology in the area occurs as a broad north-south band. This band is composed primarily of intrusive metamorphosed volcanic and intrusive rocks. This band was consolidated through plate tectonic activity from the early to late Jurassic period (approximately 150-190 million years ago) (OR DOGAMI 1979). Elevation ranges from 2,280 to approximately 4,710 feet at Hobson Horn.

Stream surveys have been completed on the North Fork Silver, Cedar Swamp, and Sourgrass Creeks. Approximately 18% of streams within the watershed provide fisheries habitat. The predominantly rocky soils support diverse forested and non-forested vegetative types.

1.2. CLIMATE

The Mediterranean climate, influenced by marine air, is characterized by cool, wet winters and warm, dry summers. Average annual precipitation is very high ranging from approximately 100 to 140 inches. The area is also within the transient snow zone, an area where rain-on-snow events commonly occur.

1.3. OWNERSHIP

This watershed analysis addresses all BLM lands within the 15,230 acre North Fork Silver Creek watershed, most of which lie within the upper reaches of this 6^{th} field watershed. Table 1 shows the distribution of land ownership in the watershed.

Table 1: Land Ownership in the North Fork Silver Creek Watershed		
Land Ownership / Administration	Acres	Percent of Total
BLM	8,486	16%
Forest Service	6,744	84%
Watershed Total	15,230	100%

Appendix A Map 2 shows the location of BLM-administered land in the watershed.

The NFP and Medford District's RMP made a variety of land use allocations as a framework within which federal land management objectives vary. Table 2 summarizes these allocations within the watershed.

Table 2: Land Allocations on BLM-Administered Lands			
Land Use Allocation	BLM Acres	% of BLM in Watershed	Comments
Matrix	799	9	This narrow strip on the south end of the watershed borders Forest Service lands and slices through the LSR.
Administratively Withdrawn (Special Areas – RNA)	499*	6*	North Fork Silver Creek RNA. * These acres do not contribute to total watershed acres because they are already included in either matrix or LSR allocations.
Late-Successional Reserve	7,687	91	Fish Hook/Galice LSR (# RO 255/RO 25B)
Riparian Reserves	--	--	1,473 BLM acres included in other allocations
TOTAL - BLM	8,486	100	

Riparian reserves border all the streams on federal land in the watershed. These areas are a critical part of the NFP's Aquatic Conservation Strategy (ACS) to restore or maintain the ecological health of watersheds and aquatic ecosystems. Riparian reserves help protect the health of aquatic systems and their dependent species as well as provide benefits to upland species. These reserves help maintain and restore riparian structures and functions, benefit fish and other riparian dependent species, enhance habitats for organisms dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for terrestrial and aquatic animals and plants, and provide greater connectivity of late-successional forest habitat (USDA, USDI 1994).

1.4. REGULATORY CONSIDERATIONS

Federal laws pertinent to BLM land management include the Clean Water Act (CWA), National Environmental Policy Act (NEPA), Federal Land Policy and Management Act (FLPMA), National Historic Preservation Act (NHPA), Endangered Species Act (ESA), and the Oregon and California Lands Act (O&C Act).

1.5 EROSION PROCESSES

Common erosion processes in this watershed are colluvial and mass movement, stream bank erosion, and concentrated flow erosion (sheet / rill erosion and gully erosion). These erosion processes are driven by the interaction of gravity, precipitation, runoff and soil shear strength. Other factors that influence erosion are climate, vegetation and fire. Water erosion is important as it not only detaches soil or rock particles but also transports the material downhill.

Stream bank erosion occurs as peak stream flows carrying debris rush through stream channels, dislodging soil particles from stream banks and transporting them downstream as sediment.

Colluvial and mass movement are the combination of gravitational movement of gravel down steep slopes with movement in mass of accumulated material out of draws or off of base slopes.

Concentrated flow erosion is a concern on hill slopes where most vegetation has been removed and roads can concentrate runoff in unconsolidated ditches, diverting it to areas where surface protection is inadequate. In this case, concentrated flow erosion is more of a concern when rain-on-snow events occur in open areas within the transient snow zone.

These erosional processes, combined with uplift of the landscape that has been occurring for the last 14 million years, are primarily responsible for the morphological characteristics of the watershed. As the landscape uplifted, belts of varying rock types were exposed to weathering. Uplift occurred faster than erosion, which resulted in deeply incised stream canyons (draws) with high gradients (Rosgen Aa+) in most of the watershed and moderate gradient channels (Rosgen B) with occasion occasional narrow floodplains. Riparian areas along these streams provide habitat for plants and animals associated with aquatic systems. Many riparian areas have been disturbed as a result of timber harvest, road construction or fire

Road density is the total road length for a given area, expressed as miles of road per square mile. Road densities in excess of four miles/mi^2 are considered high and may have detrimental cumulative effects on water quality and quantity. The North Fork Silver Creek watershed has relatively low densities averaging 3.04 miles/mi^2. Although some road designs are less impacting than others, in general, roads can intercept surface water and shallow groundwater and route it to natural drainage ways, causing concentrated, increased runoff, erosion and sedimentation. Furthermore, peak stream flows may increase compared to areas with few or no roads.

1.6. HYDROLOGY

The steep, rugged terrain of the North Fork Silver Creek watershed is similar to that in other areas of the Klamath Mountains of northern California and southwest Oregon. The area is typified by deeply incised streams in narrow, rocky canyons and steep slopes. The confined nature and relatively steep channel gradients in North Fork Silver Creek and its tributaries provide adequate flows and power to flush much of the sediment supply through its system to lower gradient areas farther down the watershed.

A first order channel is defined as the segment from the head of the channel network to the first confluence. Second order channels lie downslope of the intersection of two first order channels, and so on down through the channel network. Stream order correlates with channel length and drainage area, thereby providing an indication of relative channel size and position within a channel network (Naiman and Bilby 1998) (Appendix A, Map 3). Stream classification miles by stream order are:

Stream Order	Miles
1	45.0
2	14.0
3	8.3
4	2.7
5	3.9

Stream flow in this watershed fluctuates with the seasonal variations in rainfall. Peak flows occur during high-intensity, long duration storm events, usually in the winter and early spring. Stream flows in this watershed are heavily affected by storm intensity, rain-on-snow events and spring snow melt. There are no stream gages in this watershed.

1.6.1. Water Quality and Quantity

Water quality varies throughout the watershed. Water temperatures have been monitored in North Fork Silver Creek and at the confluence of Swamp and Sourgrass Creeks since 1994. Temperatures are cool, ranging from approximately 54 to 60 ºF. Following the Biscuit Fire, approximately 43% of BLM lands in this watershed were identified as having extensive tree mortality due to the fire (post-Biscuit satellite data). As a result, in areas with reduced stream shade, water temperature will increase. Water is uncommonly clear. However, high energy associated with high stream channel gradient flushes sediment through the system to lower gradient areas further down in the watershed and into the Illinois River.

1.6.2. Stream Channels

The major streams in the watershed can be classified into two stream types based on the Rosgen system of stream classification. Type A streams are steep, entrenched, cascading, step / pool systems with high-energy transport associated with depositional soils and are very stable if bedrock or boulder dominated. Type B streams are moderately entrenched, have a moderate gradient, and have riffle-dominated channels and infrequently-spaced pools. They have a very stable plan and profile with stable banks.

1.7. VEGETATION

The North Fork Silver Creek watershed is supports mixed conifer and mixed conifer / hardwood forests (Appendix A, Map 4). The watershed's ravelly, shallow soils provide habitat for a number of rare plant species and communities. In ultramafic soils, the Jeffery pine plant series may occur in addition to the Douglas-fir and Port-Orford-cedar series. Pockets of Brewer Spruce can be found in the watershed. Homogeneous stands of sugar pine, typically mid elevation (3,500') and mid slope in pockets of 20 - 30 acres may also occur. Sugar pine often blends into knobcone pine at higher elevations.

Vegetative conditions across the landscape are highly variable, resulting from geology, climate and disturbance. Fire exclusion resulted in significant increases in stand density (stems per acre); shifts in species composition (*e.g.*, increases in fire-intolerant, shade-tolerant species); and changes in stand structure. These changes in stand structure (*e.g.,* multi-layered canopy and high canopy closure) increased the area that functioned as late-successional forest habitat. These transformations also increased the forest=s susceptibility to large, severe fires, epidemic attack by insects and disease, and have affected the habitat quality for rare plants. Following the Biscuit Fire, the potential for insect infestation remains high. Furthermore, the rapid rate at which sprouting species are likely to respond to the fire indicates that stands are still at risk for severe fire within a short time following the Biscuit Fire. Currently, there is little or no evidence of insects in Douglas-fir but some have been found in some pines (pers. comm. Goheen) and the potential for infestation remains high.

Plant communities in the North Fork Silver Creek watershed have been affected by more direct human influences as well. Logging, beginning in the late 1960s, changed mature seral stands to early and mid seral stands. The more recent 1987 Silver Fire and 2002 Biscuit Fire affected more than 90% of the watershed, reducing the acres of late-successional forest (and its utility as late-successional forest habitat) while increasing early seral stages acres. Post fire (2003) acreage of late-successional forest may now equal that found in 1920, although the location on the landscape has changed. Preliminary observations indicate that a high percentage of large diameter trees survived where burn severity was low or the fire was spotty in moderately burned areas.

Plant communities (associations) with the same climax dominant(s) are referred to as plant series. The North Fork Silver Creek watershed contains four major plant series: Douglas-fir/tanoak, Tanoak/Douglas-fir, White fir, and Port-Orford-cedar. Several plant series occur to a lesser extent. For example, the Jeffrey pine series can be found bordering each of the four major plant series (Atzet and Wheeler 1984). More than 16 plant associations have been identified in the watershed which, when integrated with plant succession, results in a remarkably high tree species diversity. In many cases, soil chemistry exerts a stronger influence on the structure, composition, and function of a forest stand at all levels of stand development than other environmental variables, including climate, topography, or elevation (Appendix A, Map 5).

1.8. SPECIES AND HABITATS

1.8.1. Botany

Vegetation in this watershed reflects more of a coastal influence than most lands on Medford District. Vegetation is dominated by tanoak and Douglas-fir forests with some white fir stands and Port-Orford-cedar in riparian areas. Because of the moisture regime, there is a unique assemblage of species. The watershed appears to be the stronghold for at least one special status species, *Leucothoe davisiae*. Conifer and shrub diversity is high, including such paleo-endemics as Brewer spruce and Sadler oak. One small population of Alaska yellow cedar has been noted.

The 1995 Forest Service Silver Creek WA lists special status (or sensitive) species found or suspected on Forest Service lands in the watershed. Only a small percentage of BLM lands were formally surveyed for special status plants as part of project work prior to the Biscuit Fire. Surveys focused primarily on plantations where brushing and pre-commercial thinning treatments were planned. Following the Biscuit Fire, high and moderate burn severity areas were surveyed, focusing mainly on noxious weeds. Approximately 4,500 acres have been surveyed post-fire, including a majority of the plantations.

Approximately 72 occurrences of special status or Bureau Tracking plants have been located on BLM land through these surveys (Appendix A, Map 6). This equates to approximately one rare plant population for every 130 acres in the surveyed areas. Of these occurrences, species are represented under varying levels of protection, including Bureau Sensitive, Bureau Assessment, Bureau Tracking and Forest Service Sensitive. These numbers can only be considered a rough estimate of the actual number of populations and species in the watershed, since low burn severity areas have not yet been surveyed. Additional surveys related to potential salvage treatments and fuel breaks are in progress.

In comparison to the Illinois Valley flora, special status species occur less frequently and at lower densities in this watershed. For instance, the West Fork Illinois Watershed Analysis found a special status occurrence every 12 acres. However, species found in the North Fork Silver Creek are an interesting assemblage considering that serpentine soils do not exist in the watershed. The botanical diversity reflects the high soil moisture content, gabbro soils and maybe some ultramafic influenced (peridotite) soils.

The North Fork Silver Creek Research Natural Area (RNA) was designated due to this unique assemblage. The 499 acre RNA encompasses north aspect forest stands that have not been previously logged and which are dominated by tanoak and white fir associations. First, second and third order streams are also within the RNA.

1.8.2. Wildlife

In 1994, the Northwest Forest Plan designated 234,860 acres as the Fish Hook / Galice LSR. Of this, 7,687 acres is located within the North Fork Silver Watershed and encompasses 91% of the watershed. A key function of LSRs is to provide large blocks of late-successional forest habitat throughout the Pacific Northwest, provide connectivity for late-successional forest species (*e.g.*, Northern Spotted Owl), help sustain populations, and aid dispersal into the surrounding area.

The diversity of soil types and vegetative communities in the North Fork Silver Creek watershed provides potential habitat for a range of sensitive animal species. Few formal wildlife surveys have been conducted in the watershed. Distribution, abundance and presence of most species are unknown.

More than 200 vertebrate and thousands of invertebrate wildlife species might occur in the watershed. The watershed contains potential habitat for 47 vertebrate special status species (15 mammals, 19 birds, and 13 reptiles and amphibians), as well as eight invertebrate special status species. (See Chapter III, Current Condition, for a listing of the sensitive species.) Other vertebrates of concern include cavity nesting species, band-tailed pigeons, neotropical migrant birds, and six birds on USFW species of concern list (most are also BLM special status species). Of the 47 special status species, most are associated with older forest habitats. However, other important habitats include riparian areas, pine stands, and special habitats such as caves, mine adits and talus. Oak stands and meadows are minor habitat types in this watershed, but they still provide benefits to wildlife where they exist. (See Chapter V, Synthesis and Interpretation, for habitat trends.) The NFP and subsequent annual species reviews have identified Survey and Manage wildlife species that could occur in this watershed (see Chapter III, Current Condition).

The threatened northern spotted owl (*Strix occidentalis*) is the only Endangered Species Act (ESA) listed species known to occur in the watershed. There is one known NSO activity center in the watershed. In 1992, prior to the implementation of the NFP, the USFWS designated 91,684 acres as critical habitat for the northern spotted owl (CHU #OR-65). All 8,486 acres in the North Fork Silver Creek watershed are within this designated spotted owl critical habitat unit.

1.8.3. Fisheries

Silver Creek is one of the two most important tributaries to the Illinois system for wild fish production due to its "relatively unmanaged condition". It comprises approximately 8% of the Illinois River Basin. As the largest tributary to the mainstem Silver Creek, the North Fork Silver Creek contributes approximately 40% of the total flow for Silver Creek and thus has a significant effect on water quality downstream on the mainstem (USDA 1995). The BLM portion of the North Fork Silver Creek constitutes approximately 16% of the Silver Creek watershed.

There are two types of key watersheds: Tier 1 and Tier 2. Tier 1 watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. Tier 1 watersheds also have a high potential of being restored through watershed restoration programs. The Silver Creek watershed was designated in the NFP as one of three Tier 1 Key Watersheds in the Illinois River Basin. It includes the BLM portion of the North Fork Silver Creek which contains resident fish species.

Silver Creek contains fall chinook salmon, winter steelhead, rainbow, and cutthroat trout. (USDA 1995) Silver Creek is considered coho salmon Critical Habitat and Essential Fish Habitat under the rules published by the National Marine Fisheries Service. Coho salmon could potentially occupy Silver Creek upstream to natural barriers (USDA 2002).

The North Fork Silver Creek contains fall chinook salmon, winter steelhead, rainbow, and cutthroat trout (Appendix A, Map 7). A 30-foot high waterfall five miles above the mouth of North Fork Silver Creek ends all anadromous fish use. The BLM portion of North Fork Silver Creek contains resident rainbow and cutthroat trout which are both cold water species and require complex habitat, especially in early life stages.

Factors such as stream temperature, number and depth of pools, large woody material, riparian complexity, number of road/stream crossings, and sedimentation have a large impact on salmonid survival and fish productivity. Of these habitat factors, stream temperature is most affected by riparian disturbance. Rearing salmonids require a water temperature of 58EF for optimum survival. Stream temperature is primarily dependent upon the exposure of water to direct sunlight. The riparian shade component is determined by factors such as canopy cover, aspect, and channel valley form (V-shaped, flat, etc.). Following the Biscuit Fire, approximately 43% of BLM lands in this watershed showed extensive tree mortality due to the fire (post-Biscuit satellite data). This could lead to increased stream temperatures due to the loss of shading. Due to past management, riparian vegetation on some perennial streams is dominated by alders, which has excluded conifer establishment. A riparian zone dominated by alders has a reduced potential for large woody debris recruitment and hence channel complexity is decreased. Furthermore, the watershed contains natural and human-made barriers (road culverts) which isolate fish populations.

Salmonid production can be limited by inadequate summer stream flows; high water temperatures; erosion and sedimentation; lack of large woody material in the stream and riparian area; lack of rearing and holding pools for juveniles and adults, respectively; stream channelization in the canyons and lowlands; and juvenile and adult passage barriers. These are not all issues of concern in this watershed. See Chapter 3, Current Condition, for a detailed summary of these factors in the North Fork Silver Creek watershed.

Some streams on BLM land in the watershed have been surveyed for physical habitat by the Oregon Department of Fish and Wildlife. See Chapter 3 Current Conditions, Aquatic Habitats and Species.

1.9. FIRE

Fire is a primary agent of natural disturbance in the North Fork Silver Creek watershed. The majority of the watershed has historically experienced a mixed to high severity fire regime. Mixed severity fire regimes are associated with infrequent fires (35-100+ years) of both high and low intensity, creating a mosaic effect. At the landscape level, mixed severity fire regimes create a patchy appearance and individual stands will often consist of two or more age classes. A high percentage of the watershed's natural stands have a history of frequent surface fires, resulting in two or three storied stands where each story is even aged. The layered understory vegetation often contributes to fire intensity. Waxy-leaved shrubs and trees can carry flames into the overstory, creating a high intensity fire that is usually 100 acres or less in size.

Approximately 25% of the watershed has a fire regime of more frequent fires (0-35 year fire return interval). This type of fire behavior occurs in brush or grass dominated areas at lower elevations with south or southwest aspects. These fires tended to be stand replacing and slowed or halted when vegetation or aspect changed.

Fire regime modification in the Pacific Northwest, due to prolonged fire exclusion, has increased fuel loads and fuel continuity. This has resulted in more severe fire effects (Agee 1993). Dead and down fuel and understory vegetation are no longer periodically removed, creating fuel build-ups. The longer interval between fires results in higher intensity stand-destroying fires rather than the historically low and moderate intensity stand-maintaining fires.

It is important to recognize that each vegetative type is adapted to its particular fire regime (Agee 1981). Therefore, vegetative types that existed prior to Euro-American settlement cannot be maintained in the current fire regime that has resulted from fire exclusion. The Biscuit Fire which burned into the Silver Creek watershed in 2002 is an example of wildfire occurring in large areas where fire has been excluded for a long period of time. The Biscuit Fire burned across almost 500,000 acres over a period of more than four months. Approximately 99% of the

BLM portion of the North Fork Silver Creek watershed is within the fire perimeter.

1.10. HUMAN USE

The land ownership pattern in the watershed is block federal ownership. The lands within the watershed are revested Oregon and California Railroad grant lands (O&C lands).

The North Fork Silver Creek is remote and access limited. Current human use of the watershed includes dispersed recreation, timber production / harvesting, mining, and harvest of forest products. Recreational use of the area is dispersed and includes off-highway vehicle (OHV) use, hunting, mountain biking, and horseback riding. There is documentation of historic and contemporary mining in the watershed.

The Sourgrass and Shady Branch recreation sites receive infrequent day or overnight use. Visitors enjoy the sites because they provide a primitive, natural setting. The primary users are these sites are seasonal hunters.

1.11. VISUAL RESOURCES

The area is in BLM's Visual Resource Management (VRM) Class IV. Moderate levels of change are permitted to the characteristic landscape. Management activities within this VRM class may dominate the view and be the major focus of viewer attention. However, activities should be made to minimize the effect of these activities through careful location, minimal disturbance, and should repeat the existing basic elements of form, line, color, and texture (Medford District RMP 1995.

2.0. KEY ISSUES

The purpose of this section is to focus the analysis on the key ecosystem elements that are most relevant to the management questions, human values, or resource conditions in the watershed (Federal Guide for Watershed Analysis, Version 2.2, 1995).

Key issues focus the analysis on the unique elements of the watershed. Key issues are addressed throughout the watershed analysis within the context of related core topics. Key issues are summarized below in Table 3. A short narrative that discusses the relevance of each key issue follows this table. The issues are not presented in any order of relative importance.

Table 3: Key Issues

Key Issues	Related Core Topic
Soils - Low soil productivity	Erosion Processes, Water Quality, Vegetation
Water Quality and Quantity - High peak flows due to high annual precipitation, large number of forest openings occur in the transient snow zone (TSZ). - Tier 1 Key Watershed	Erosion Processes, Hydrology, Stream Channel, Water Quality, Species and Habitats (Aquatic)
Botany - Unique plant communities and assemblages occur in the watershed.	Species and Habitat
Special Areas - The North Fork Silver Creek RNA is located within the watershed.	Species and Habitat, Vegetation, Water Quality, Human Uses, Erosion Processes
Late-Successional Forest Habitat Connectivity - Biscuit Fire impacts to connectivity in the Fish Hook/Galice Late-Successional Reserve - An unusual east / west isolated strip of BLM matrix land occurs on the southern edge of the watershed.	Species and Habitat
Fisheries - Natural and human-made barriers (road culverts) isolate fish populations in the watershed.	Stream Channel, Species and Habitats, Water Quality, Hydrology
Port-Orford-cedar (POC) - POC as well as its root disease, *Phytophthora lateralis*, occur within the watershed.	Species and Habitat, Vegetation, Human Uses
Fire - Following the Biscuit Fire, Fire Condition Class I predominates. - The Biscuit Fire's size and overall intensity were unusual according to fire records of the past 100 years. A high percentage of the forest stands were returned to early seral stages. - Fire hazard could return to pre-Biscuit fire levels fairly quickly.	Vegetation, Species and Habitats, Human Uses
Transportation Systems - The transportation system pre-dates LSR designation and may not suit current management objectives.	Water Quality, Human Uses, Erosion Processes

2.1. SOILS

Average annual precipitation in this area ranges from 100-140". This is very high and should result in very high growth rates of vegetation. However, this is not the case. Soils are gravelly and shallow to bedrock, water holding capacity is low and summer precipitation is often marginal. These may be the main reasons for relatively low soil productivity. Other possible reasons are addressed in Chapter 3. Regardless of the reason, low productivity will have a dampening effect on efforts to restore the watershed.

2.2. WATER QUALITY AND QUANTITY

Watershed peak flows can be high due to the extensive transient snow zone (TSZ) in combination with high annual precipitation. The Biscuit Fire has created more openings in the TSZ. These openings are now covered with dead trees where previously there were live trees with high canopy cover that intercepted snow fall. Openings within the TSZ allow accumulation of wet snow on the ground that will melt when a warm rainstorm occurs. This can create more rapid runoff and higher stream peak flows than would have occurred prior to the fire.

Because this is a Tier 1 Key Watershed, emphasis is to be placed on the restoration of water quality to maintain or improve anadromous fish habitat. The Medford District RMP requires that there be “no net increase of roads” (USDI 1995 p. 23). The Biscuit Fire has created conditions that could reduce water quality in terms of temperature.

2.3. UNIQUE BOTANICAL COMMUNITIES

The North Fork Silver Creek watershed features a diversity of plants and plant communities for many reasons. A variety of soils and seral stages as well as high precipitation contribute to botanical diversity in the watershed. Conifer diversity is relatively high and includes such relict species as Brewer spruce and Alaska yellow cedar, both of which appear to be on the edge of their ranges in this area. Shrub diversity is also high with such unusual species as Sadler oak and Siskiyou laurel. Wetlands include fens dominated by the California pitcher plant. At least three plant associations are found only on the BLM portion of the North Fork Silver Creek watershed and two are known only from the upper reaches of the Silver Creek and Howard Creek watersheds. Five species are considered Bureau Sensitive, Bureau Assessment or Bureau Tracking species under the Special Status plant policy. These species and communities were affected to varying degrees by the Biscuit Fire.

2.4. SPECIAL AREAS

One special area, the North Fork Silver Creek Research Natural Area (RNA), occurs in the watershed. The primary vegetation communities are Douglas-fir or white fir dominated with a diversity of shrub species. The RNA was also was designated for its intact Port-Orford-cedar riparian area. A recent post-fire vascular plant survey found that approximately 28% of the RNA experienced high or moderate burn severity (USDI 2002). Long term Biscuit Fire effects are currently unknown, but the RNA could provide a “control” for comparing recovery of different burn severities and between managed and unmanaged stands.

2.5. LATE-SUCCESSIONAL FOREST CONNECTIVITY

Douglas-fir late-successional forest habitat connectivity in the watershed has been influenced by natural events and human activities (fire, timber harvest, roads and mining). The Fish Hook / Galice LSR encompass a majority of this watershed. It provides a north / south connectivity corridor between the Kalmiopsis and Wild Rogue Wilderness areas. Portions of that connectivity have been altered by the Biscuit Fire. There is also a small strip of matrix land on the southern border of the watershed (799 acres), which is located in the middle of the Fish Hook / Galice LSR. The late-successional forest patches in this matrix strip have been reduced by past timber harvesting and the recent Biscuit Fire. This matrix strip presents an interruption in the connectivity between the north and south portions of this large LSR.

2.6. FISHERIES

A series of plunge pools/waterfalls on North Fork Silver Creek as well as culverts throughout the watershed restrict upstream adult and juvenile fish passage. These natural and human made barriers have isolated the resident fish populations. If these fish were eliminated due to natural catastrophic events or land management practices, the barriers would prevent recolonization.

2.7. PORT-ORFORD-CEDAR

Port-Orford-cedar (POC), *Chamaecyperis lawsoniana* as well as the POC root disease, *Phytophthora lateralis*, occurs within the watershed. The North Fork Silver Creek riparian area is believed to be infected from its origin near Soldier Saddle through its convergence with Silver Creek. Infected trees have not been noted in the majority of upland areas.

Humans have been the main vectors of the pathogen into the watershed. Before the disease was understood, the spread of the disease occurred during road construction, road maintenance, mining, logging, and traffic flow on forest roads.

Additional information about POC, its root disease and POC management is available in the USDA, USDI publication, *Supplemental Environmental Impact Statement for the Management of Port-Orford-Cedar in Southwest Oregon* (December 2003).

2.8. FIRE

Fire exclusion in this watershed over the last 100 years contributed to the size and severity of the Biscuit Fire in 2002. Approximately 99% of the BLM administered watershed area is inside the Biscuit Fire containment line. Only 25% of the vegetation within that line was unburned. Approximately 44% of the land (3,675 acres) experience moderate to high burn severity (USDI 2002; Appendix A, Map 8). The watershed is now primarily within fire condition class I, which is probably closer to historic conditions than existed just before the Biscuit Fire. Management activities such as prescribed fire can reduce the future threat of catastrophic wildfire.

3.0. CURRENT CONDITION

The purpose of this section is to present detailed information relevant to the key issues and to document the current range, distribution, and condition of the relevant ecosystem elements.

3.1. CLIMATE

The North Fork Silver Creek watershed has a marine influenced Mediterranean climate with cool, wet winters and warm, dry summers. The precipitation is in the form of rain and snow. About 95% of the watershed is in the transient snow zone (TSZ), at elevations of 2,500’ to 4,000’. The TSZ is where snow packs accumulate and melt throughout the winter in response to alternating cold and warm fronts. Average annual precipitation in this watershed ranges from approximately 100-140”. The least amount of rain falls in the east end of the watershed and the most, in the far west end of the watershed at higher elevations.

3.2. EROSION PROCESSES

3.2.1. Erosion

Erosion hazard is an indication of a soil's susceptibility to particle or mass movement from its original location. Particle erosion hazard for concentrated water flow assumes a bare soil surface condition. If the soil is protected by vegetation, litter or duff such that no mineral soil is exposed, concentrated flow erosion is unlikely to occur. Streambank erosion occurs on exposed streambanks during peak flows. Mass movement is a function of the mass strength of the soil mantle and underlying geologic material. Large plant root strength plays a role in the susceptibility to mass movement. Most soil and highly-weathered rock is weakest at high moisture levels.

Soils in the analysis area are generally well to somewhat excessively drained (Ref. Soil Survey of Jo. County, OR. SCS 1983). They include:

Beekman-Colestine complex, Beekman-Vermisa complex, and Vermisa-Beekman complex occur on steep to very steep slopes (50 to 100%). They are comprised of gravelly loam and extremely gravelly loam (Vermisa) surface layers over very gravelly loam subsoils. Depth to fractured metamorphic bedrock is 20 to 40 inches except for Vermisa which is 10 to 20 inches. These soils cover 75% of the analysis area. They are most susceptible to colluvial and mass movement erosion process.

Jayar very gravelly loam occurs on moderately steep to steep slopes (20 to 70%). It is comprised of very gravelly loam surface layers over very gravelly loam subsoil. Depth to fractured metavolcanic or altered sedimentary bedrock is 20 to 40 inches. This soil covers 6% of the analysis area. It is somewhat susceptible to colluvial and mass movement erosion process. It is susceptible to stream bank erosion process.

Josephine gravelly loam occurs on moderately steep to steep slopes (20 to 55%). It is comprised of gravelly loam surface layers over clay loam and gravelly clay loam subsoil. Depth to bedrock is 40 to 60 inches. This soil covers 7% of the analysis area. It is slightly susceptible to colluvial and mass movement erosion process. It is susceptible to stream bank and concentrated flow erosion processes.

a. Colluvial and Mass Movement

The dominant erosion process is a combination of colluvial (gravel) movement and mass movement, typically in the form of debris flows.

Colluvial movement refers to downslope gravitational movement of soil particles and aggregates. Slopes in the watershed are frequently steep to very steep (50-90%) and soils are gravelly and very gravelly. Recent field observation showed slopes with very gravelly surface layers which are commonly referred to as ravel or ravelly slopes. Ravel moves downslope at an estimated rate of tens to hundreds of feet per year. The faster rates are likely in recently severely burned areas. As the ravel moves downslope, slope decreases and colluvial material accumulates, typically on footslopes and in draw bottoms. Draw bottoms are particularly susceptible to mass movement in the form of debris flows (USDI 2002). Steep foot slopes where ravel has accumulated may also be subject to mass movement in the form of debris slides.

Forms of mass movement that may occur in the watershed include debris flows and debris slides. These usually occur rapidly during periods of deep saturation (*e.g.,* late winter or early spring). A debris flow is a mass of soil, rock, and plant material that moves downslope in a linear fashion, often removing all vegetation and scouring to bedrock. In draw bottoms, the relatively loose ravel material becomes saturated and flows down the draw as the draw slopes or inner gorges determine its route. This leaves a steep-sided draw with or without intermittent stream flow. A debris slide is characterized by loss of sheer strength of a saturated mass of loose accumulated ravel material on steep foot slopes.

Tree roots help keep soil in place. When trees die in a fire, their root systems decay and lose root strength. With little root strength, the soil mass may become mobile as saturation occurs. This process may take 2-5 years to become evident following fire.

Currently, no mass movement has been observed on BLM land after the Biscuit Fire and the degree of past mass movement is unknown. The FS has observed and monitored mass movement features in the Silver Creek watershed downstream from BLM administered land. The FS mass movement features were typically slides triggered by large events such as the 1964 flood (USDA 1995).

b. Streambank Erosion

Another process that commonly occurs in the watershed is stream bank erosion. This is the loss of streambanks through sloughing, block failure or scouring by high stream flows.

In this watershed, streambank erosion results from high peak stream flows combined with exposed deep, fine/medium-textured soils along Rosgen type A or B stream channels (see Stream Channel section below). The watershed experienced a 30-40 year storm event in January 1997. This type of high peak flow event may have caused streambank erosion in areas of limited bank protection or root strength. Streambank erosion or failure has been observed on North Fork

Silver Creek and some of its tributaries (pers. comm. Matthews 2003). Some streambank erosion may be attributable to road constraints on streams that forces stream energy into areas of loose soil where the streams would not otherwise flow.

c. Concentrated Flow

This form of erosion occurs when water accumulates in areas with little or no protective organic material. As the water flows down slope it builds energy which allows for detachment of soil particles that travel as sediment in the flowing water. Sediment is then deposited where flow rates diminish.

Little evidence of concentrated flow erosion, such as gullies or rills, has been observed in the watershed before or after the Biscuit Fire. This is attributed to high rates of infiltration in the predominately gravelly soils. However, a wet rain-on-snow event could result in concentrated flow (see discussion of Transient Snow Zone below).

Conditions that are most conducive to concentrated flow erosion include: road drainage outlets, unprotected road ditches, areas of bare soil usually created by ground disturbing activities or fire, wheel ruts on natural surface roads, and highly altered ground surface created by OHVs or other motorized equipment. Roads are commonly prone to this type of erosion (see Road Density discussion below).

d. Road Density

Roads on sloping ground intercept surface water and shallow ground water. The water is commonly routed by the road to a draw or other natural drainage and reaches streams more quickly than would naturally occur. Therefore, the more roads that exist in a particular area, the greater potential peak stream flows will be. With an increase of peak stream flow, streambanks are more susceptible to erosion as the stream channel adjusts to the change in flow pattern. Additional stream sediment caused by this phenomenon comes predominately from eroded streambanks. Other sources of stream sediment are the road surface, slough from steep road banks, and eroded channels at drainage outlets.

The above gives a general perspective on high road densities. Road design and locations on the landscape, however, produce varying effects. For example, an outsloped road with water dips, a rocked surface and outlet filters that are farther from a stream would produce lower levels of sediment runoff than a natural surfaced road with ditches or that is close to a stream.

Within the North Fork Silver Creek watershed, road densities range from low (about 2 mi / mi^2) to very high (>6mi/mi^2). Overall road density is “moderate” at 3.04 mi/mi^2.

3.2.2. Soil Productivity

Past planting experience and observation indicate low soil productivity in much of the watershed in spite of high annual precipitation. This could be due to a variety of factors:

- Some soils, such as Vermissa, are very shallow to bedrock.

- Ultramafic parent material, specifically peridotite, may be present although soil maps do not indicate this. Few plant species can tolerate this unusual soil chemistry; therefore, these soils produce plants that grow slowly and have a scattered distribution. This results in thin duff and litter layers as well as difficulty reestablishing vegetative cover (pers. comm Mazzu 2003).

- Thick gravelly ravel layers may cover productive soils at toe slopes, preventing young vegetation from extending roots into the buried productive soil layer (pers. comm. Dierkes 2003).

- Nutrient limitations may occur in some soils (pers. comm. Dierkes 2003).

- Hydrophobic conditions exist in a few areas which may or may not be due to the Biscuit Fire. As moisture is repelled in the upper part of the soil, little moisture accumulates in the underlying soil. At these sites, plants derive little benefit from high precipitation. Hydrophobic conditions do not appear to be widespread in the watershed (pers. comm. Dillman 2003).

There is no data to confirm the association of the above factors with reduced soil productivity in the watershed. Further study would be needed to quantify the degree and extent of low soil productivity. This information could be useful in planning effective vegetative treatments.

3.3. HYDROLOGY

3.3.1. Water Quality and Quantity

The Oregon Department of Water Quality (DEQ) has monitored or collected water quality data from various sources on the streams and water bodies in Oregon. This information is captured in Oregon Department of Environmental Quality's (DEQ) 1988 *Oregon Statewide Assessment of Nonpoint Sources of Water Pollution*, and has been periodically updated and compared to standards. This has led to listing of some streams as "water quality limited". The most recent stage of this process has been the publication for public review of Oregon's 1998 Section 303(d) Decision Matrix by the DEQ.

Table 4 lists streams in the Silver Creek watershed currently listed as water quality limited.

Table 4: Oregon DEQ's 303(d) Listed Streams

Stream & Segment	Parameter / Criterion	Data Source	Supporting Data or Info
Silver Creek (River mile 0–13.3)	Summer Temperature (Fish rearing, 64º F)	USFS data	Exceeded standard 1990-1993
North Fork Silver Creek (River mile 0–7, all on USFS)	Summer Temperature (Fish rearing, 64º F)	USFS data	Exceeded standard 1993

Summer temperatures at two sites were monitored on North Fork Silver Creek (BLM administered land) in 1994. The seven day moving averages did not exceed the DEQ standard.

Water quality limited streams are to be managed under Water Quality Management Plans (WQMP). Because Silver Creek is the mainstem stream in this watershed, all streams that feed into it will be included in the WQMP. The DEQ has scheduled preparation of a WQMP for the entire Illinois River system in late 2004 or 2005.

a. Water Temperature

Many factors contribute to elevated stream temperatures in the North Fork Silver Creek watershed. Low summer stream flows (due in part to below normal precipitation patterns), hot summer air temperatures, low gradient valley bottoms in the lower part of the watershed, south aspects, lack of riparian vegetation (due to wildfire, floods or management activities), channel alterations and high channel width-to-depth ratios result in elevated stream temperatures that can stress aquatic life (USDI 1998). Logging and fire are the two forms of human disturbance most evident in this watershed. However, some streams may naturally have temperatures that exceed DEQ standards due to lack of shade vegetation, particularly in rocky areas, and warm summer temperatures throughout the North Fork Silver Creek watershed.

Though North Fork Silver Creek has not been identified as Water Quality Limited (303d listed), its naturally low summer temperatures help counterbalance warmer temperatures down stream. It is probable that replacement of shade producing streamside vegetation lost in the Biscuit Fire will be called for in the WQMP to maintain or further reduce summer temperatures in the upper North Fork Silver Creek system. The riparian areas downstream of the plunge pools of North Fork Silver Creek and the adjacent section of Hawk Creek are of particular concern for shade loss due to the Biscuit Fire.

b. Sediment and Dissolved Oxygen

Other potential water quality concerns are sediment and dissolved oxygen. Sediment was of particular concern after the Biscuit Fire. Following large, high intensity fires such as the Biscuit Fire, erosion caused sediment may quickly reach stream systems. Post –Biscuit fire erosion / sedimentation has, however, been minimal so far. Little upland erosion or fine sedimentation in the streams have been observed. This is can be attributed to high soil infiltration rates and minimal rain on snow events.

Dissolved oxygen is lowest during low flows or when rapidly growing water plants or algae use the available oxygen. Plant growth in this watershed is not a factor. Grab sample testing of dissolved oxygen at low flows has not indicated levels low enough to be of concern.

c. Stream Flow

Tributary stream flow fluctuates with the seasonal variation in precipitation. Generally, tributary streams respond more quickly to storms than does the mainstem. However, the degree of fluctuation and the response time varies depending upon certain key conditions. This watershed has two factors that would indicate that it is a flashy system: 1) an abundance of gravelly, shallow soils and 2) 92% of the area consists of transient snow zone (TSZ). Based on recent field observation, however, the stream system is not flashy. Apparently, soil and weathered bedrock are able to absorb surface water and maintain a deep ground water system. This abundant ground water sustains streams through an average summer. Also, response time to storms appears to be moderate though there is no data to show this. Response to rain on snow events would likely be quite different. Because nearly half the large TSZ is now in openings, snow pack would rapidly melt under a driving warm rain and stream flow would quickly increase.

Maximum peak flows generally occur in December, January and February. No flow data specific to the North Fork Silver Creek watershed is available.

In this watershed, the primary human disturbances that potentially affect the timing and magnitude of peak flows include roads, soil compaction and vegetation removal due to past timber harvest. Quantification of these effects on stream flow in the watershed is not available. Roads quickly intercept and route shallow ground and surface water to streams. The road-altered hydrologic network may increase the magnitude of peak flows and alter the timing of when runoff enters a stream (causing increased peak flows and reduced low flows). This effect is more pronounced in areas with high road densities and where roads are in close proximity to streams (USDI 1998). Road density is discussed in the soils section of this chapter.

Soil compaction resulting from skid roads also 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 (USDI 1998). The extent of compaction within this watershed has not been quantified. Overall, however, as there has been little observed compaction induced surface runoff, instances of significant soil compaction are unlikely.

Vegetation removal reduces water interception and transpiration and allows more precipitation to reach the soil surface and drain into streams or become groundwater. Until crown closures reach pre-fire levels, sites are considered to be hydrologically unrecovered. Rates of hydrologic recovery are site-specific and depend on many factors, including the type and extent of disturbance, soils, climate, and rates of revegetation (USDI 1993). Extensive vegetation removal in the TSZ is of particular concern in that it can cause altered stream flow and increased peak flow (USDI 1998). The extent of early seral vegetation, compaction, openings within the TSZ, and road density is unknown for the North Fork Silver Creek watershed. Therefore, the hydrologic impacts of those factors are also unknown.

There is no stream flow data for the North Fork Silver Creek or its tributaries. Low summer flows in the North Fork Silver Creek watershed reflect low summer rainfall and are exacerbated by periods of below-normal rainfall.

3.3.2. Stream Channels

Stream orders are defined by how many streams come together to create a larger stream. A stream that is at the headwaters and has no tributaries is a first order stream. When two first order streams flow together at the point that they join, the stream becomes a second order stream, and so on. There are approximately 74 miles of order 1 through 5 streams and approximately 5.9 miles of the North Fork Silver Creek in the study area.

Given their overwhelming majority (80%), first and second order streams have a major influence on downstream water quality. Most first and second order streams in the watershed are characterized by intermittent or ephemeral stream flow and are generally very narrow and V-shaped with steep gradients. Large woody debris, which dissipates stream energy and slows channel erosion, is a key component of these headwater streams. The amount of large woody debris in first and second order streams in the planning area has been reduced through past timber harvest and prescribed burning. This loss of woody debris contributes to reduced channel stability and increased sediment movement downstream during storm events (USDA, USDI 1994).

Third and fourth order streams comprise roughly 15% of the stream miles in the analysis area. Many of these streams support fish or directly contribute to the water quality of fish-bearing streams. Third and fourth order streams are generally perennial, fairly narrow and have U-shaped channels with stream gradients less than five percent. During winter storms, these streams can move large amounts of sediment, nutrients, and woody material. Channel condition varies depending on inherent channel stability and past management practices. The amount of large woody debris contributed to these streams has been reduced by past management practices in the riparian areas (USDA, USDI 1994).

The lower 3.9 miles of North Fork Silver Creek is a fifth order stream and constitutes approximately 5.3% of the stream miles in the watershed. This stream supports fish and provides other beneficial uses. Fifth order and larger streams tend to be wider with flatter gradients and narrow flood plains or strips adjacent to the stream channel. These are stable channels that require major flood events to destabilize them in spots. Management activity on adjacent uplands and the confining of the stream by the adjacent road may have adversely affected the stream (USDA, USDI 1994).

Forest stands along most streams on BLM-administered land generally contain trees of sufficient size to provide a future source of large woody debris. However, in this watershed past practices such as salvage logging from stream channels, clear cutting in and adjacent to riparian areas, and hazard or fallen tree removal along adjacent roads may have reduced the amount of large woody debris in the fifth order stream (USDA, USDI 1994).

A stream classification system has been developed by Rosgen (1996) that is useful in assessing streams' sensitivity to disturbance and their recovery potential. Table 5 describes the types of streams common in the watershed. The classifications are symbolized by letters and numbers. The first letter represents stream type and numbers represent channel material.

Table 5: Rosgen Stream Classification		
Stream Type	General Description	Landform / Soils / Features
Aa+	Very steep, deeply entrenched, debris transport, torrent streams.	Very high relief. Erosional, bedrock or depositional features; debris flow potential. Deeply entrenched streams. Vertical steps with deep scour pools; waterfalls.
A	Steep entrenched, cascading, step / pool streams. High energy / debris transport associated with depositional soils. Very stable if bedrock or boulder dominated.	High relief. Erosional or depositional and bedrock forms. Entrenched and confined streams with cascading reaches. Frequently spaced, deep pools in associated step / pool bed morphology.
B	Moderately entrenched, moderate gradient, riffle dominated channel, with infrequently-spaced pools. Very stable plan and profile. Stable banks.	Moderate relief, colluvial deposition, or structural. Moderate entrenchment and width / depth ratio. Narrow, gently sloping valleys. Rapids predominate with scour pools.

Based on field observation, much of the North Fork Silver Creek on BLM land is stream type B or A.

Table 6: Rosgen Management Interpretations of Various Stream Types					
Stream Type	Sensitivity to Disturbance	Recovery Potential	Sediment Supply	Streambank Erosion Potential	Vegetation Controlling Influence
AA+3,4	very low	excellent	low to very low	low	negligible
A2	very low	excellent	very low	very low	negligible
A3	very high	very poor	very high	high	negligible
A4	Extreme	very poor	very high	very high	negligible
B4	moderate	excellent	moderate	low	moderate

3.3.3 Tier 1 Key Watershed

The North Fork of Silver Creek is located in the upper part of the Silver Creek 5th field watershed. This watershed is designated in the NFP as a Tier 1 Key Watershed which means that it is a watershed “selected for directly contributing to anadromous salmonid . . . conservation”. As stated in the NFP, the management strategy for Key Watersheds includes:

- Reduce existing system and non-system road mileage outside roadless areas. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds.
- Key Watersheds are highest priority for watershed restoration.
- Watershed analysis is required prior to management activities, except minor activities such as those Categorically Excluded under NEPA.

There are no anadromous fish are in streams within the BLM portion of the North Fork of Silver Creek watershed. However they are tributary to the main stem of North Fork Silver Creek which has a water fall that blocks upstream migration of anadromous fish. Water quality attributes (low summer temperatures, low fine sediment, and plentiful dissolved oxygen) for anadromous fish are important for streams on BLM land as they supply water for anadromous fish downstream.

3.4. VEGETATION

Vegetation data on BLM land was compiled using GIS information and MicroStorms data derived from the BLM's Operational Unit Inventories. Four major plant series (Tanoak/Douglas-fir, White fir, Port-Orford-cedar and Douglas-fir/tanoak) are mapped within the North Fork Silver Creek watershed. While not formally mapped, other plant series do occur as inclusions in larger mapping units.

Basal area (BA) of trees on a site provides a relative measure of site productivity. An area that can support 200 ft^2/acre of basal area is, for example, more productive than an area that can support 100 ft^2/acre of basal area. Basal area in a plant series considers all species; it is not limited to the tree species that series is named for. The following discussion indicates the relative productivity of each of the four major series in the watershed.

3.4.1. Plant Series

a. Tanoak/Douglas-fir

This blend of communities is referred to as either the Douglas-fir/tanoak series or Tanoak/Douglas-fir series. There is not enough data to distinguish which species is climax. The Douglas-fir series occurs in areas that have experienced frequent fire disturbance, typically warmer and drier sites. The tanoak series tends to occur on moister, more productive sites with less frequent fire intervals. Sometimes the Douglas-fir and tanoak series occur in a coarse mosaic as opposed to large contiguous blocks, with subtle shifts in microsite and soil conditions affecting species composition and regeneration potential.

In general, tanoak sites are productive. Average total basal area for this series is 262 ft^2/acre (Atzet and Wheeler 1984). The tanoak series occurs where soil and atmospheric moisture are plentiful. The series occurs most frequently on cooler aspects in fine textured soils (Atzet and Wheeler 1984). Fire is the principal inhibitor of dominance of individual tanoak trees (Tappeiner et al. 1990). Due to successful fire suppression over the last 70 years, this species has increased in the watershed.

Douglas-fir is the most common tree species in southwestern Oregon. Sites within the Douglas-fir series average 254 ft^2BA/acre (Atzet and Wheeler 1984). Douglas-fir tends to produce conditions that favor fire wherever it occurs. This species is self-pruning, often sheds its needles and tends to increase the rate of fuel buildup and fuel drying (Atzet and Wheeler 1982).

b. White fir

Sites in the white fir series are also considered productive with basal areas averaging more than 341 ft^2/acre (Atzet and Wheeler 1984). The white fir series is widespread, diverse, and productive (Atzet and McCrimmon 1990). White fir's thin bark provides little insulation during low intensity underburns until tree diameter reaches at least eight inches. Moreover, the shade tolerant nature of white fir, which allows branches to survive close to the ground, makes the lower crown a ladder to the upper crown (Atzet and Wheeler 1982). Due to the successful fire suppression, white fir occupancy has increased. This series is most often found above 3,000 feet and at some moist sites lower in elevation. In higher elevation stands, white fir predominates but at lower elevations, Douglas-fir is most common, with white fir only appearing in the later successional stages.

c. Port-Orford-cedar

Port-Orford-cedar (POC) requires high daytime humidity. Consequently, it is associated with stream channels, lower slope positions, or other areas that meet the humidity criteria. Port-Orford-cedar tolerates ultramafic soils and can compete well there as long as humidity criteria are met. Productivity on ultramafic soils is lower than on other soils: basal area averages approximately 166 ft^2/acre on ultramafic soils compared to 401 ft^2/acre on non-ultramafic soils (Atzet and Wheeler 1984). POC is susceptible to an exotic pathogen, *Phytophthora lateralis* (PL), which is present on in the watershed. POC downstream from or adjacent to PL infestations are considered at risk.

After the Biscuit fire, most surviving POC is in the mid-size pole class. A high percentage of larger POC burned in the fire. Entire POC stands burned during extreme fire conditions within and adjacent to riparian zones. Scattered trees greater than 20"DBH survived where the fire pattern was spotty. A higher distribution of POC occurs in north-south drainages whereas western red cedar is more common on east-west drainages.

d. White Oak

The white oak series occurs at low elevations and is characterized by shallow soils. Average basal area is 46 ft^2/acre. Although Oregon white oak is usually considered a xeric species, it also commonly occurs in moist locations such as flood plains, heavy clay soils, and river terraces. On better sites, white oak is out-competed by species that grow faster and taller (Stein 1990). Water deficits significantly limit survival and growth (Atzet and McCrimmon 1990). White oak has the ability to survive as a climax species in environments with low annual or seasonal precipitation, droughty soils, and where fire is a repeated natural occurrence (Stein 1990). The natural fire regime for this series is one of high frequency and low intensity. Due to past fire suppression this species has decreased in the watershed and is found only in the lower elevations of the North Fork Silver Creek watershed. It is typically not tree size and is being out-competed by Pacific madrone, other hardwoods and shrubs.

e. Pine Species and Brewer Spruce

The **Jeffrey pine** series is confined to ultramafic influenced soils (Atzet and Wheeler 1982). Serpentine areas dominated by Jeffrey pine may have the lowest productivity of any conifer series in the Klamath Province with an average basal area of 83 ft^2/acre (Atzet and Wheeler 1984). While not considered important in terms of timber production, these sites are floristically diverse, supporting many special status plants. They also have value as unique habitats for a variety of wildlife species.

In the North Fork Silver Creek watershed, Jeffrey pine is located at 4,000-4,500 feet on west and northwest facing slopes intermixed with Douglas-fir and sugar pine stands. Jeffery pine stands are rare in the watershed. Trees 200-250 years old or greater can be found and, where present, typically dominate the overstory. Natural pine regeneration will consist entirely of individual trees that escape fire injury by chance.

Ponderosa pine stands average approximately 170 ft^2 BA/acre. This series is relatively rare as ponderosa pine does not often play the role of a climax dominant (Atzet and Wheeler 1984). This series tends to occupy hot, dry aspects that burn frequently. Therefore, ponderosa pine regeneration is fire dependent and the past 70 years of fire suppression have resulted in reduced ponderosa pine (Atzet and Wheeler 1982).

Western white pine is found at 4,000' or higher on benches and in swales near ridge lines. It can be found as individuals within high species diversity stands; it does not occur in western white pine pockets. Most of these trees have a stunted appearance. While these trees could be old growth, most are mid sized, measuring only 10-18" DBH and seldom measuring over 20". Next to Brewer spruce, western white pine may be the most uncommon tree species in the watershed. The western white pine series has not been identified as occurring within the watershed, but can be found adjacent to this watershed along the West Fork Illinois River. Jimerson (1995) found that stand replacement fires occurred regularly within this series in northwestern California between 1820 and 1910. After 1910, fire events were of lower intensities, perhaps the result of fire suppression. Productivity in this series is low, averaging 122 ft^2 BA/acre.

Knobcone pine has serotinous cones which usually require high temperatures from fire to open and disperse seed. Therefore, the presence of knobcone pine indicates past high intensity fires. Abundant knobcone pioneer seedlings have regenerated as a result of the 2002 Biscuit Fire.

Brewer spruce is located on Chrome Ridge at elevations between 4,000 and 4,500 feet. A patch is located in Hawk Creek. It is also found in isolated pockets in the Sourgrass area.

Table 7 summarizes the extent of the major plant series in the North Fork Silver Creek watershed on BLM lands.

Table 7: Major Plant Series

Plant Series	Acres	Percent
Tanoak/Douglas-fir	4,439	52
White Fir	3,165	37
Port-Orford-cedar	488	6
Douglas-fir/Tanoak	394	5
Totals	***8,486***	***100***

3.4.2. Plant Associations

Plant series are further refined by plant associations (Table 8), which are based on the concept of potential natural vegetation that would be present under climax conditions (Forest Service Plant Association Groupings GIS data).

Table 8: Plant Associations		
Plant association	Acres	Percentage
Tanoak-canyon live oak and/or Sadler oak	3,078	36%
Port-Orford-cedar/salal	1,389	16%
Douglas-fir-Canyon live oak - cool, dry - SW Oregon	1,131	13%
White fir/Oregon grape	921	11%
Unknown *Sugar pine/Sadler oak … recently identified (9/2003)and is located in upper half of North Fork Silver Ck RNA; not shown on Plant Association map	851	10%
White fir-cool, dry	521	6%
Tanoak/evergreen huckleberry	257	3%
White fir-Shasta red fir	144	2%
Douglas-fir/poison oak - warm, often low elevation	50	1%
Tanoak/salal	50	1%
White fir/rhododendron	23	<1%
White fir-Douglas-fir - warm, dry	21	<1%
Douglas-fir/ultramafic - SW Oregon	17	<1%
White fir-western hemlock/Oregon grape	15	<1%
Shasta red fir - Siskiyou Province, SW Oregon	13	<1%
Douglas-fir-chinquapin-salal - SW Oregon	4	<1%
Total	8,485	100%

3.4.3. Biscuit Fire Effects and Implications

a. Fire Effects

Table 9 summarizes Biscuit Fire burn severity acres by vegetation type (Appendix A, Map 9). Burn severity indices, which indicate potential vegetation change, were developed through USFS interpretation of satellite image data supplied by Remote Sensing Application Center. Additional analysis of site specific vegetative conditions will be necessary to categorize seral stage within each vegetation type and to prescribe forest management activities.

Table 9: Vegetation Type and Burn Severity

Pre-Fire Vegetation Condition Class	**Acres**	**Burn Severity** (acres)							
		Little/ No Change		**Low**		**Moderate**		**High**	
		Total	Matrix	Total	Matrix	Total	Matrix	Total	Matrix
Shrub/Brush	133	17	0	50	6	46	4	20	0
Plantation	2,023	338	45	591	54	729	74	365	58
Partial Cut	1,163	268	27	486	22	314	7	95	0
Unentered; Mixed Conifer	1,303	252	15	295	39	303	26	453	27
Unentered / Closed Canopy	214	118	2	62	10	23	4	11	9
Mature	3,650	1,243	73	1,089	119	643	168	675	124
Total	***8,486***	***2,236***	***162***	***2,573***	***250***	***2,058***	***283***	***1,619***	***218***

Shrub/Brush: Shrub communities which may include a few scattered hardwoods.

Plantation: Plantations resulting from commercial harvest (clearcut, partial cut, or overstory removal).

Table 9: Vegetation Type and Burn Severity

		Burn Severity (acres**)**			
		Little/ No Change	**Low**	**Moderate**	**High**
Partial Cut: Scattered overstory of larger conifers**,** with understory of conifer reproduction mixed with some hardwoods and brush.					
Unentered Mixed Conifer: Scattered overstory of conifers, with moderate to heavy understory of hardwoods and brush.					
Unentered Closed Canopy: Mostly closed canopy of 12-20” DBH conifers. May include some hardwoods <12” DBH.					
Mature: Mostly closed canopy of 20” DBH or larger conifers, sometimes mixed with co-dominants of 12-20”conifers and large hardwoods.					
Little/No change: Very little or no observable change. Ground verification indicates nearly all affected areas were under burned. A low change in a plantation may still indicate a high percentage of the regeneration was burned even though it was a low intensity burn. If the area was old growth with a low intensity under burn, then it would have little or no change.					
Low Change: Vegetation is mostly dead but needles and leaves remain; very low (<20 %) canopy closure.					
Moderate Change: All vegetation is dead; most overstory needles and leaves remain.					
High Change: All vegetation is dead; few needles or leaves remain.					

b. Post- Biscuit Fire Salvage Potential

Usable forest products can be retrieved from salvaging dead merchantable sized trees. The matrix and LSR areas of the Biscuit Fire areas were evaluated for potential post fire salvage potential in 2003. A strip cruise method for estimating volume/acre of salvageable material was conducted. Small diameter material is not included because recovery potential was consider to be low due to rapid deterioration within the first year. Acreages were determined using aerial photographs and GIS technology. Total acres consist of harvest acres (riparian areas were removed).

- Total volume per acre = 7.01 MBF / Acre
- Total acres = 1,140
- Total estimated volume (all species, all diameters >20” DBH) = 7,991 MBF
- Average diameter (all species) = 22”

Table 10: Biscuit Fire Potential Salvage

Harvest Parameters	**Estimated potential salvageable Volume (MBF)**
All Douglas-fir 20” DBH or larger	6,393
Above parameter *and* retain two 26” DBH trees/acre	4,683
Douglas-fir 50” DBH or greater	2,631

c. Pre-fire Condition of Past Harvest Units

Prior to its designation as an LSR by the NFP, the North Fork Silver Creek watershed was intensively managed for timber production beginning in the late 1960s continuing through the early 1990s. Primary harvest methods were clearcut, partial cut, and overstory removal. Stand data from the Sourgrass timber sale (USDI 1985) identifies the types of mature forest stands that existed prior to the Biscuit Fire. Stand ages ranged from 90-250 years old with site class productivity indexes of 4 and 5. Conifer basal area of harvest units ranged from 85-190 ft^2/ac with average tree diameters of 22-28"DBH. Conifer volume ranged from 10-44 MBF/acre. Diameter growth was 6/20th (last ten year cycle) and basal area growth was slow. Stands contained at least two canopy layers. The upper canopy contained trees consistent with identified plant associations. Few stands had fully developed mid canopy layers. The mid canopy layer contained shade tolerant species such as Douglas-fir, chinquapin and tanoak. High stem counts of white fir seedlings and saplings had spread within all plant series. Douglas-fir seedling and sapling reproduction was infrequent or located in small mosaic patches. Shrub layers included a heavy cover of tanoak or Sadler oak. Ceanothus and manzanita cover varied, depending on overstory canopy cover. All reforestation units in the North Fork Silver Creek watershed had received extensive stand development treatments and met BLM stocking standards prior to the Biscuit Fire.

Approximately 2,000 plantation acres were burned in North Fork WA by the Biscuit Fire and were evaluated post fire for potential replanting. Non-plantation units will be evaluated in fall 2003 for planting potential. Several hundred acres will be planted in fall 2003. Approximately 1,700 acres are proposed for planting by 2004. Maintenance and stand development treatments are planned to resume on planted acres. Table 11 identifies the planting as of December 2003.

Table 11: Burned Areas Proposed for Conifer Reforestation in 2003-2004

Location (Operational Inventory unit)	Unit Name	Acres	Proposed/ Treatment Date
35S-09W-2-012	Sourgrass	46	Fall 2003
35S-09W-3-008	Sourgrass Salvage	30	Fall 2003
34S-09W-33-001	Sourgrass-f.s. Road	7	Fall 2003
34S-09W-34-006	Hobson Horn	22	Fall 2003
34S-09W-34-007	Sourgrass-hobson	15	Fall 2003
35S-09W-2-018	Sourgrass	54	Fall 2003
35S-09W-2-019	Sourgrass	13	Fall 2003
35S-09W-3-015	Sourgrass	50	Spring 2003
35S-09W-11-003	Sourgrass	23	Fall 2003
35S-09W-3-014	Sourgrass	34	Fall 2003
35S-09W-12-018	Silver Spur	36	Fall 2003
35S-09W-12-019	Silver Spur	26	Fall 2003
35S-09W-13-006	Galice Fire/ Silver Spur	17	Fall 2003
35S-09W-13-010	Silver Spur	10	Fall 2003
35S-09W-14-002	Silver Spur	32	Fall 2003
35S-09W-14-014	Silver Spur	39	Fall 2003
35S-09W-14-015	Silver Spur	19	Fall 2003
35S-09W-15-013	Silver Spur	7	Fall 2003
35S-09W-15-014	Silver Spur	15	Fall 2003
35S-09W-23-001	Silver Spur	38	Fall 2003
35S-09W-23-005	Silver Spur	13	Fall 2003
35S-09W-21-005	Silver Spur	14	Fall 2003
35S-09W-3-012	Sourgrass	50	Fall 2003
35S-09W-10-009	Sourgrass	38	Fall 2003
35S-09W-2-004	Sourgrass	21	Fall 2003
35S-09W-3-018	Sourgrass	11	Fall 2003
35S-09W-9-009	Silver Creek	74	Fall 2003
35S-09W-10-004	Sourgrass	24	Fall 2003
35S-09W-10-008	Unknown - Pre-80	33	Fall 2003
35S-09W-11-008	Silver Spur	67	Fall 2003
35S-09W-12-016	Silver Spur	18	Fall 2003

Table 11: Burned Areas Proposed for Conifer Reforestation in 2003-2004			
Location (Operational Inventory unit)	**Unit Name**	**Acres**	**Proposed/ Treatment Date**
35S-09W-12-017	Silver Spur	29	Fall 2003
35S-09W-13-004	Soakar Creek	9	Fall 2003
35S-09W-14-003	Sour Silver	19	Fall 2003
35S-09W-14-008	Silver Spur	28	Fall 2003
35S-09W-14-009	Silver Spur	31	Spring 2003
35S-09W-14-011	Silver Spur	8	Fall 2003
35S-09W-14-013	Soakars Ck	9	Fall 2003
35S-09W-14-017	Cedar Swamp	17	Fall 2003
35S-09W-15-001	Sour Silver	100	Fall 2003
35S-09W-15-005	Cedar Flat	30	Fall 2003
35S-09W-15-008	Silver Cat Scarif	20	Fall 2003
35S-09W-15-009	Cedar Flat	5	Fall 2003
35S-09W-16-010	Unknown - Pre-80	9	Fall 2003
35S-09W-16-011	Unknown - Pre-80	11	Fall 2003
35S-09W-17-005	Silver Creek #4	32	Fall 2003
35S-09W-17-006	N Fork Silver Creek	15	Fall 2003
35S-09W-20-005	Hawk Creek	41	Fall 2003
35S-09W-22-003	Cedar Flat	23	Fall 2003
35S-09W-11-004	Sourgrass	41	Fall 2003
35S-09W-11-013	Unknown - Pre-80	20	Fall 2003
35S-09W-9-001	Old Silver Cr.	21	Fall 2003
35S-09W-12-003	Unknown Pre-80	18	Fall 2003
35S-09W-10-001	Sourgrass 2-10	16	Fall 2003
35S-09W-10-005	Unknown - Pre-80	11	Fall 2003
35S-09W-16-003	Silver Creek	32	Fall 2003
35S-09W-2-011		39	Fall 2003
35S-09W-20-001	Hawk Creek	16	Fall 2003
35S-09W-21-004	Hawk Creek	18	Fall 2003
35S-09W-3-009	Sourgrass	5	Fall 2003
35S-09W-3-010	Sourgrass	19	Fall 2003
35S-09W-14-020	Silver Spur	4	Fall 2003
35S-09W-15-016	Silver Spur	2	Fall 2003
35S-09W-1-021		26	Fall 2003
35S-09W-3-021	Sourgrass Salvage	5	Fall 2003

d. Landscape Patterns

The watershed experienced two large-scale fire events in the last 20 years: the Galice Fire in 1987 and the Biscuit Fire in 2002. The 1920 O&C revestment notes indicate that most 40 acre parcels in T39S, R9W, had experienced some level of fire intensity.

The Biscuit Fire altered mature conifer stand structure. High intensity fire destroyed entire conifer components of forest stands in: the Hawk Creek drainage; southwest corner of the BLM portion of the Biscuit Fire in Section 16 and 17; and the lower reaches of North Fork Silver Creek. A contiguous overstory network of large green trees in Section 3 remains due to less severe fire (primarily an under burn).

A mosaic of 30-40 acre spot fires located throughout the watershed, were of moderate to high burn severity. Approximately 60% of these areas were in plantations, which show 85-90%

mortality. The remaining 40% were in non plantation areas, characterized as open growth shelterwood stands of Douglas-fir and sugar pine with a tanoak understory and little or no mid-level canopy. Mid-size tanoak and deciduous hardwoods experienced 80% mortality. The surviving 20% are mainly trees greater than 24”DBH or trees located in draws. Few medium size green trees remain.

The fire consumed most mid to high elevation stands. Hardwoods and brush species that were top killed or partially scorched now have a great advantage over conifers due to their newly acquired position in the canopy and their ability to resprout (tanoak, madrone) or germinate from seed banks (manzanita, ceanothus). The ridges have an abundance of these fire adapted species, especially on east and southeast slopes. Due to the aggressive nature of these species, sites are likely to have an impenetrable growth of brush within 5-10 years.

A higher percentage of the remaining green stands are in riparian areas, along draws and in areas the spot fires missed, effectively interlacing burned areas with functioning forest stands. The potential for early seral conifer stand conditions has increased significantly. Without further disturbance (fire or management activities to reduce competing brush and hardwoods) conifer regeneration will be limited for several decades.

3.5. SPECIES AND HABITATS

3.5.1. Botany

a. Overview

The responsibilities of the BLM include the active management of special status as well as survey and manage species and their habitats, special areas and native plants. The following are protection categories used as guidelines for management of special status and survey and manage species and their habitats.

Listed and proposed listed species are formally listed by the U.S. Fish and Wildlife Service (USFWS) as endangered or threatened or officially proposed for listing. The goals are to enhance or maintain critical habitats, increase populations of threatened and endangered plant species on federal lands, and to restore species to historic ranges consistent with approved recovery plans and federal land use plans after consultation with federal and state agencies.

State listed species are those plants listed under the Oregon Endangered Species Act. Conservation will be designed to assist the state in achieving its management objectives.

Candidate and Bureau-sensitive species are federal or state candidates and those species that BLM believes might become federal candidates. Bureau-sensitive species are usually categorized as List 1 under the Oregon Natural Heritage program (ONHP 2001). List 1 species are threatened with extinction or presumed to be extinct throughout their range. The broad goal is to manage habitats to conserve and maintain populations of candidate and Bureau-sensitive plant species at a level that will avoid endangering the species, which could lead to listing as endangered or threatened by either state or federal governments.

Bureau assessment species are considered by the BLM as important to monitor and manage, but not to the same extent as candidate or Bureau-sensitive species. The goal is to manage where possible so as not to elevate their status to a higher level of concern. These species are usually List 2 species under the ONHP (2001). List 2 species are threatened with extirpation or presumed extirpated from the state of Oregon. These are often peripheral or disjunct species which are of concern when considering species diversity within Oregon.

BLM tracking and **BLM watch** species are not currently special status species, but their locations are tracked during surveys to assess future potential needs for protection. They are usually List 3 or 4 under the ONHP (2001). List 3 species need more information before their status can be determined, but may be threatened or endangered in Oregon or throughout their range. List 4 species are of conservation concern but are not currently threatened or endangered. This includes taxa that are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered (ONHP 2001).

Survey and manage (S&M) species were identified in the NFP as needing special management attention (USDA, USDI 1994). A supplemental EIS amending the S&M guidelines was published in 2001. Category A & C species must be managed at known or high priority sites and be located prior to ground disturbing activities. Categories B, D & E do not require pre-disturbance surveys, but do require strategic surveys and management of known or high priority sites. Category F species only require strategic surveys and do not dictate management of known sites. Strategic surveys are region wide, not focused at the project scale. Their purpose is to collect information to help determine the overall or range-wide status of these species. Annual species reviews have changed the status of several S&M species.

Research Natural Areas (RNAs) and **Areas of Critical Environmental Concern (ACECs)** are designated specifically for scientific and educational purposes. Both are nominated and designated through a process guided by BLM's Resource Management Planning regulations and policy. ACECs were developed under the Federal Land Policy and Management Act and are unique to the BLM. RNAs can be found on other federal lands.

Prior to the Biscuit Fire, botanical surveys in the North Fork Silver Creek watershed focused on vascular plants in plantations. The plantations were surveyed prior to brushing or pre-commercial thinning. These areas, for the most part, experienced high burn severity in the Biscuit Fire.

Following the fire, a noxious weed survey was completed for BLM lands burned under high and moderate severities. Special status vascular plants were reported incidental to the survey. Also, a vascular plant survey was done for the North Fork Silver Creek RNA, reports of which are still pending. Special status surveys, including non-vascular species, are being completed for approximately 1,000 acres of potential salvage and for fuel breaks along fire lines and ridge lines.

Some unusual plants not found in other portions of the Medford District occur in the North Fork

Silver Creek watershed.

b. Known/Potential Species and Fire Effects

Table 12 lists the special status and Bureau tracking species that have been found or are suspected to occur in the North Fork Silver Creek watershed.

Table 12: Special Status and Bureau Tracking Species

Species	Protection Status	Habitat	Considerations
Frasera umpquaensis Umpqua gentian	Bureau Sensitive ONHP List 1	Moist true fire forests, in openings or edges	Sparsely extends from central OR to Klamath Mts.
* *Leucothoe davisiae* Sierra (Siskiyou) Laurel	Bureau Assessment ONHP List 2/3	Wetlands, riparian	Curry County into California
Carex livida Livid sedge	Bureau Assessment ONHP List 2	Wetlands	Potentially a new species endemic to this region.
Lomatium engelmannii Engelmann's desert parsley	Bureau Assessment ONHP List 2	Gravelly, metamorphic slopes	New sighting to Medford District
Saxifragopsis fragarioides Joint leaved saxifrage	Bureau Assessment ONHP List 2	Rocky crevices	Recently found.
Cypripedium californicum California ladyslipper	Bureau Tracking OHNP List 4	Wetlands, riparian	Endemic to the Klamath/Siskiyou Mts.
Darlingtonia californica California pitcher plant	Bureau Tracking ONHP List 4	Wetlands/fens, riparian	Tillamook County south to northern CA
***Kalmiopsis leachiana* Kalmiopsis	Bureau Tracking ONHP List 4	Dry, mountainous areas	Kalmiopsis wilderness and scattered sites adjacent
Bensoniella oregana Bensonia	Bureau Sensitive ONHP List 1	Riparian areas	Suspected; found on Forest Service
Eriogonum lobbii Lobb's buckwheat	USFS Sensitive ONHP List 2	Gravelly ridges/talus; Silver and Indigo creeks	Suspected; found on Forest Service
Gentiana setigera Waldo gentian	Bureau Sensitive ONHP List 1	Wet meadows, fens on serpentine	Suspected; found on Forest Service

* Currently a Bureau Tracking (ONHP List 3) species that has been recommended for a status change to OHNP List 2 which would make it Bureau Assessment.

** Site was reported in 1989 but has not been relocated since then.

Table 13 lists the Survey and Manage species that could occur in this watershed based on habitat potential and proximity to known sites. No survey and manage species have been found to date.

Table 13: Survey and Manage Plants Suspected or known to Occur in the Watershed

Species and Status	Habitat
Vascular Plants	
Clustered lady's slipper *Cypripedium fasciculatum*	Old growth forest; dry or damp, rocky to loamy sites; 60-100% shade. Elevation 1,300-7,300'. Bureau Sensitive/ONHP List 1, recommended List 2.
Mountain lady's slipper *Cypripedium montanum*	Old growth forest; found on moist sites but may occur on dry sites in other parts of its range. Elevation 650-7,000'. Bureau Tracking/OHNP List 4.
Bryophytes	
Moss *Tetraphis geniculata*	Occurs on rotten wood, prefers the cut end of old-growth logs in cool, humid, shaded locations at low to middle elevations. A closed canopy provides the best micro climate. ONHP List 3
Fungi	
Blue Chantrelle ***Polyozellus multiplex***	In association with roots of ***Abies*** in late-successional mid-elevation montane conifer forests
Lichens	
Hypogymnia duplicate	Mid-elevation old growth Douglas-fir; coast range bog

Table 13: Survey and Manage Plants Suspected or known to Occur in the Watershed	
Species and Status	**Habitat**
Pseudocyphellaria rainierensis	Mid-elevation old growth Douglas-fir. ONHP List 3.

Habitat conditions for the above species have dramatically changed due to the Biscuit Fire. Previously known plant sites experienced varying fire effects, resulting in at least short term impacts in high and moderate burn severity areas. Long term effects are unknown, especially to habitat in the 44% of area where the canopy was documented as dead (post-Biscuit satellite data).

The majority of known sites for vascular plants were relocated after the Biscuit Fire. These sites showed some level of short term survival except in the case of *Frasera umpquaensis.* This species has been monitored for eight years in permanent plots near Sourgrass saddle and Hobson Horn. A Joint Fire Sciences research grant funded the relocation of these monitoring plots, which burned under varying severities. Preliminary observations showed that the hotter an area burned and the longer it smoldered (*i.e.* the more the duff and litter layer removed), the fewer plants survived (or at least emerged one year post-fire). In an area that experienced a moderate severity burn the study population showed 100% loss. Other preliminary effects included reduced flowering at all plots and smaller plant stature where some fire impacts occurred.

For *Leucothoe davisiae*, more populations were found post-fire than pre-fire because a larger area was surveyed following the fire. Occurrence numbers jumped from eight to approximately 25. This species is predominantly in riparian corridors and fens. Populations were charred, but will probably survive.

Cypripedium californicum and *Darlingtonia californica* tend to co-exist in fens (along with *Leucothoe davisiae)* within the watershed. Post fire surveys located more occurrences than were known prior to the Biscuit fire, but there is no complete information on how many occurrences existed prior to burning. Both species are endemic to southwestern Oregon and northwestern California, with the pitcher plant's northern range extending into Tillamook County. *Cypripedium californicum* has the narrowest range of all lady slippers known in Oregon and is endemic to the Siskiyou Mountains. Fens burned under varying severities. However, changes in productivity and occurrence cannot be quantified due to a lack of pre-fire data. Information collected after previous fires (Mendenhall) showed that fen populations recovered well due to reduced thatch, which gave the California pitcher plant space to grow.

Another wetland species is *Carex livida*. One site was located in the watershed. It is a species more likely to be found in the serpentine fens of the Illinois Valley. It is currently undergoing taxonomic research to determine if the species found in southwestern Oregon is actually a new species, different from populations in other parts of the state.

Lomatiun engelmannii data is still being gathered. To date, two sites have been found in the watershed. It is limited to ultramafic soils and its populations are typically small. This species is difficult to identify in the field which could lead to underestimated occurrences.

At least five occurrences of *Saxifragopsis fragarioides* have been recently discovered. This species is found in rock outcropping crevices, a habitat easily protected during management activities.

One population of *Kalmiopsis leachiana* was reported in 1989 in the watershed. It also occurs on adjacent Forest Service land. Return visits have not been successful in re-locating the population. The 1989 report, however, predicted that the population would be shaded out within 10 years. Therefore, potential population decline and shrub density may have made relocation difficult. The population was not found post-fire and future visits would be needed to determine the population's existence.

Bensoniella oregana has been found on Forest Service lands in the Silver Creek watershed and also on BLM lands. Due to lack of pre-fire surveys, it can be hypothesized that the species may have occurred and may have been affected by burning in the riparian zone. This species is not known to be tolerant to fire.

Eriogonum lobbii has also been found on Forest Service lands within the Silver Creek watershed. The majority of known occurrences are on gabbro based soils, which are found in the BLM portion of the watershed. Therefore, the species is suspected to occur on BLM lands. Its primary habitat occurs on open ridges and balds, which experienced moderate and high burn severities.

Gentiana setigera is another suspected species for the watershed. It has been found nearby on Forest Service lands in fens.

A species of concern in the watershed is Brewer spruce (*Picea breweri).* This paleo-endemic is intolerant of fire. Its thin bark and hanging branches promote easy torching and charring on the boles. The Biscuit Fire may have killed numerous stands of this species. Very little Brewer spruce occurs on BLM land in the North Fork Silver Creek watershed.

The S&M species that may occur in the watershed are all dependent upon moist, shaded habitats. Since the Biscuit fire reduced the live canopy area by 44% (post-Biscuit satellite data), it can be hypothesized that less habitat is currently available for these species.

c. Noxious Weeds and Exotic Plants

Table 14 lists the noxious weeds reported during the 2003 survey completed under the Biscuit Fire Emergency Stabilization and Rehabilitation plan.

Table 14: Known Noxious Weeds and Exotic Plants

Species	Habitat
Bull thistle *(Circium vulgar)*	Every road or landing seems to have at least one plant.
Canadian thistle (*Circium arvense*)	Disturbed areas, wetlands; invading pitcher plant fens.
Diffuse knapweed *(Centauria diffusa*)	Disturbed areas, primarily old gravel pits.
Klamath weed *(Hypericum perforatum*)	Along roads, landings, meadows, skid trails and plantations.
Himalayan blackberry (*Rubus discolor*)	Patches along roadsides, disturbed areas, mostly riparian.
Tansy ragwort *(Senecio jacobaea*)	Disturbed areas, primarily gravel pits and wetlands including California pitcher plant fens.
Mullein *(Verbascum thapsus)*	Disturbed areas, roadsides and gravel pits.

Noxious weed occurrences may have been temporarily set back due to the Biscuit Fire. Given the amount of fire disturbance, however, these pioneer species may vigorously return or expand. For example, Himalayan blackberry is one of the first species to return / resprout in high severity burns within riparian corridors. Many of these populations will be young and small.

d. Unique Plant Associations

Atzet et al. (1996) identified at least three plant associations found only on BLM lands in the vicinity of the North Fork Silver Creek watershed. Two associations are found only in T34 and 35S, R8 and 9W within the watershed.

The Tanoak-Golden Chinquapin-Sugar Pine is only found in T35, R9. Jeffrey pine dominates the overstory, but tanoak regeneration is abundant in the understory. It's found only on ultramafic soils.

The Tanoak-Golden Chinquapin/Salal-Sadler Oak is found in both townships/ranges. It is not associated with ultramafic soils, but tends to be on rocky soils. Atzet et al. (1996) note that it includes ice age relics (also called paleoendemics).

The Tanoak-Douglas-fir/Sadler Oak-Dwarf Oregon grape was not identified as specifically as the other two associations. It is described as occurring in the northwestern corner of the Grants Pass Resource Area in sandstone with high surface rock content. It is typically dominated by Douglas-fir, but sugar pine can be a component of the canopy. This is the association where pockets of knobcone pine can be found.

Species richness is low in these three associations, probably due to rocky, droughty soils.

Two Port-Orford-cedar associations are found in the upper reaches of the Silver creek and Howard Creek watersheds. They are Port-Orford-Cedar-Tanoak/Salal and Port-Orford-cedar-Western Hemlock/Sierra Laurel. The latter is most unique because of its association with Siskiyou (Sierra) laurel.

e. Special Areas

The North Fork Silver Creek RNA occupies 600 acres on north facing slopes in this watershed. It is a forest stand that is largely been unentered by past forest management activities, except for the upper slopes, where some harvesting occurred. It contains a first order stream system that feeds into the North Fork Silver Creek. It is primarily a Douglas-fir-white fir forest grading into white fir towards the upper slopes. It was designated as part of a regional system of RNAs throughout Oregon and Washington which represent specific vegetation communities or cells. Their purpose is to ensure that all vegetation associations are well represented. North Fork Silver Creek RNA encompasses a mid-elevation Douglas-fir-white fir cell, a white fir forest at mid-elevation with Oregon grape, myrtle boxwood and chinquapin in the understory cell and a first to third order stream system on metamorphic rocks in the western Siskiyou cell.

A discrepancy was discovered with the RNA boundaries during a vascular survey in 2003. The

original topographic map in the RNA nomination document varies from the one on the Medford District GIS layer. The current map layer does not include the white fir forest cell. It appears that the original nominated acres (600) were reduced to 499, most likely to remove plantations. The acreage that was removed encompasses most of the white fir dominated plant associations for which the RNA was designated.
Plant associations identified during the 2003 vascular survey were 1) tanoak/white fir/dwarf Oregon grape, 2) Douglas-fir/golden chinquapin/dwarf Oregon grape, 3) sugar pine/Sadler oak, 4) tanoak/Douglas-fir/canyon live oak/dwarf Oregon grape, 5) Douglas-fir/salal/pacific rhododendron. Two riparian areas, one for the first and second order streams and one for North Fork Silver Creek were also described. Species richness was highest in riparian areas with 52 species in the first/second order streams and 77 species in riparian areas associated with North Fork Silver Creek. The sugar pine/Sadler oak association had the highest upland species richness with 57 species. It had the second highest shrub richness (19 species) behind North Fork Silver Creek (22 species). No special status or survey and manage species were found, except for the Bureau tracking species, *Leucothoe davisiae* and *Darlingtonia californica.*

3.5.2. Wildlife

a. Habitats

The watershed's coniferous forests vary in age and structure. The stands have a significant hardwood component, particularly tanoak, which contributes to the structural and vegetative diversity. The plant communities and habitats support an array of native wildlife. Key habitats in the watershed include late-successional forest, pine stands, riparian areas, and special habitats such as caves, mine adits, and talus. Oak stands and meadows are a very minor component of this watershed, but are important where they exist. All of these habitats have been impacted by processes such as the Biscuit Fire and timber harvesting and road building.

1) Upland Habitats

Upland forests dominate the watershed with numerous conifers, hardwoods, shrubs, and herbaceous species. Many of the hardwoods are berry and mast producers that offer a rich food source for wildlife. They include tanoak *(Lithocarpus densiflorus)*, canyon live oak (*Quercus chrysolepis*), California hazel *(Corylus cornuta),* Pacific madrone *(Arbutus menziesii)* and manzanita *(Arctostaphylos spp.)*. Pacific madrone occurs in very few areas of the watershed.

Upland habitat conditions range from early to late-seral stages. Many early seral stands are the result of past timber harvest. Numerous roads have been constructed throughout the uplands. High road densities contribute to disturbance and fragmentation of late-successional forest patches and decrease the effectiveness of a number of habitats. Roads also contribute to increased vehicular/human disturbance and provide access for poaching. Conversely, areas with low road densities offer refugia from human disturbance. The North Fork Silver Creek RNA and sections 4 and 9 is a large unroaded area.

2) Riparian Habitats

Riparian areas are typically the most heavily used habitat by both humans and wildlife. Many life cycle requirements of animals are met in these areas. Aquatic and amphibious species are intrinsically tied to these habitats, as are all the species that feed on these animals. There are approximately 1,473 acres of riparian reserves within the North Fork Silver Creek watershed. Riparian areas on federal lands have been affected by past practices such as timber harvest, mining, and natural disturbances, such as fire. During the Biscuit Fire, the riparian areas burned with a range of intensities. The most severely burned riparian areas, such as lower North Fork Silver Creek, experienced high canopy and understory vegetation mortality. Severely burned areas reduce the potential foraging and dispersal corridors for a variety of wildlife species.

Area streams and creeks have good water quality and support amphibians, such as the tailed frog (*Ascaphus truei*), which need very cold, clear, fast moving streams.

3) Specialized/Sensitive Habitats

Special and unique wildlife habitats include: 1) naturally scarce habitats such as caves, springs, mineral licks, 2) rare habitats resulting from human influence on the environment (low elevation old-growth, oak/grasslands, etc.) and 3) rare habitats due to natural cycles (snags, meadows, fens, etc.). Often, these habitats receive a greater level of use by wildlife than surrounding habitats, or are essential for certain aspects of a particular animal's life history (*e.g.,* hibernation).

The North Fork Silver Creek watershed contains a number of unique habitats. The continued maintenance of these habitats will determine the presence of many sensitive species. Relevant sensitive habitats are discussed below.

Late-successional forest habitat is characterized by stand conditions such as down wood, snags, high canopy closure and understory structure. Late-successional forests include forest stands greater than 80 years old (NFP / RMP). Most of the 47 special status species expected to occur in this watershed are associated with late-successional forest habitats.

The watershed contains 7,687 acres (91% of the watershed area) of the Fish Hook/Galice LSR. However, this watershed does not contain large blocks late-successional forest habitat due to past timber harvest and fires (1987 Silver Fire and the Biscuit Fire). These activities and events reduced the quantity and distribution of late-successional habitat in the watershed.

According to the vegetation condition class summary for the watershed, approximately 3,650 acres in the watershed were in mature forest conditions before the Biscuit fire. This represents approximately 43% of the 8,486 BLM watershed acres. Approximately 1,318 acres of the 3,650 pre-fire mature stands burned at moderate to high severity levels. Approximately 44% of the canopy has been lost due to the recent Biscuit Fire according to post-fire satellite data. This represents a potential loss of suitable of forage, breeding habitat, and cover for many state and BLM listed sensitive species dependent on late-successional forest habitats.

Due to the wide variety of niches, mature and old growth forests have a greater diversity of wildlife species than do younger forested stands. The size of these forest patches and their connectivity largely determine their suitability for many wildlife species such as the American marten (*Martes americana*) and northern spotted owl (*Strix occidentalis*).

Meadows – There are very few meadows the North Fork Silver Creek Watershed. Those that do occur are very small (< 5 acres) and have been heavily encroached upon by brush and young conifers. Due to their small size and poor quality, these meadows provide little habitat or forage for meadow dependent species.

Dispersal corridors aid in gene pool flow, natural reintroduction and successful pioneering of species into previously unoccupied habitat. Animals disperse across the landscape for a number of reasons including food, cover, mates, refuge, and to locate unoccupied territories. The vast majority of animals must move during some stage of their life cycle (Harris and Gallagher 1989).

Dispersal corridors are usually located in saddles, low divides, ridges, and along riparian areas. Without such corridors, many isolated wildlife habitats would be too small to support the maximum diversity of species. Numerous ridgelines within the watershed allow for localized and regional dispersal. Dispersal between drainages is also accomplished through low divides. As part of the Fish Hook/Galice LSR, the North Fork Silver Creek watershed provides connectivity between the Kalmiopsis and Wild Rogue Wilderness areas. The loss of forest structure in moderate to high severity burned areas could affect dispersal corridors within the watershed and between the wilderness areas.

Dispersal corridors provide hiding and resting cover. Connectivity is particularly important for certain fur bearers, such as fisher and marten (USDA, USDI 1994) and species such as the northern spotted owl (*Strix occidentalis*), which depend on higher levels of canopy closure to successfully move between habitats without becoming victims of predators such as great horned owls (*Bubo virginianus*) and red-tailed hawks (*Buteo jamaicensis*) (Forsman *et al*. 1984). Movement of northern spotted owls between large areas is thought to be crucial to long term population viability (Thomas *et al*. 1990).

Riparian reserves serve as important dispersal corridors across the landscape because they often provide late-successional habitat. Severely burned riparian areas, such as lower North Fork Silver Creek, represent a loss of potential dispersal corridors for a variety of wildlife species.

Mine adits play a critical role in the life history of many animals, providing shelter from environmental extremes, seclusion and darkness. Mines are the primary habitat for species such as Townsend's big-eared bat *(Corynorhinus townsendii)*, a ROD buffer species and Bureau sensitive species. Other species such as the bushy-tailed woodrat *(Neotoma cinerea)* and the cave cricket *(Ceuthophilus spp.)* use caves as their primary residence. These sites are also used seasonally for a number of species such as ringtails, bats (roost sites) and porcupine *(Erethizon dorsatum)* (dens). A number of mine adits are located in the watershed although recreational use limits their value for wildlife as it displaces easily disturbed species. Old cabins associated with these adits also provide roosting opportunities for bats.

b. Species

Diverse soils, vegetation and habitats in this watershed could support a wide variety of animal species. Distribution, abundance, and presence for the majority of species are unknown because few formal wildlife inventories were conducted prior to the Biscuit Fire. Only a few surveys for key special status species have been done since the Biscuit Fire.

More than 200 vertebrate and thousands of invertebrate wildlife species could occur within the North Fork Silver Creek watershed. This includes 47 vertebrate special status species (15 mammals, 19 birds, and 13 reptiles and amphibians), as well as eight invertebrate special status species. Of these 47 special status species, most are associated with older forest habitats.

Federal agencies are responsible for the active management of special status and survey and manage species and their habitats. The special status protection categories (described in the preceding botany section) serve as guidelines for special status species management and their habitats. In addition to these categories, an additional wildlife category is USFWS Birds of Conservation Concern (2002) the goal of which is to aid conservation of these species by avoiding and minimizing unintentional take to the extent practical.

1) Special Status Species

Tables 15 and 16 list known and potential special status species found in the watershed, along with status and level of survey as of September, 2003. This list includes species listed under the ESA, proposed for listing, and candidate species being reviewed by the USFWS. State listed species as well as Bureau assessment species and species listed in the ROD as "Buffer" species are also listed and Northwest Forest Plan Survey and Manage species are also indicated. (For more information on this list and habitat needs see Appendix C.)

Table 15: Special Status Species (Vertebrates)

Common Name	Scientific Name	Presence	Status*	Survey Level (as of 9/2003)
Gray wolf	*Canis lupus*	absent	FE,SE	none to date
Red tree vole	*Aborimus longicaudus*	suspected	BS, SM	none to date
Fisher	*Martes pennanti*	suspected	BS,SC,FC	limited
California wolverine	*Gulo gulo luteus*	unknown	BS,ST	limited
American marten	*Martes americana*	unknown	BT,SV	limited
Ringtail	*Bassacriscus astutus*	present	BT,SU	limited
Peregrine falcon	*Falco peregrinus*	migratory	BS,SE, BOCC	none to date
Bald eagle	*Haliaeetus leucocephalus*	migratory	FT,ST	none to date
Northern spotted owl	*Strix occidentlis*	present	FT,ST	limited surveys
Northern goshawk	*Accipiter gentilis*	suspected	BS,SC	none to date
Mountain quail	*Oreortyx pictus*	suspected	BT,SU	none to date
Pileated woodpecker	*Dryocopus pileatus*	present	BT,SV	incidental sightings
Lewis' woodpecker	*Melanerpes lewis*	present	BS,SC,BOCC	Incidental sightings
White-headed woodpecker	*Picoides albolarvatus*	unknown	BS,SC,BOCC	none to date
Flammulated owl	*Otus flammeolus*	unknown	BS,SC.BOCC	none to date
Purple martin	*Progne subis*	unknown	BS,SC	none to date
Great gray owl	*Strix nebulosa*	unknown	BT,SV,SM	none to date
Western bluebird	*Sialia mexicana*	present	BT,SV	none to date
Acorn woodpecker	*Melanerpes formicivorus*	unknown	BT	none to date
Tricolored blackbird	*Agelaius tricolor*	unknown	BA,SP	none to date
Black-backed woodpecker	*Picoides arcticus*	unknown	BS,SC,	none to date
Bank swallow	*Riparia riparia*	migratory	BT,SU	none to date
Olive-sided flycatcher	*Contopus cooperi*	unknown	BT,SV,BOCC	none to date

Table 15: Special Status Species (Vertebrates)				
Common Name	**Scientific Name**	**Presence**	**Status***	**Survey Level (as of 9/2003)**
White tailed kite	*Elanus leucurus*	migratory	BA	none to date
Willow flycatcher	*Epidonax traillii brewsteri*	unknown	BT,SV	none to date
Rufous Hummingbird	*Selasphorus rufus*	unknown	BOCC	none to date
Townsend's big-eared bat	*Corynorhinus townsendii*	suspected	BS,SC	limited surveys
Fringed myotis	*Myotis thysanodes*	present	BA,SV	limited surveys
Yuma myotis	*Myotis yumanensis*	present	BT	limited surveys
Long-eared myotis	*Myotis evotis*	suspected	BT,SU	limited surveys
Long-legged myotis	*Myotis volans*	suspected	BT,SU	limited surveys
Silver-haired bat	*Lasionycterus noctivagans*	suspected	BT,SU	limited surveys
Pacific pallid bat	*Antrozous pallidus*	unknown	BT,SV	limited surveys
Brazilian free-tailed bat	*Tadarida brasiliensis*	unknown	BA	limited surveys
Western gray squirrel	*Sciurus griseus*	present	BT	none to date
Western pond turtle	*Clemmys marmorata*	unknown	BS,SC	limited surveys
Foothills yellow-legged frog	*Rana boylii*	unknown	BA,SV	limited surveys
Red-legged frog	*Rana aurora*	unknown	BA,SU	limited surveys
Clouded salamander	*Aneides ferreus*	suspected	BT,SU	none to date
Southern torrent salamander	*Rhyacotriton variegatus*	present	BT,SV	limited surveys
Black salamander	*Aneides flavipunctatus*	unknown	BA,SP	none to date
Sharptail snake	*Contia tenuis*	suspected	BT,SV	none to date
California mountain kingsnake	*Lampropeltis zonata*	suspected	BT,SV	none to date
Common kingsnake	*Lampropeltis getulus*	suspected	BA,SV	none to date
Northern sagebrush lizard	*Sceloporus graciosus*	unknown	BT	none to date
Del Norte salamander	*Plethodon elongatus*	suspected	BA,SV	none to date
Western toad	*Bufo boreas*	suspected	BT,SV	none to date
Tailed frog	*Ascaphus truei*	present	BA,SV	limited surveys

*STATUS ABBREVIATIONS: FE--Federal Endangered SC--ODFW Critical SM--Survey and Manage
FT--Federal Threatened SV--ODFW Vulnerable BTBBureau Tracking FP--Federal Proposed
SP--ODFW Peripheral or Naturally Rare BA- Bureau Assessment ST--State Threatened
SU--ODFW Undetermined BS--Bureau Sensitive FC--Federal Candidate
SE--State Endangered BOCC – US Fish and Wildlife Service Birds of Conservation Concern list

Table 16: Special Status Species (Invertebrates)			
Common Name	**Presence**	**Status****	**Survey Level (as of 9/2003)**
Oregon Megomphix Snail	Unknown	BT	None to date
Oregon Shoulderband Snail	Unknown	BS	None to date
Cooley's Acalypta Lace Bug	Unknown *	BT	None to date
Travelling Sideband Snail	Unknown	BS	None to date
Franklin's bumblebee	Unknown	BS	None to date
Gray-blue Butterfly	Unknown *	BT	None to date
Coronis Fritillary Butterfly	Unknown *	BT	None to date
Siskiyou Cholealtis Grasshopper	Unknown *	BT	None to date

* = Suspected on Medford District BLM, unknown if range extends into this watershed
** STATUS: BS = Bureau Sensitive; BT=Bureau Tracking

2) Threatened or Endangered Species

Northern Spotted Owl – The northern spotted owl (*Strix occidentalis*), currently listed as threatened under the ESA, is known to nest in the watershed. There is one known activity center in the watershed which is located in the LSR. An active site is one in that has been occupied by a territorial single or pair at least once since 1985. Yearly northern spotted owl surveys have not been conducted in a consistent manner in this watershed; the last time an active pair of birds was located at this site was in 1992. One protocol survey (of six required) was done in 1993 and no birds were located. No surveys were conducted between the 1993 surveys and the Biscuit Fire (2002). In 2003, surveys were conducted at the known site, as well as suitable spotted owl habitat within the Biscuit Fire. Pair status was confirmed at the known site; no other spotted owls were detected.

NSOs nest primarily in late-successional mixed coniferous forest, usually dominated by Douglas-fir. They prefer larger stands with multiple layers and a closed canopy. Dispersal habitat for spotted owls has a canopy closure of 40% or greater, and is open enough for flight and predator avoidance. The McKelvey model is used to classify forest stand type into NSO nesting, roosting, foraging, or dispersal habitat. The model predicts NSO populations based on habitat availability.

In the early 1990s, the mapped forest types were classified and McKelvey ratings determined across the Medford District using photo interpretation without field verification. McKelvey ratings have not been reassessed following the Biscuit Fire. Therefore, no current data, or pre-fire field verified data quantifying the amount of NSO suitable nesting, roosting, foraging, and dispersal habitat in the watershed. Suitable habitat and dispersal corridors for spotted owls were likely reduced following the Biscuit Fire in the moderate and high burn severity areas. Since lower canopy cover is needed for NSO dispersal habitat, more lands within the watershed are likely to be suitable dispersal habitat, rather than suitable nesting, roosting, and foraging habitat after the Biscuit Fire. Areas that were under-burned will recover more quickly and will have a greater chance of becoming suitable nesting, roosting, and foraging habitat in the near future.

All 8,486 BLM acres in the North Fork Silver Creek Watershed are located within a designated NSO critical habitat unit (CHU #OR-65). CHUs were designated prior to the NWFP ROD, to aid in the recovery of the NSO in the absence of a recovery plan.

Marbled murrelet (threatened) critical habitat was designated by the USFWS in May 1996. Critical habitat has not been identified in this watershed, which is outside the expected range of the marbled murrelet. Marbled murrelet surveys have been conducted in this watershed, but no birds have been detected.

Bald Eagle (threatened) - There are no known nest sites in the watershed. Bald eagles could be present in the watershed during dispersal. Preferred nesting habitat consists of older forests, generally near water, with minimal human disturbance. This watershed has no large bodies of water to provide suitable prey and foraging opportunities for Bald eagles

Fisher (candidate) are found in late-successional forests with 40-70% canopy cover and appear to be closely associated with riparian areas in these forests. They mainly use large living trees, snags and fallen logs for denning. Little distribution or density information is known. The closest fisher sighting has been in the nearby Galice Creek drainage. Remote camera surveys have been initiated in this watershed since the Biscuit Fire, but no fishers have been observed.

3) Other Species of Concern

Peregrine falcons nest on ledges on cliff faces. There are no known historic or current peregrine falcon nests or suitable cliff faces in the watershed. The peregrine falcon was de-listed by USFWS in August, 1999 and is no longer a federally listed species. It is currently recognized as a Bureau sensitive species.

Neotropical migratory birds are birds that winter south of the Tropic of Cancer and breed in North America. Studies conducted on the Medford District found that neotropical migrants comprise 42-47% of the breeding species at lower elevation forests dominated by Douglas-fir (Janes 1993). In higher elevation, white fir forests, neotropical migrants are likely less abundant. Therefore, the relatively high elevation of this watershed would indicate few neotropical migrants, although some are known to use this watershed. Potential neo-tropical habitats in this watershed include late-successional forest, riparian areas, pine stands, and brush fields. A loss of nesting habitat, cover and feeding area for the white-headed woodpecker (*Picoides albolarvatus*), a state listed sensitive species, and other migratory birds has occurred as a result of the Biscuit Fire in the severely burned pine stands in the Hobson Horn area.

More then twenty years of breeding bird surveys (BBS), breeding bird census (BBC), winter bird population study, and Christmas bird counts indicate that many bird species are declining. This is particularly true for birds that use mature and old growth forest in the tropics, North America or both (DeSante and Burton 1994). Rates of decline are well documented for birds on the east coast of North America, and less so on the west coast.

A multi-agency agreement, “Partners in Flight”, was launched in 1990 as a long-term monitoring effort to gather demographic information. This monitoring will identify the impact that deforestation and forest fragmentation have on temperate breeding bird populations.

Mariposa copper (*Lycaena mariposa*) is an endemic butterfly to the Siskiyou Mountains and Kalmiopsis Wilderness. The butterfly’s host plant is *Vaccinium myrtillus*; however, this is a high alpine species and is not the same *Vaccinium* species found in this watershed (pers. comm. Mazzu and Mousseaux 2002). In the summer of 2003, surveys at the Hobson Horn *Darlingtonia* bog found no mariposa butterflies. The surveys also noted a lack of suitable habitat, possibly due to the Biscuit Fire.

Game species within the North Fork Silver Creek watershed include elk, black tailed deer, black bear, mountain lions, ruffed grouse, blue grouse, grey squirrels, and mountain quail. The entire watershed is open to hunting during the season appropriate for the particular game species. Population numbers are unknown because few formal surveys were conducted prior to the Biscuit Fire.

Natural fires and past land management practices, especially road building, have increased the amount of forest “edge” in the watershed. Roads affect the suitability of all habitat types. High road densities negatively affect deer and elk and facilitate poaching. Unroaded areas provide refugia for game species. The Sourgrass drainage has the lowest road density in the watershed and includes several large unroaded patches. The North Fork Silver Creek RNA also provides another large unroaded area.

The North Fork Silver Creek watershed provides a mix of thermal cover, hiding cover and forage areas for deer and elk. The Biscuit Fire reduced the amount of thermal and hiding cover for deer and elk as there was a 44% reduction in canopy cover. Deer and elk forage has increased as a result, however. Fire-initiated early seral stands provide forage as sprouting and regrowth occur. Deer and elk populations may increase as a result of the vegetation and habitat type shifts that occurred as a result of the Biscuit Fire. The North Fork Silver Creek watershed is within three miles of the Peavine Mountain area, which supports active elk herds and elk have been observed in the North Fork Silver Creek watershed since the Biscuit Fire.

Snag and down wood dependent species are of special concern. Past timber harvest has reduced the habitat for a variety of species such as bats, woodpeckers, owls, and salamanders, which use snags and down logs. However, the Biscuit Fire created many snags within this watershed especially in older stands. Dead and dying trees have also increased following the fire and will add to the supply of snags and coarse wood over time.

Amphibian species are of concern, especially in riparian areas lacking canopy cover as a result of the Biscuit Fire. No formal amphibian surveys were conducted prior to the fire but several sensitive species were suspected to occur due to the watershed's high water quality. Since the Biscuit Fire, limited surveys have been done in riparian areas. In 2003, amphibian surveys were conducted in a few reaches by the USGS as part of a two year post fire monitoring effort. Tailed frogs (*Ascaphus truei*), pacific giant salamanders (*Dicamptodon tenebrosus*), and southern torrent salamanders (*Rhyacotriton variegatus*) were found during these surveys. Tailed frogs and pacific giant salamanders were also observed during BLM post fire fish surveys.

Band-tail pigeons *(Columba fasciata)* are known to occur in the watershed. Throughout their range, they have shown a great decline in population since monitoring began in the 1950s (Jarvis and Leonard 1993). These birds are highly prized as a game species and restrictive hunting regulations have not increased bird populations. Habitat alteration due to timber harvest may partially explain the population decline (Jarvis and Leonard 1993).

Band-tail pigeons are highly mobile and utilize many forest habitat types. Preferred habitat consists of large conifers and deciduous trees interspersed with berry and mast producing trees and shrubs. In the spring and fall, large flocks migrate through the watershed. The birds use higher elevation habitats to feed on blue elderberries, manzanita berries, and Pacific madrone berries. Fire exclusion has reduced these food sources.

3.5.3. Fisheries

a. General

The Illinois River and its tributaries are important spawning and rearing habitats for both anadromous and resident salmonids. Silver Creek, including North Fork Silver Creek, is a designated Key Watershed. Key watersheds provide a system of watersheds that serve as refugia crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. These refugia include areas of high quality as well as degraded habitat. High quality habitat areas, such as Silver Creek, serve as anchors for the potential recovery of depressed stocks. Key watersheds overlay portions of all land use allocations in the Medford

District and contain additional management requirements or emphasize restoration activities in those areas.

The Illinois River constitutes a significant portion of the remnant native wild fish population/habitat within the Rogue River basin. Thus, the Illinois River watershed is believed to be the stronghold for wild anadromous fish populations in the Rogue basin. Silver Creek is one of the two most important tributaries to the Illinois system in terms of wild fish production because of its relatively unmanaged condition. Silver Creek contains fall-chinook salmon, steelhead trout, rainbow trout, and cutthroat. (USDA 1995) Silver Creek is considered coho salmon Critical Habitat and Essential Fish Habitat under the rules published by the National Marine Fisheries Service. Coho salmon may occupy Silver Creek downstream of natural barriers (USDA 2002). North Fork Silver Creek contains fall Chinook salmon, winter steelhead, rainbow trout and cutthroat trout. Fall Chinook use the lower 1.1 miles of North Fork Silver Creek, while steelhead use 5.0 miles, all the way to the 30' high waterfall that ends all anadromous fish use. Sculpin inhabit North Fork Silver Creek below BLM managed lands. The BLM portion of North Fork Silver Creek contains rainbow trout and although cutthroat trout have not been found, they are suspected to be present.

Silver Creek comprises about 8% of the Illinois River Basin. Silver Creek summer flows contribute approximately 20% of the total Illinois River flow. North Fork Silver Creek is the largest tributary to the mainstem Silver Creek and contributes approximately 40% of the total Silver Creek flow, thus representing a large effect on the water quality of the downstream mainstem (USDA 1995). The BLM portion of North Fork Silver Creek is about 16% of the Silver Creek watershed and contains 13.6 miles of fish bearing streams.

The area is typified by deeply incised streams in narrow rocky canyons, steep slopes, and numerous landslides. The confined nature and relatively steep channel gradients in Silver Creek provide stream power that is adequate to flush much of the sediment supply through its system to flatter or wider areas (USDA 1995). The steep, rugged terrain is similar to that of other areas of the Klamath Mountains of northern California and southwest Oregon.

Large woody debris (LWD) contributes to riparian and stream habitat by providing shade and detritus for terrestrial and aquatic insects. LWD also helps small stream bank stability and improves fish habitat in larger channels. LWD is important for creating habitat complexity needed to rear juvenile anadromous fish and to provide cover. Large wood is delivered to channels primarily by landslides, falling from riparian areas and toe slopes, and transport from steep tributaries (USDA 1995).

Stream meander is important for dissipating stream velocity and increasing winter refuge habitat for juvenile fish. Pool habitat is of particular significance to juvenile salmon during all life stages. Fish production can also be limited by barriers such as road culverts. Yearling juvenile fish can move miles within one watershed, especially during summer months when they seek cool waters. Excessive sedimentation, especially if delivered at the wrong time, can delay spawning and suffocate eggs in redds. Suspended sediment can cause gill damage and secondary infections on wintering juvenile fish which have been stressed from the lack of sufficient winter habitat to allow escape from high water velocities.

Roads located next to streams can disconnect streams from the floodplain, impede stream meander and act as heat sinks. Timber harvest and roads accelerate surface water runoff and erosion of sediment into streams, resulting in decreased macroinvertebrate and fish production. Among forest management practices, logging roads produce the most sediment. The density and length of logging road distribution can be major factors in determining sediment production. Four miles of BLM road #35-9-1 parallel North Fork Silver Creek on BLM land. In some segments, the road may restrict riparian width and shade, and alter channel morphology. During high stream flows, some road segments may occupy the stream channel reducing historic width in some places and may be subject to erosion. Formal stream surveys have not been completed.

Off-channel habitat areas in unconfined and lower gradient streams provide refuge for juveniles during high flows. Properly functioning off-channel habitat areas have frequent active side channels related to large wood and geomorphology.

Summer water temperatures are primarily influenced by stream flow and shade. Stream shade is the amount of solar radiation blocked from the stream by vegetation or topography. Stream shade can be lost naturally (*e.g*. fire, floods) or may result from human activities (*e.g*. harvest, roads, and mining). Stream temperature can be influenced by reduced forest canopies (Amaranthus et al. 1989). In water temperatures exceeding 70ºF, stressed salmonid fish populations may have reduced fitness, greater susceptibility to disease, decreased growth and altered timing of migration or reproduction. Growth slows and eventually ceases as water temperature approaches the upper lethal limit of 75°F (Beschta et al. 1987; USDA 1995. The BLM portion of the North Fork Silver Creek watershed has good water quality including low summer water temperatures. See Water Quality section.

In 1995, a fisheries and riparian habitat improvement treatment occurred on 25 acres along the upper North Fork Silver Creek (USDI 1994). This project included road decommissioning, upland thinning, and riparian reserve treatments. Two main objectives in the riparian reserve were to 1) reduce tree density, focusing on Port-Orford-cedar (POC) and red alder and 2) provide woody material to develop debris jams to improve fish habitat. Due to the gentleness of bank slope and stand density, it was appropriate to thin along the stream bank leaving enough conifers and hardwoods to provide bank stability and shade. Treatments included brushing, precommercial thinning, girdling and hand piling/burning slash less than 6" DBH. Some trees were girdled to provide future large wood to the stream. In the floodplain where *Phytophthora lateralis* infection was evident, all POC was either cut (if less than 6" DBH) or girdled (6" DBH or greater). Along the stream channel, POC occurrence was significantly reduced to provide growing space for other conifers and hardwoods and decrease the potential for infection. Red alders were also girdled due to their high densities along the creek. Slash was allowed to fall into the creek. The largest trees were left intact.

Two years after treatment, results showed fewer live alders and POC and increased coarse wood in the channel. In the spring following treatment, debris jams composed of slashed material began to form along the treated stream reach wherever a root wad or existing log provided an anchor point. Alder stems less than 10" DBH had begun to fall in the stream channel adding larger material randomly along the watercourse, sometimes supplementing existing debris jams.

After a second winter, girdled large alders (up to 14" DBH) had decomposed enough to fall into the stream channel as well as contribute class 1 down logs along the stream bank. Girdled POC had also begun falling into the stream (Betlejewski 1998). The treatment did result in a slight increase in stream temperature but it was still within the optimal range for salmonids. Fish population monitoring in the treatment area and in an upstream untreated control reach shows an increase in population numbers within the treatment reach. Furthermore, the addition of in stream wood has increased channel complexity by creating pools, stream meander and debris jams.

b. Stream Habitat

Table 18 summarizes stream habitat conditions for Class I-IV streams where Oregon Department of Fish and Wildlife (ODFW) protocol physical habitat surveys have been completed. The summary conditions are based on ODFW habitat benchmark standards (Table 19) (ODFW 1996).

Table 17: Stream Habitat

Stream*	Fish Bearing (Y/N)	LWD	Sediment in spawning gravels (silt, organics, sand)	Canopy Closure	Pool Freq.	Residual Pool Depth	Gradient (%)
Cedar Swamp (1996)	Y	A** ($27\ m^3$)	D (7%)	D (96%)	A (10.5)	Unknown	5.7 %
Cedar Swamp (2000)	Y	A ($28.5\ m^3$)	A (13%)	D (93%)	A (9.0)	U (0.44 m)	5.0%
Sourgrass	Y	A ($26.5\ m^3$)	D (0%)	D (93%)	A (17.3)	Unknown	5.5%
North Fork Silver Reach #1	Y	U ($13.2\ m^3$)	D (5%)	D (75%)	A (8.8)	Unknown	4.6%
North Fork Silver Reach #2	Y	U ($10.1\ m^3$)	A (10%)	(95%)	A (10.6)	Unknown	4.0%
North Fork Silver Reach #3	Y	U ($16.1\ m^3$)	U (23%)	(91%)	A (14.5)	Unknown	3.5%
North Fork Silver Reach #4	Y	D ($42.9\ m^3$)	U (44%)	(98%)	A (12.6)	Unknown	5.6%

* See ODFW surveys for maps of reaches and stream segments surveyed.
**See Table 19 below for benchmark standards.

Table 18: Oregon Department of Fish and Wildlife Habitat Benchmarks

Habitat Type	Undesirable (U)	Adequate (A)	Desirable (D)
LWD Volume (m^3) / 100 m stream length	< 20	χ	> 30
Sediment Levels (% fines in spawning gravels)	> 20	χ	< 10
Canopy Closure (%)	< 70	χ	> 75
Pool Frequency (channel widths between pools)	> 20	χ	5-8
Residual Pool Depth (m)	< 0.5	χ	> 1.0

Cedar Swamp Creek is a fish bearing tributary to North Fork Silver Creek. Resident rainbow trout are present in the lower 1.4 miles of the Cedar Swamp drainage, which includes two tributaries. Cutthroat trout, which occupy similar habitat as rainbow trout, are assumed present with approximately the same distribution as rainbow trout.

ODFW conducted a habitat survey of the entire length of Cedar Swamp Creek in 1996. The channel is constrained by hill slopes within a moderate V-shaped valley. Large (12-20"DBH) and second growth timber (6-12"DBH) were found in this watershed. Riparian vegetation consisted of deciduous trees (6-12"DBH) and coniferous trees (6-12"DBH). Rapids were the dominant habitat type found, with an average unit gradient of 5.7%. Large woody debris was 'adequate' at 27 m^3/ 100 meters of stream length. Canopy closure was desirable with an average of 96%. Pool frequency was at adequate levels at 10.5 channel widths per pool.

In 2000, the middle portion of Cedar Swamp Creek was resurveyed by ODFW. This section of the channel was alternately constrained by hill slopes and high terraces in a broad valley and contained mature trees (20-36"DBH). The average unit gradient was 5.0%, with rapids (41%) and scour pools (20%) as the two dominant stream habitat types. Gravel (47%) and cobble (28%) dominated the stream substrate. The most common riparian trees were 20-36"DBH conifers and 6-12" DBH hardwoods. Large woody debris was adequate at 28.5 cubic meters per 100 meters of stream length. Pool frequency was adequate at 9.0 channel widths per pool.

Sourgrass Creek is a fish-bearing tributary to North Fork Silver Creek. Resident rainbow trout are present in the lower 4.6 miles of the Sourgrass drainage which includes three tributaries. Cutthroat trout, which occupy similar habitat as rainbow trout, are assumed present with approximately the same distribution as rainbow trout.

ODFW surveyed the entire length (three reaches) of Sourgrass Creek in 1996. The lower reach was 0.87 miles through a narrow valley with an open V-shape and a channel constrained by hill slopes. Second growth and large timber were present, with a riparian vegetation mix of conifers and young hardwoods. The average unit gradient was 5.1% and rapids (90%) were the dominant habitat type. Large woody debris was adequate ($27m^3$/100m).

The middle reach extended 1.05 miles through a narrow valley with a moderate V-shape and a channel constrained by hill slopes. Mature timber was found with conifers dominating the riparian vegetation. The average unit gradient was 5.5% and rapids (64%) were the dominant habitat type. The volume of large woody debris was adequate ($24m^3$/100m).

The upper reach extended 1.3 miles through a narrow valley with a moderate V-shape and a channel constrained by hill slopes. Second growth and large timber were found, with conifers dominating the riparian vegetation. The average unit gradient was 6.1% and rapids (71%) were the dominant habitat type. The volume of large woody debris was high ($33m^3$/100m).

North Fork Silver Creek contains rainbow trout for approximately 6.2 miles. An unnamed tributary in section 14 contains rainbow trout for 0.3 miles, while another unnamed tributary which enters North Fork from the north in section 15 contains rainbow trout for 1.1 miles. Cutthroat trout, which occupy similar habitat as rainbow trout, are assumed present with approximately the same distribution as rainbow trout.

ODFW conducted a habitat survey from the BLM in Section 17 to the end of North Fork Silver Creek in 1996. The survey consisted of four reaches. The lower reach was 1.6 miles through a narrow valley with a moderate V-shape and a channel constrained by hill slopes. Large timber is found with the riparian vegetation consisting of a mix of conifers and young hardwoods. The average unit gradient was 4.6%, with riffles (44%) and rapids (40%) as the dominant habitat types. The volume of large woody debris was low ($13m^3$/100m).

Reach two was 1.9 miles through a narrow valley with a moderate V-shape and a channel constrained by hill slopes. Large timber and second growth timber was found. The riparian vegetation was a mix of conifers and young hardwoods. The average unit gradient was 4.0%, with rapids (75%) as the dominant habitat type. The volume of large woody debris was low ($10m^3$/100m).

Reach three was 0.9 mile through a narrow valley with a moderate V-shape and a channel constrained by hill slopes. Second growth timber was found with the riparian vegetation consisting of a mix of conifers and young hardwoods. The average unit gradient was 3.5% with riffles (23%) and rapids (61%) as the dominant habitat types. The volume of large woody debris was low ($16m^3$/100m).

Reach four was 1.2 miles through a narrow valley with a moderate v-shape and a channel constrained by hill slopes. Mature timber was located with the riparian vegetation consisting of a mix of large conifers and young hardwoods. The average unit gradient was 5.6%. Riffles (21%) and rapids (62%) were the dominant habitat types. Large wood volume was high (43 m^3/100m).

c. Large Wood

Streams in the North Fork Silver Creek watershed typically have the same primary factors limiting fish production: insufficient instream habitat complexity in the form of large woody debris key pieces (24" or larger in diameter with a length equal to or greater than bankfull width) and lack of mature trees, especially conifers >32" DBH within 100' of the stream. Alders occupy many streams in this watershed and are dominant in heavily managed riparian areas. The alder now constitutes a dense canopy that precludes successful establishment of native conifers. In some instances Douglas-fir stands have developed around the fringes of the alder dominated zone, but are growing slowly as a result of competition for light. Large wood is expected to decline until conifers return to riparian areas (USDA 1995).

Large wood is an important component of stream habitat. It plays a critical part in determining stream productivity. It is an important determinate of stream hydraulics, microsite habitat conditions, feeding substrate, and pool and drop creation. The Southwest Oregon Late-Successional Reserve Assessment (USDA, USDI 1995) lists desirable minimum levels for large wood (outside of the stream channel) after stand replacement (fire with timber salvage) and non-stand replacement (commercial thinning) events. These and the ODFW benchmarks for instream conditions provide standards for evaluating stream and riparian reserve conditions.

Post Biscuit Fire rehabilitation and stabilization monitoring surveys were conducted in the fall of 2002. Table 20 shows the large wood distribution in the surveyed areas. Pre-fire data from these stream segments was not available, but it appeared the fire had caused trees to fall into streams. Although, the Biscuit Fire contributed additional large wood to streams, some surveyed reaches still lacked key pieces of large woody debris.

Table 19: Large Woody Debris

Stream Name*	Pieces** (100m stream length)	Volume (m^3/100m stream length)	Key Pieces*** (100m stream length)
Cedar Swamp Creek	14.8	40.2	1.6
Hawk Creek - Section 17	13.1	23.0	1.1
North Fork Silver Creek Section 11	7.0	2.1	0
Sourgrass tributary Section 3 NW ¼ of SW ¼	18.5	18.9	2.1
North Fork Silver Creek tributary. Section 17 NW ¼ of NE ¼	25.1	49.6	2.7
North Fork Silver Creek tributary. Section 16 NW ¼ of NE ¼	20.5	21.3	0
North Fork Silver Creek tributary. Section 15 NW ¼ of NW ¼	20.5	59.3	2.7
North Fork Silver Creek tributary. Section 14 NW ¼	20.9	32.9	1.8
Sourgrass Creek tributary. Section 9 NW ¼ of NE ¼	22.8	36.1	2.3
Upper Sourgrass Section 3	5.0	26.1	1.4
ODFW Benchmarks******			
Undesirable	<10	<20	<1
Desirable	>20	>30	>3

* Reach length varied among streams.
** Minimum size is 6" × 10'
*** Key pieces are >24" x ≥30'
****ODFW 1996.

d. Macroinvertebrates

Macroinvertebrates were surveyed in 1991, 1992, 1994, 1995, 1996, and 2000 by Aquatic Biology Associates, Inc. The erosional and margin habitat scores have always been in the high or near high range (82-90% erosional, 78-81% margin) and have shown little variation. This could change as wood in the channel decays, is transported downstream and is not replaced from the riparian zone which in some places is primarily red alder. Alder that falls into the channel is not as stable and decays more rapidly than conifers. This stream system demonstrated a lot of resilience or buffering capacity during dramatic swings in drought and flood cycles as seen in the 1990s. This is shown by the erosional and margin habitat scores which have always been in the high or near high range and have shown little variation. Detritus habitat scores have been much more variable, ranging from 78-99% and may be explained by drought conditions. Table 21 summarizes the bioassessment scores. See Appendix D for a more detailed summary of the macroinvertebrate surveys.

Many factors contribute to the macroinvertebrate conditions. Low levels of large instream wood decrease the ability of the stream to retain detritus and nutrients upon which the macroinvertebrates depend. Additionally, without large wood to dissipate energy from high peak flows, macroinvertebrate populations are vulnerable to winter scour.

Table 20: Macroinvertebrate Habitat Condition

Stream	Date	Erosional Habitat	Margin Habitat	Detritus Habitat
N. Fork Silver section 11 upstream of road 35-9-11	1994	High (88.7%)	N/A	Moderate (78.1%)
N. Fork Silver above Cedar Swamp	1996	Moderate (68.5%)	Moderate (78.8%)	Low (68.0%)
N. Fork Silver above Cedar Swamp	2000	Very High (91.1%)	High (86.7%)	High (82.3%)
N. Fork Silver above Sourgrass sec. 16	1992	Very High (82.0%)	N/A	Very High (99.0%)
	1996	Moderate (71.8%)	Moderate (78.8%)	Moderate (73.2%)
N. Fork Silver above Sourgrass	2000	High (81.5%)	High (80.6%)	Very High (91.7%)
N. Fork Silver sec 17, at end of road 35-9-16	1991	High (83.1%)	High (80.6%)	High (92.7%)
N. Fork Silver sec 17, at end of road 35-9-16	1995	Very High (90.3%)	Moderate (77.6%)	High (89.6%)

e. Special Status Species

Coho salmon (*Oncorhynchus kisutch*) is federally listed as threatened. Silver Creek has coho Critical Habitat in the lower reaches (USDA 2002). A series of barriers restrict coho from accessing the upper reaches of Silver Creek. The only special status species in the watershed is cutthroat trout, which is on the Oregon Natural Heritage Program (1998) Status List 3 which includes species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range. This species is also on the state of Oregon's "Vulnerable" list.

Coho salmon in the Silver Creek watershed are part of the southern Oregon/northern California Coho Evolutionarily Significant Units (ESU), which was federally listed as threatened on May 6, 1997 (Federal Register, May 6, 1997). The ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California. Most of the coho in this ESU are in the Rogue River, with the largest remaining population in the Illinois River (Stouder et al. 1997). Current summer water temperatures in the Illinois river drainage limit coho production from reaching historical levels (USDA 1997).

Table 21: Factors Affecting Freshwater Habitat and Density-Independent Salmonid Survival

Life stage	Factors affecting population productivity	Potential mechanisms affecting survival
Egg to emergent fry	Substrate stability, amount of fine sediment in spawning gravels, spawning gravel permeability, water temperature, peak flows	High flow events cause loss of eggs due to streambed scour and shifting; reduced flow and DO levels to eggs due to high sedimentation cause increased mortality; high fine sediment levels cause entombment of fry; increased temperatures advance emergence timing, thereby affecting survival in next life stage; anchor ice reduces water exchange in redd causing low DO levels

		and/or eggs to freeze.
Emergent fry to fall parr	Flow dynamics during emergence period, stream gradient, number of sites suitable for fry colonization, predators, temperature[1], nutrient loading[1]	Loss of emergent fry occurs due to being displaced downstream by high flows; advanced emergence timing causes fry to encounter higher flows; high gradient and lack of suitable colonization sites for emergent fry cause fry to move downstream increasing risk of predation; stranding and excessive temperature promote disease and cause mortality; temperature and nutrient changes affect growth thereby affecting other causes of density-independent loss.
Juveniles	Fall and winter flows, number of accessible winter refuge sites, temperature, predators	Displacement during high flows; stranding and death due to dewatering; loss due to predation; loss due to poor health associated with winter conditions.[1]

[1] Effects are likely to have both density-independent and dependent components.

f. Salmonid Distribution

Anadromous salmonids are not present in the BLM portion of the watershed. A 30' waterfall five miles upstream on North Fork Silver Creek restricts their passage. Resident salmonids within the watershed include rainbow trout (*Oncorhynchus mykiss*) and cutthroat trout (*O. clarki).* Cutthroat occupy similar habitat to that of rainbow trout. Although cutthroat trout have not been found in this watershed, their presence is suspected due to the presence of rainbow trout. Sculpin (*Cottidae sp.)* have not been found in the BLM portion of the North Fork Silver Creek watershed.

Both resident and anadromous salmonid populations have been in decline for decades and are considered to be depressed throughout the Illinois River basin (USDA 1997). Historically, ODFW harvest data was the only measure of anadromous fish population levels within the Illinois River basin. As a result of declining population levels, ODFW presently prohibits trout fishing within the entire Illinois River basin.

Resident cutthroat and rainbow trout are distributed throughout many reaches of all tributaries above and below anadromous fish barriers (see Map 6). The southern Oregon /northern California Coast ESU of cutthroat trout was ruled not warranted for listing in April 1999. The Illinois River trout population appears to be much smaller than that observed in the 1950s.

Table 22: Resident Cutthroat and Rainbow Trout Distribution

Stream	Miles
North Fork Silver Creek	6.2
Cedar Swamp Creek	1.0
Cedar Swamp Creek Tributary #1: First major tributary entering from the SW ¼ of sec.14	0.2
Cedar Swamp Creek Tributary #2: Second major tributary entering from the NE ¼ of sec.14	0.2
Unnamed tributary entering N. Fork Silver from the east at the north side of sec.14.	0.3
Unnamed tributary that enters N. Fork Silver at the NW ¼ of sec. 15. This tributary drains from sec. 10	1.1
Sourgrass Creek	3.25
Sourgrass Creek tributary #1: Enters Sourgrass in sec. 9. Flows from the northwest.	0.9
Sourgrass Creek tributary #2: Enters Sourgrass in the NW ¼ sec. 3. Flows along the border of sec 3 and 4.	0.3
Sourgrass Creek tributary #3: Enters Sourgrass in the SE ¼ sec. 3. Flows are from the SE ¼ sec. 3.	0.15

g. Fish Passage Barriers

Fish barriers are physical, chemical or biological factors that prohibit upstream or downstream passage of juvenile or adult fish. Examples are dams, culverts, low water flow, temperature, waterfalls, and predation. A series of plunge pools and waterfalls in section 17 at the end of road 35-9-1 present physical barriers to fish passage. Table 24 lists the culverts on BLM roads over fish bearing streams.

Table 23: North Fork Silver Creek Culverts

Stream Name	Road Number	Road Mile	Drop to Stream (ft)
Cedar Swamp Creek	35-9-14	1.0	0.3
Cedar Swamp Creek Tributary	35-9-14	0.9	1.5
North Fork Silver Creek	35-9-1	1.4	1.6
North Fork Silver Creek	35-9-11	0.1	3.0
North Fork Silver Creek	35-9-14	0.01	2.0
North Fork Silver Creek Tributary	35-9-1	3.6	4.0
Sourgrass Creek	35-9-1	4.4	0.6

3.6. FIRE

Ecosystems are dynamic entities whose basic patterns and processes are shaped and sustained on the landscape not only by natural successional processes, but also by abiotic disturbance such as fire, drought, and wind. Disturbance is often temporally and spatially unpredictable, maintaining a mosaic of successional stages over natural communities, thus influencing the range of natural variability of ecosystem structure, composition, and function (Kaufmann et al. 1994). Fire is an especially complex disturbance agent: the results are often not repeatable and the conclusions are often contradictory (Pyne 1996).

Fire has always played an integral part in the Pacific Northwest forest environment (Agee 1981) and in shaping plant communities in southwestern Oregon (Atzet and Wheeler 1982). The North Fork Silver Creek watershed is a fire dependent ecosystem with numerous fire adapted species. As described by Mutch (1994) fires provide:

- nutrient cycling
- plant succession and wildlife habitat regulation
- biological diversity
- reduced biomass
- insect and disease control

When looking at the historic landscape, human development, and values placed on the landscape, several elements of wildland fire should be considered including historic fire regime, condition class, fire hazard, fire risk, and values at risk. All of these elements can play a significant role in determining management direction for a given area.

3.6.1. Fire Regime

Fire regimes are the result of the biological, physical, climatic and anthropogenic components of an ecosystem as reflected in the fire frequency (how often a fire occurs), fire intensity (rate of energy released), fire size, seasonality (season of occurrence), and severity or type of fire (*e.g.*, crown, surface, ground).

Fire regimes have been described in many ways at national and regional scales (Heinselman 1981; Davis and Mutch 1994; Agee 1981). For this analysis, fire regime classifications developed by the BLM, Oregon State Office, and the Forest Service, Region 6 are used.

I	0-35 years, low severity.
II	0-35 years, stand-replacing, non-forest
III	35-100+ years, mixed severity
IV	35-100+ years, stand-replacing
V	>200 years, stand-replacing
VI	No fire
VII	Non-forest

Areas in the North Fork Silver Creek watershed fit into two of these categories:

Fire Regime II (0-35 years, stand-replacing, non-forest): Includes true grasslands (Columbia basin, Palouse, etc.) and savannahs with typical return intervals of less than 10 years and mountain shrub communities (bitterbrush, snowberry, ninebark, ceanothus, Oregon chaparral, etc.) with typical return intervals of 10-25 years. Fire severity is generally high to moderate. Grasslands and mountain shrub communities are usually only top killed and resprout.

Fire Regime III (35-100+ years, mixed severity): This regime usually results in heterogeneous landscapes. Large, stand destroying fires may occur but are usually rare. Stand destroying fires may Areset@ large areas (10,000-100,000 acres) but subsequent mixed intensity fires are important for creating landscape heterogeneity. Within these landscapes, a mix of stand ages and size classes are important; the landscape is typically not dominated by one or two age classes.

The persistence of certain species in southwestern Oregon can be attributed to their adaptations to fire (Kauffman 1990). If fire regime is altered, the capacity for a species to survive may be changed. Hence, if an area has a fire regime that experienced frequent fire, and through suppression that regime has been altered, the hazard of catastrophic fire has been increased, posing a greater risk to ecosystem components.

3.6.2. Fire Condition Class

Fire Condition Classes describe how far from normal the historic fire regime currently is considering key ecosystem components (Hardy et al. 2000). This is a coarse scale assessment that quantifies land conditions resulting from fire exclusion and other influences (timber harvest, grazing, insects and disease, and non-native plants). Changes to key ecosystem components such as species composition, structural stage, tree or shrub stand age, and canopy closure are identified. Table 25 summarizes the three fire condition classes, their characteristics, and general management options.

Table 24: Fire Condition Class		
Condition Class	**Attributes**	**Management Options**
1	▪Fire regimes are *within or near* historical ranges. ▪The risk of losing key ecosystem components is *low*. ▪Fire frequencies have changed by *no more than one* return interval. ▪Vegetation attributes (species composition and structure) are *intact* and functioning within historical ranges.	These areas can be maintained within the historical fire regime by treatments such as fire use.
2	▪ Fire regimes have been *moderately* altered from historical ranges. ▪ The risk of losing key ecosystem components has increased to *moderate*. ▪ Fire frequencies have increased or decreased by more than one return interval resulting in *moderate* changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. ▪ Vegetation attributes have been *moderately* altered from historic ranges.	These areas may need moderate levels of restoration treatments, such as fire, manual or mechanical treatments, to be restored to the historical fire regime.
3	▪Fire regimes have been *significantly* altered from historical ranges. ▪The risk of losing key ecosystem components is *high*. ▪Fire frequencies have increased or decreased by multiple return intervals resulting in *dramatic* changes to fire size, frequency, intensity, severity, or landscape patterns. ▪Vegetation attributes have been *significantly* altered from historic ranges.	These areas need high levels of restoration treatments such as hand or mechanical treatments before fire is used to restore the historical fire regime.

The majority of the North Fork Silver Creek watershed is currently in Fire Condition Class 1 due to the Biscuit Fire. Approximately one quarter of the area approaches Fire Condition Class 2.

3.6.3. Fuel Hazard and Wildfire Ignition Risk

Fuel hazard and wildfire ignition risk are used to better understand and plan for potential fire management problems and to identify opportunities land management opportunities. Wildfire can often prevent achievement of short term and mid term land management goals. Stand destroying wildfire can delay late-successional forest development as well as convert existing mature forests to early seral forests.

a. Fire Hazard

The 2002 Biscuit Fire appreciably changed the fire hazard in the watershed. Prior to the Biscuit, fire exclusion had created vegetation and fuel conditions that contributed to the large, uncharacteristic fire. Before the fire, almost the entire watershed was in condition class 2 or 3 (T. Atzet pers. Comm.) Post- fire approximately 75% of the area is in condition class 1 and 25%, condition class 2.

b. Fire Risk

Fire risk pertains to the potential for fire ignition. Human actions greatly influence the pattern of fire occurrence and the number of fires in a watershed. This watershed has a low to moderate risk of human caused ignition. Human uses which create ignition risk include mining, logging and other forestry work, recreation, tourism, and travel. Human use within the watershed is low to moderate. The human caused fire occurrence pattern for the watershed would generally be a fire starting at a work or recreation site.

Lightning occurrence in the watershed is moderate. The watershed typically experiences at least one lightning storm event every two to three summers. Multiple fire starts can result from such a storm. During the past 30 years in the vicinity of the North Fork Silver Creek watershed, some of these starts became large fires due to increased fuel hazard, their remote locations, difficult access, and low suppression priority due to the long distance to communities and populated areas.

Historical fire occurrence in the watershed between 1970 and 2002 is summarized in Table 26. Data available prior to 1970 is incomplete for analysis purposes. During this 32 year time period, 18 fires occurred on the BLM portion of the watershed with 15 suppressed at 10 acres or less. On BLM lands in the watershed, the 1987 Galice Fire burned 932 acres, the Silver Fire burned 92 acres and in 2002 the Biscuit Fire burned 8,404 acres of the 8,486 total BLM acres in the watershed.

Table 25: Historic Fire Occurrence 1970-2002

Cause	Total Fires	Yearly Average Number of Fires	Total Acres	Average Fire Size (acres)	Yearly Average Fire Size (acres)
Human	8	0.25	1	0.125	0.03
Lightning	10	0.31	9,437	943.7	294.9
Total	18	0.56	9,438	524.3	294.9

Currently 25% of the watershed is in a moderate risk category (condition class 2) and 75%, a low risk category (condition class 1). As noted above, the Biscuit Fire altered the condition class of the watershed by burning 99% of the total BLM watershed acreage.

3.7. HUMAN USE

3.7.1. Socioeconomic Overview

The North Fork Silver Creek watershed is in the northwest corner of Josephine County, which has a population of 75,726. The county population has steadily increased and demographics have shifted to a greater percentage of senior citizens and young ex-urbanites (USDA 1995). Between 1980 and 1990, the proportion of persons over the age of 65 in Josephine County increased 42% (USDA 1995). The 2000 US Census shows the segment of the population age 65 and older is 20.1%, exceeding the state average of 12.8%. Seniors are commonly here because of the favorable social climate, proximity to family, and/or enjoyment of southern Oregon's many amenities. Normally they are not tied economically to southern Oregon and most receive an annuity of some type. The new, young ex-urbanities generally possess a higher income, higher education level, and generally have strong environmental values but little experience in land management practices. Many of these folks have few ties to the traditional industries of southern Oregon (USDA 1995). Although there is a shift towards higher education and income in Josephine County, overall the county is still rated as one of the state's highest for poverty. The unemployment rate in Josephine County is considerably higher than the state average and wages are among the lowest in the state. Josephine County ranks among the highest for poverty, particularly for single head-of-household families with children. College educated individuals comprise 14.1% of the population in Josephine county, compared to 25.1% for the state as a whole. The high school dropout rate is among the highest for the state at 14.2% with the state average at 9.9%.

Josephine County contains 1,640 square miles of land with only 24% in private ownership. Only a small percentage of the private land is in farms. The majority of income earned in Josephine County was historically dependent upon the mining and lumber industry. Since the late 1980s, the timber industry has declined substantially. The county timber harvest fell 67% between 1988 and 1994 and continues to decline. Agriculture, forestry, fishing, hunting, and mining make up only 3.7% of the industry in Josephine County with health, education, and social services leading the industry at 20.8%. Communities are diversifying their economic base and employment is primarily management, professional, and related occupations (26.5%) with farming, fishing, and forestry occupations the lowest at 1.5%. There has also been a significant shift in the last decade toward a more service oriented economy (USDA 1995).

3.7.2. Recreation

Dispersed recreation in the watershed includes primitive camping, off-highway vehicle (OHV) use, hunting, mountain biking, hiking, horseback riding and driving for pleasure. The Shady Branch campground located off of BLM road #35-9-1 was built in the early 1960s. It is a dispersed camp with room for 2 to 3 sites in section 11 along the North Fork Silver Creek. There is a vault from a previously placed toilet and an abandoned well. The Sourgrass dispersed recreation site is located farther down BLM road #35-9-1 in Section 16. It offers room for one camp and a fire ring. At the end of BLM road #35-9-1 in section 17 are the Plunge Pools, another dispersed recreation site consisting of a fire ring, camping for 1-2 parties and swimming holes created by a waterfall. An informal trail continues west along the creek for approximately a mile. There are other pull outs along the North Fork Silver Creek road system that are used for camping and day use (USDI BLM 2002). The visitors enjoy the sites because they provide a primitive, natural setting. Although very few visitors visit the Sourgrass, Shady Branch, and Plunge Pools recreation sites, these sites are popular base camps during hunting season.

The watershed's only developed recreation, the Forest Service administered Hobson Horn Trail, travels through approximately 0.85 miles of BLM administered land in T35S, R9W sec 8. The surrounding forest is an open stand of sugar pine which burned severely during the Biscuit Fire (USDI 2002).

3.7.3. Roads

Most roads in this watershed were constructed for timber and forest management purposes. Many are on BLM land and are insloped, aggregate surfaced road with ditch relief culverts. These mid slope natural surface roads are a source of erosion and sedimentation to streams.

Prior to 1992, road drainage culverts were designed for a 25-50 year flood event or were based on channel width and stream flow. Culvert designs did not consider native and anadromous fish passage. Concentrated flow through many of these structures was too great to allow upstream fish movement. Scour at the exit of these structures created pools and, over time, drops developed which restricted all movement of fish beyond these points and greatly reduced spawning habitat. Today's culverts are designed to accommodate bed load and debris transport for a 100-year flood event and to assure native and anadromous fish passage. During road inventories, existing culverts are evaluated for future replacement to meet 100-year flood events

Road density and type vary. Table 26 summarizes road miles by surface type. The average road density in this watershed is 3.04 mi/mile^2. There are a total of 37.7 miles of BLM roads and 2.2 miles of private and other agencies roads in the watershed. The BLM continues to analyze and inventory BLM roads in order to improve roads and reduce road density to a level appropriate for land management and the environment.

Table 26: Road Surfacing

Road Ownership	Surface Type	Miles	Total
BLM	Natural (NAT)	4.9	33%
	Pit Run Rock (PRR)	2.5	5%
	Grid Rolled Rock	6.5	17%
	Aggregate Base Coarse	20.3	34%
	Unknown various types	3.6	7%
	Bituminous Surface Treatment	0.3	1%
Private & Other Agencies	Unknown / Various Types	2.2	3%
Total Road Miles		40.3	100%

3.7.4. Minerals and Mining

a. Minerals

Review of BLM's computerized lands and minerals database records (LR 2000) indicates that there are eight current mining claims in the watershed. The Fluffy Dog Mine is a current placer claim located at the falls.

On BLM administered land, three levels of mining operations may occur. The lowest impact level is casual use, which includes those operations that usually result in negligible surface disturbance. These types of operations usually involve no mechanized earthmoving equipment or explosives, and do not include residential occupancy. Administrative review of these operations is not required. The level of casual user in the watershed is not known.

Mining activity above casual use but primarily exploratory in nature requires the filing of a mining notice pursuant to BLM Surface Management Regulations (43 CFR § 3809). The mining notice informs the BLM of the level of operations that will occur, existing disturbance, equipment that will be used, and reclamation plans that will follow completion of mining activities. A reclamation bond is required before mining may commence as outlined in the mining notice. Currently, there are no mining notices on record for operations proposed to occur on BLM administered lands in the watershed.

b. Mineral Potential

Geology within the North Fork Silver Creek watershed is part of the Dothan Formation. It contains granitic rocks formed during the Cretaceous and Jurassic periods with a small lens of ophiolite to the east. There are no non-metallic deposits within the watershed. Chromite, nickel, and asbestos are intermittent, and other metals such as gold, silver, and platinum are intermittent with exploration possible (Oregon DOGAMI 1985).

c. Past Mining Impacts

The existing physical conditions of mined areas are variable ranging from open cuts, adits, and waste piles with little or no vegetative cover to areas with heavy regrowth of trees and shrubs over previously cleared areas. Erosion created by past mining activity appears to be minimal.

3.7.5. Cultural Resources

No formal surveys for cultural resources have occurred in the North Fork Silver Creek watershed. A few historic sites are known through general history of the area, were identified by fire personnel during the Biscuit Fire, or have been located during post Biscuit fire rehabilitation and inventory activities. Most sites are related to historic mining and include placer and lode mining features, a mill site, habitation areas, and trails. The Hobson Horn fire lookout (no longer intact) is also within the watershed.

There are no prehistoric sites known in the watershed. It is speculated that this is a consequence of the absence of anadromous fish in the watershed.

4.0. REFERENCE CONDITION

The purposes of this section are to assess how ecological conditions have changed over time as the result of human influence and natural disturbance, and to develop a reference for comparison with current conditions and key management plan objectives (Federal Guide for Watershed Analysis, version 2.2, 1995).

4.1. CLIMATE

The climate of southwestern Oregon has not been static. During the Holocene (the past 10,000 years), shifts in temperature and precipitation have affected the type and extent of vegetation, viability of stream and river flows, fish and animal populations, and human access to higher elevations. At the beginning of the Holocene, the climate was warmer and drier than today. This trend continued until 6,000 years ago when wetter, cooler conditions began to prevail. During the past few thousand years, modern climate and vegetative patterns have developed. The onset of wetter, cooler conditions gradually changed vegetation patterns as well as the quantity and distribution of game animals and migrating fish. However, during this time, environmental forces have not been constant. Fluctuating cycles of drier and wetter conditions, varying in duration, characterize the modern climatic pattern (Atwood and Gray 1995).

4.2. EROSION PROCESSES

In general across the region, prior to Euro-American settlement there were more mature forests with openings created by lightning and Native American burning practices. Vegetation, coarse woody material, and organic matter on the forest floor protected the soil from erosion.

Within the watershed, no prehistoric sites have been found and there is no documentation of any Native American burning in the watershed. It would appear unlikely that Native American burning was an important ecological factor in the watershed, particularly as a contributor to the erosion processes.

Mass movement (debris flows) or debris slides may have occurred on steep (>50%) gravelly soils, a source of accumulated ravel. Accelerated mass movement can be caused by a low root strength coupled with an increase in moisture content.

Concentrated flow (gully and rill) erosion occurred mainly in draws where channels were created. The density of these channels varied with climatic cycles. During wet cycles, intermittent stream channels were more common. During dry cycles, cobbles, gravel and plant debris accumulated in draws, burying channels (USDI 1998).

Native people created foot trails instead of roads. These narrow foot trails had very little effect on erosion, water quality or water quantity. In the 1850s, mining brought people, roads and road associated erosion to the area. In the early to mid 1900s, hard rock mining began with the Bunker Hill and Hansen Saddle mines. These mines were located high on the slopes away from major streams. However sediment and processing effluent may have entered the stream network through small tributary streams.

In the 1960's, logging and its associated roads began to impact the watershed. Clear cutting was a common silvicultural system. Erosion levels increased due to roads. Productivity may have diminished because of the consequent lost organic matter, however soils may be inherently of low productivity.

4.3. HYDROLOGY

4.3.1. Water Quality and Quantity

a. Water Quality

Prior to Euro-American settlement, historical summer water temperatures were likely lower than today due to lower stream width-depth ratios and more riparian vegetation. Given the fire occurrence prior to 1920, some stream reaches could have been sparsely vegetated at times, resulting in periodically higher water temperatures (USDI 1998).

Past logging and recent fires reduced riparian vegetation which allowed more solar radiation to reach streams which typically increases water temperatures. In this watershed, preliminary seven day maximum temperature monitoring has indicated that water temperature is higher than before the Biscuit Fire.

Sediment loads and turbidity were historically lower due to fewer sediment sources prior to Euro-American influences. Though sedimentation likely has increased, observed turbidity and fine sediment from the Biscuit Fire have been minimal even during peak flows (pers. comm. Messerle 2003).

b. Floods

There are no records regarding past flooding in the watershed. However, the periodic flooding within the Rogue River Basin would certainly typify flood regimes in the North Fork Silver Creek watershed. Warm rain on snow events are typically a primary cause for the extreme floods documented in the Rogue basin in 1853, 1861, 1862, 1866, 1881, 1890,1927, 1955, 1964, and 1974 (Atwood and Gray 1995). All of these, except for the flood of 1890 which was a rain event, were caused by rain on snow events. Warm rain on snow events have, no doubt, been historically significant factors in flooding and high peak flows in the North Fork Silver Creek.

In the past 30 years, more openings have been created through clear cutting and road construction in this watershed which exists primarily in the transient snow zone. Snow pack accumulation in these openings, followed by warm rains, has likely resulted in increased peak flows and flooding.

c. Droughts

Drought conditions were noted in 1841, 1864, 1869-74, 1882-85, 1889, 1892, 1902, 1905, 1910, 1914-17, 1928-35, 1946-47, 1949, 1959, 1967-68, 1985-88, 1990-92, and 1994 (LaLande 1995).

During drought years, many small streams in the watershed went dry and the larger streams had low flow.

d. Beaver Dams

Beaver dams were prevalent on the Illinois River system before Euro-American influence. Presumably they occurred in the North Fork Silver Creek watershed as well. Beaver dams added woody material to streams, trapped and stored fine sediment, and reduced water velocities. As a result, riparian zones were wider than they are today. Between 1827 and 1850, fur traders removed most beaver from the region. The loss of beaver dams likely resulted in scouring of channel beds and banks, increased width / depth ratios, narrower riparian zones and fine sediment deposition in pools.

e. Mining Effects

Within the North Fork Silver Creek watershed, small scale placer mining may have occurred in mainstem streams in the late 1800s. There is no documentation of large scale mechanized placer mining in the North Fork of Silver Creek and no placer mine tailings have been observed. Given the time frame in which placer mining occurred, natural restoration of streams and flood plains has probably occurred to some degree.

Two hard rock gold mines, including mills, were established in the early part of the 20th century: the Bunker Hill (1914) and Hansen Saddle (late 1920s) mines. Trees were cut for timber to build the mills. Erosion and sedimentation likely occurred at both sites, with some sediment reaching main streams. Processing waste chemicals may also have reached the main stream from these sites though the extent of resulting pollution is not known. Historic documentation mentions that a cyaniding plant was located at the Bunker Hill Mine in 1940 for removing gold from the ore.

4.3.2. Stream Channels

Prior to Euro-American settlement, the steeper, headwater streams in the watershed had varying amounts of large woody material (LWM). Generally, the forested streams had sufficient amounts to create pools and meanders. Forests along these streams provided shade and an abundant source of LWM resulting from tree mortality. The coarse wood provided both structure and nutrients for the streams. The streams were longer, more complex and provided more aquatic habitat than they do now. Mining and logging resulted in slightly decreased sinuosity. Decreased LWM and sinuosity have resulted in decreased stream surface as well as possible down cutting and decreased groundwater recharge in areas.

4.4. VEGETATION

Historical vegetation patterns refer to the forests or vegetation that existed prior to significant Euro-American modification. Examples of Euro-American modification include land clearing, home building, road construction, timber harvest, mining, grazing, and fire exclusion.

4.4.1. Forest Stand Types

The information described below is based on the General Land Office O & C Revestment Notes (c. 1920). This information is from a systematic, consistent inventory of all lands in western Oregon that were revested from the Oregon and California Railroad. The inventory was done by 40 acre parcels and included legal description, date inventoried, commercial volume of 16+" DBH conifers, volume or average diameter by tree species, and comments (e.g. if the parcel had been burned, presence of non-merchantable conifers that were less than 16" DBH, hardwoods, common shrubs, etc.).

Late-successional forest present at the time can be inferred from this data. In evaluating the inventory data, 10+ MBF per acre in commercial volume is used to index late-successional forest. Areas surveyed in 1920 within the watershed are T35S, R9W, Sections 3,5, 7, 9, 11, 15, 17, 19, 21, 23, 29, and 31. Thirty-five parcels were estimated to have no commercial volume and 25 were estimated to have 5-10 MBF per acre. The following table shows the location of the twelve 40-acre parcels that were estimated to have more than 10+ MBF per acre suggesting the extent of late-successional forest.

Table 27: Estimated Historical Late-Successional Forest (circa 1920)

T35S, R9W 40 acre location	Vol. >10mbf Late-successional Forest (parcel legal description)
Sec 3	SESW
Sec 5	NWSE
Sec 15	SWNE, SENE, NWNW, NWSE,SWSE
Sec 17	NENE
Sec 21	NENW
Sec 23	NENE, NWNE
Sec 29	NENE

Table 28: Summary of 1920 Inventory Comments

Comments	Number of Forty Acre Parcels
Burned to various levels.	137 out of 158 forties (87%)
Areas along creek did not burn	9
Douglas-fir burned and pine did not burn	11
Douglas-fir was limby, rough or shabby and low quality wood. Possibly grown at low densities.	12
Common brush species were manzanita and whitethorn.	Nearly all
Western white pine was listed as a commercial species.	6
Western white pine was listed as 10-12" poles.	3
Sugar pine was listed as the largest diameter tree.	17
Port-Orford-cedar was found, generally along the creek.	17

4.4.2. Landscape Patterns

Fire has been the most evident agent of disturbance in the watershed. Prior to about 1850, most fire starts could be attributed to lightning strikes. Prior to the 1980s, most fires in the watershed appear to have been of low or moderate intensity, with larger size class trees surviving the fires.

It is unlikely that these stands experienced stand replacement fires in which the majority of the above-ground biomass is killed. All known fires prior to 1920 occurred in T35S, R9-10W.

There was very little late-successional forest in 1920. Four hundred and eighty acres (5.5% of the watershed) had more than 10 MBF per acre. All late-successional forest was located in T35S, R9W.

4.5. SPECIES AND HABITATS

4.5.1. Botany

a. Special Status Species

Botanically, reference conditions are difficult to ascertain. Surveys for the North Fork Silver Creek watershed were very limited prior to the Biscuit Fire. However, some assumptions can be made. Prior to the fire it can be assumed that late-successional forest was more plentiful. Canopy coverage protecting moist microsites was at least 44% greater than current levels according to post-Biscuit satellite data. Pre-fire special status vascular plant locations were all in riparian areas; none were in plantations.

Riparian areas were more intact and continuous than today. This means that potentially there were more special status or Bureau tracking occurrences because the known species for this area are all dependent upon riparian habitat.

Nonvascular species presence prior to the Biscuit Fire is unknown. Due to coastal influences, rare lichens or bryophytes could have been a component of the canopy or of the coarse woody debris on the forest floor, especially in riparian areas.

Noxious weeds were nonexistent before the advent of European settlers.

4.5.2. Wildlife

Wildlife populations in the North Fork Silver Creek have historically been influenced by natural events and human activities. Prior to Euro-American settlement, Native Americans managed the landscape for habitats and products they found useful. There is no evidence regarding Native American burning in this watershed. However, in southwest Oregon, fires were used to remove undesirable vegetation and to promote desired products. Various wildlife species were hunted during this time to meet everyday needs. Human exploitation of these wildlife resources was probably at a sustainable level and had little long term effect on wildlife populations.

The amount and type of old growth forest in the watershed varied in response to disturbance events such as fire, wind throw, and insect infestations. These disturbances played an important role in snag production and cavity dependent species populations. Most of the watershed had a mixed severity fire regime with stand replacing fires every 35-100+ years (Agee 1990). Old growth/mature forest was the dominant forest type in southwestern Oregon prior to Euro-American settlement, occupying as much as 71% of the area (Ripple 1994). There is very little historic information on the frequency of occurrence of late-successional obligate species. However, it's likely that species that benefited from these forests, such as pileated woodpeckers *(Dryocopus pileatus)*, northern spotted owls (*Strix occidentalis*), northern flying squirrels *(Glaucomys sabrinus),* and red tree voles *(Arborimus longicaudus)* were more abundant than they are now due to larger contiguous blocks of late-successional habitat. It is also likely that animal dispersal, recolonization of former habitats, and pioneering into unoccupied territories was accomplished more effectively than it is today due to the older forest connectivity. Ripple (1994) estimated that 89% of the forest in the larger size classes was in one large, connected patch extending throughout most of western Oregon. Due to the greater mature habitat connectivity, species that benefited from edge environments, such as striped skunks *(Mephitis mephitis)* and great horned owls (*Bubo virginianus),* were probably less common than they are today.

Large predators such as grizzly bears (*Ursus arctos)* and wolves *(Canis lupus)* were present in the watershed (Bailey 1936) and, along with cougar *(Felis concolor)* and black bear *(Ursus americanus),* maintained the balance between species such as Roosevelt elk *(Cervus elaphus)* and blacktailed deer *(Odocoileus hemionus)* and the available forage. Wolverines *(Gulo gulo luteus)* remained at high elevations throughout the year. This species is an opportunistic predator, feeding on animals such as porcupines *(Erithizon dorsatum)* and available carrion.

Larger scale habitat changes and effects to wildlife populations occurred after Euro-American settlement. Since the 1850s, human activities such as mining, timber harvest, road construction, and fire suppression have changed historic vegetation patterns and habitat distribution. These influences had indirect and direct effects to the wildlife populations.

Historically, exotic species were not found in the watershed. Their current presence, the result of both intentional and accidental introductions, has impacted native populations through displacement, competition, predation and disease.

4.5.3. Riparian

Water quality has varied greatly over time. Water quality was most likely very good prior mining, timber harvesting, and road building. Unaltered seeps, springs, and riparian vegetation, as well as high elevation snow, contributed to cool water. During the winter and spring, occasional floods would flush the system clear of sediment deposited from natural slides and erosion.

Even though water quality is still good, it is likely that many native aquatic and amphibious species are less prevalent now than they were during pre-settlement times. In general, the riparian habitat in the watershed has been degraded from conditions prior to mining, road construction and timber harvesting. It no doubt supports fewer species than in the past.

4.5.4. Fisheries

Pre-Euro-American Settlement: Prior to Euro-American settlement, the North Fork Silver Creek watershed may have supported abundant populations of resident trout in most streams or they may have been planted by miners. There is no information regarding this. The natural barriers present today that restrict anadromous fish use most likely have existed for a very long time. In addition, mixed mature conifers and hardwoods in riparian zones would have provided dense canopies. Summer water temperatures were probably slightly cooler than they are now. There would have been large woody material dispersed throughout the streams providing complex habitats for resident trout.

Prior to Euro-American presence and road building, stream channels were less constrained, though some are naturally constrained by topography. Multiple channels dissipated flows and created fish habitat. Riparian vegetation and adequate floodplain connections limited the effects of annual peak flows. Winter scour had less impact on macroinvertebrate and fish populations, especially in low gradients. In addition, large riparian down wood held back spawning gravels during high flows in some steeper gradient streams. Occasionally, landslides delivered sediment to streams. However, large wood almost always accompanied the sediment delivery. The wood controlled sediment movement throughout the system and the sediment did not become embedded within the spawning gravel. Erosion and sedimentation were in balance with stream transport capacity resulting in pools with good depth and cover. Sediment in the spawning gravels was not limiting to fish or macroinvertebrate populations.

Post-Euro-American Settlement: Primitive roads first appeared in the 1850s along with mining. Road construction expanded with timber harvest. Higher road densities led to an increase in peak winter flows, especially when roads were located near streams. Winter scour began limiting macroinvertebrate populations and transported wood away from streams. Sedimentation of streams increased as well and impacted salmonid production. Some of the roads built in the North Fork Silver Creek watershed are near streams. Stream-side roads limited stream meander and the development of multiple channels. Furthermore, riparian trees were removed in order to build roads. Down wood, much of which would have extended into the stream channels, was also likely removed to make way for roads. Peak flows were now more damaging, as the streams could not naturally diffuse the high energy from flood events due in part to the lack of large woody debris.

Timber harvest has had one of the biggest impacts on fish habitat. Streamside trees, especially large ones, were harvested leaving little available for recruitment as large woody debris for fish habitat. Thus habitat complexity, which is dependent on the large wood declined. Logging may have caused an increase in stream temperature. More recently this watershed had low stream temperatures.

Mining activity was located high on slopes away from major streams. Sediment and processing effluent may have entered the mainstem of North Fork Silver Creek from smaller tributaries. Due to the distance of mining activity from the mainstem of North Fork Silver Creek, it is unlikely that mining had a significant effect on fish habitat.

There is no evidence of past agricultural activity in the North Fork Silver Creek watershed.

4.6. FIRE

Fire regimes in this watershed reflect ecosystems that are more stable in the presence of fire than in its absence (Agee 1990). Approximately 75% of the watershed had a mixed severity fire regime wherein stand-replacing fires less than 100 acres in size occurred every 35-100+ years (Agee 1990). Vegetation was a mosaic of early to mid seral open forests with patches of shrubs or herbaceous species.

Grass and brush dominated areas (25% of the watershed) typically had frequent (0-35 years) stand replacing fires which removed the tops of sprouting shrubs and grass and killed most of the trees encroaching on this habitat (pers. comm. Atzet 2003). Within five years, resprouting brush and grasses would dominate.

With the advent of fire exclusion, the pattern of frequent high intensity and mixed surface fire ended. Dead and down fuel and understory vegetation were no longer periodically removed. Species composition changed and thinner barked, less fire-resistant species increased. Live and dead fuel increased. The understory became dense with conifer and hardwood reproduction. The potential for higher intensity, stand destroying / replacement fires increased.

Before European settlement, fuel build up was likely low in most areas. Naturally occurring fire maintained a comparatively open forest understory with little fuel accumulation or understory vegetative growth. The build up of fuel and vegetation that has resulted from aggressive fire suppression and fire exclusion has created a hazardous situation that has contributed to fires of disproportionate historical scale in southwestern Oregon over the last three years.

4.7. HUMAN USES

4.7.1. Prehistory and Ethnography

Archaeological evidence indicates that human occupation of southwest Oregon dates back at least 10,000 years (Atwood and Gray 1995; Goebel 2001). The native people of the region were primarily hunter-gatherer-fishers who made their living from a wide variety of natural resources found in the narrow canyons and small interior valleys they occupied. People wintered in permanent villages located in the low elevation river valleys and dispersed during the spring, summer and fall season to exploit upland resources.

Ethnographically, Penutian and Athapaskan speakers occupied the region. Tribes included the lowland Takelma who resided in a territory centered on the middle portion of the Rogue River, the Taltuctuntede along Galice Creek, and the Dakubetede on the Applegate River. Their Athapaskan neighbors included the Shasta Costa located west of the Takelma below Grave Creek. At the time of Euro-American contact, native cultures could be characterized as stratified, village-based societies, with ceremonial systems much like those found among the Hupa, Karuk, and Wiyot of northwestern California (Aikens 1993; Kendal 1990). Gray (1987) provides an excellent synthesis of the Takelma and their Athapaskan neighbors.

Traditional Native American cultures were essentially destroyed in the Rogue and Illinois River Valleys by the influx of miners in the early 1850s and the subsequent Rogue River Indian Wars. By 1856 most area tribes were forcibly moved to the Siletz and Grand Ronde Reservations.

Living descendents of these Native Americans are members of two federally recognized tribes: the Confederated Tribes of Grand Ronde and the Confederated Tribes of Siletz.

4.7.2. Burning by Native Americans

Fire is an important aspect of ecosystem function in southwest Oregon. Major plant communities are dependent on fire and other types of disturbance to successfully maintain ecosystem health (Atzet and Martin 1991). In this respect, Native Americans played an active role in maintaining fire dependent communities over time and in establishing themselves as the ultimate “edge loving species” (Bean and Lawton 1993; Lewis 1989, 1993). Edges (ecotones) are one of the most productive habitats for plants, animals, and people.

There is some parallel between modern vegetation management and Indian burning: each seeks to maintain an array of plant communities across the landscape. Communities provided small and big game habitat, natural fuel breaks, and for native populations, various edible plant foods, materials for basketry, and other technological uses. Other uses of fire included hunting, crop management, insect collection for consumption, pest management, warfare, food preparation, and clearing of travel routes (Williams 1993). Fire also recycles nutrients, provides vistas, and often destroys forest pathogens. Williams (1993) provides an extensive bibliography on the use of fire by Native Americans.

4.7.3. Gold Mining

Gold mining was at one time the mainstay of the southern Oregon economy. It started settlements, built roads and schools, promoted local government, and established law and order (Libbey 1964). The first gold discovery in Josephine County was along the Illinois River at the mouth of Josephine Creek in 1850. Initially place mining techniques were used to extract the gold from sediment. Easily found gold was soon panned out and the area’s miners turned their sights on other methods to extract gold (Kramer 1999). Hydraulic methods were introduced as early as 1856, lode mining in 1864, and by the early 1900s, dredges and excavators were used along some stream courses (Heylum 1998; Oregon Mining Journal 1897). By 1911, most of the principal placer deposits in the county had been found and worked.

The North Fork Silver Creek watershed was part of the Galice Mining District. Once there were enough miners and claims in a given area, mining districts were created to provide some degree of governance of mining activities and to help resolve disputes in an otherwise unorganized community (Kramer 1999). Placer mining began on Galice Creek in 1854. Activity diminished during the 1860s and by the 1880s, the small placers were being laboriously re-worked by Chinese. Quartz mining started in the district approximately in 1886 and was the principal quartz mining area in southern Oregon during the 1890s. Fairly extensive milling and processing areas were built including the Bunker Hill Mines (Beckham 1978). Between 1854 and 1912, an estimated $3 million was extracted from the district. The North Fork Silver Creek watershed has not been extensively mined in contrast to the Rogue River and its tributaries.

Mines and processing facilities produced a demand for forest products, and almost certainly impacted forests heavily at the local level. Flumes, chutes and towns needed building materials.

4.7.4. Roads

Before European settlement of the west, Native Americans traveled the country on a network of trails. Constructed paths and game trails led to hunting places, summer camps, and advantageous view points. Many of the trails ran along the top of ridges and were kept clear of vegetation. An early effort to locate a trail from the coast into the interior valley was made by Lieutenant L.L. Williams. During the Rogue River War of 1855 he set out from the mouth of the Rogue River and was almost immediately confronted with rough and nearly impassable terrain. He wrote in his notes that “We again set out and in one or two miles we came upon an old but plain and well beaten Indian trail leading from Rogue River on the right, directly across our route in a course about N/NW” (Atwood 1978). The military pursued Native Americans into the more remote and rugged regions of the Rogue River canyon during the Indian wars.

As the west developed, animal trails and foot paths became narrow roads used to transport people and supplies mainly along streams, ridges and through saddles. These roads were generally naturally surfaced and the amount of associated sediment flow depended on use, location, weather, and soil type. As the use of these roads increased over the years, the roads themselves changed in design. Many of today's highways began as trails and are now widened, realigned, and surfaced to meet the increase and change in vehicle traffic. Even with more traffic, crushed rock surfacing, asphalt, modern techniques in road stabilization, and improved road drainage have actually decreased sedimentation and erosion along the original natural surfaced roads.

The first roads in the North Fork Silver Creek watershed were trails that became roads during expansion into the area (Bear Camp, Hobson Horn, Peavine, and Silver Creek roads). The Silver Creek trail was the earliest known trail in the North Fork Silver Creek watershed. It is dated to at least 1879 (Walling 1883) and was used to access mining claims. The Serpentine Springs Road is shown on a 1918 General Land Office revestment survey map as a trail to the Mount Peavine Lookout from Soldier Camp (US General Land Office 1918). The trail was converted to a road in 1929 by Mr. Robertson, owner of the Bunker Hill Mine.

Prior to the construction of the Galice access road, the Peavine Mountain and Bear Camp roads were the main arterials into the back country south of the Rogue River. In the late 1960s, the area was opened to timber harvest and roads were constructed to access timber, including the Galice access road. The existing Silver Creek road (BLM road #35-9-1) was constructed over part of the old trail during this period (pers. comm. Reed 2003).

4.7.5. Recreation

During the early twentieth century, recreational activity was intertwined with work and food acquisition (Atwood and Gray 1995). The 1930s brought the Civilian Conservation Corps (CCC) which, among other duties, was responsible for building roads. These new roads provided recreational opportunities that were not previously available to many people. People began using roads to access sites for hiking, camping and driving for pleasure. Other recreational activities included hunting and horseback riding.

5.0. SYNTHESIS AND INTERPRETATION

The purposes of this section are to compare existing and reference conditions of specific ecosystem elements, to explain significant differences, similarities or trends and their causes, and to assess the capability of the system to meet key management plan objectives.

5.1. EROSIONAL PROCESSES

The major changes between historic reference conditions and current conditions are due to increases in the intensity and the types of human activities in the watershed. Native people's activities were extremely limited. Natural fires were spotty with a general return interval of 35-100 years. This contrasts strongly with the use of fire to reduce slash after logging and with the use of back firing during the Biscuit Fire. Approximately 43% of the BLM lands burned in the Biscuit Fire burned with a severity such that there were extensive amounts of dead trees.

Forest management has included fire suppression and road construction as well as logging with yarders on steep slopes and tractors on gentle to moderate slopes. Many years of fire suppression has resulted in fuel accumulation, which resulted in the extensive, high intensity Biscuit Fire and its consumption of duff, litter and most of the coarse woody material. The top layer of severely burned mineral soil commonly shows color changes due to consumption of organic matter and the effects of heat on the mineral components. In the case of the Biscuit Fire, roughly 43% burned at high severity levels. The results include increased ravel and accumulation of soil and rock in draws and at the base of slopes. Therefore, for the next five years the area will be especially susceptible to debris flows down draws and perhaps debris slides on steep footslopes. Roads crossing steep draws are particularly susceptible to damage from debris flow. Roads may also divert debris flows at crossings, creating added damage to roads and natural resources.

Past planting and field observation have indicated that there is a common occurrence of low soil productivity in the analysis area especially considering the high levels of precipitation. Reasons for this may include shallow depth to bedrock, limitations in nutrient availability, ultramafic influences. There is little to no data available that would show why there are indications of low productivity. Such information would be helpful in planning and implementing future land management.

5.2. HYDROLOGY

5.2.1. Water Quantity

The stream flow regime in the watershed reflects human influences that have occurred since European settlers arrived. However, changes due to human disturbance have not been quantified but do include channel widening, bank erosion, channel scour and increased sediment loads.

Road construction, timber harvest, and Biscuit fire suppression are the major factors that can alter the timing and magnitude of stream flows. Road building and timber harvest can increase the magnitude and frequency of peak flows in some tributaries. As the vegetation in harvested areas recovers, the magnitude and frequency of peak flows diminish. However, the Biscuit Fire has effectively initiated a new recovery process, given that it killed trees on roughly 43% of the analysis area, approximately double the amount of open early seral vegetation that existed prior to the fire.

Approximately 92% of the analysis area is in the transient snow zone (TSZ). This is unusually high. Furthermore, many new openings with standing dead trees that will fall over in the next few years were created following the Biscuit Fire. Therefore, the watershed will likely experience increased peak flow rates during rain on snow events which could alter stream structure, increase sediment, transport large amounts of wood and reduce fish habitat

Road effects vary with their locations on the landscape. Roads adjacent to streams especially have a direct effect on flow patterns and water quality. Roads were historically built where natural gradients made road location and construction easiest, generally in valley bottoms near streams. Roads that traverse side slopes affect natural drainage by intercepting surface and shallow ground water and rerouting the flow. However, observation indicates that this is not an extensive problem in the watershed. Permanent road systems will prevent stream flows from returning to pre-disturbance levels (USDI 1998). However, road construction and reconstruction techniques can minimize long term negative effects by spreading runoff so that most is subject to soil infiltration.

Hydrologic cumulative effects analyses have not been completed for subwatersheds within the watershed. The area has a moderate road density of 3.04 miles per square mile. TSZ openings are very high, early seral stage vegetation is high, but compaction is probably low.

5.2.2. Water Quality and Quantity

Changes in water quality, particularly temperature, which can stress aquatic species, are predominantly caused by roads and a loss of riparian vegetation. Water quality elements most affected by human disturbances are temperature, sediment and turbidity.

Riparian vegetation re-growth following the Biscuit fire will provide shade and should reduce stream temperatures. Riparian planting would speed recovery. Even though winter stream turbidity following the Biscuit fire was not high, even during peak flows, road maintenance drainage improvements such as outsloping and dipping as well as road decommissioning would decrease sedimentation (USDI 1998; pers. comm. Messerle 2003).

5.2.3. Stream Temperature

Thermographs (continuous temperature recorders) have been placed in drainages in the North Fork Silver Creek watershed since 1994. The seven day maximum temperature through 2002 did not exceed 62ºF with the majority between 54-58ºF. This data indicates water temperature has not been an issue of concern in this watershed. However, loss of shading vegetation following the Biscuit Fire (approximately 43% of the watershed) could result in increased stream temperatures. As riparian reserves are managed for increased canopy cover, shade retention, and large wood, stream temperatures should recover to pre-Biscuit Fire temperatures.

5.2.4. Sedimentation

Sedimentation is not a great concern in this watershed, although past logging and road building would account for any increases. Most of the watershed drainages are thought to be transport systems which move sediment downstream very quickly. Increased peak flows coupled with the removal of riparian vegetation and instream wood, could have led to increased scour, bank erosion, and sediment delivery to aquatic systems.

Mass slope movements have not been observed following the Biscuit Fire. Some stream bank erosion or failure has been observed on North Fork Silver Creek and some of its tributaries, a portion of which may be attributable to roads. A rain on snow event could result in concentrated flow and erosion, especially given that the Biscuit Fire severely burned approximately 20% of the area. There will be increased susceptibility to debris flows down draws and/or debris slides on steep footslopes which could add sediment to fish streams in the watershed.

Stream sedimentation is expected to return to its historic range of variability due to management goals for riparian reserves (Aquatic Conservation Strategy objectives) and the LSR, with the assumption that new activities will not contribute new sedimentation.

5.2.5. Stream Flow

Road construction, timber harvest and Biscuit fire suppression are factors which could have adversely affect the timing and magnitude of stream flows. Intensity and frequency of peak flows, if they have occurred as a result of past management activities, will diminish as vegetation grows in previously harvested areas. Potential indirect adverse effects of altered peak flows on salmonid reproduction would diminish. A large percentage of the watershed has returned to an early seral stage, making the watershed susceptible to high peak flows. In addition, the large expanse of TSZ makes the risk of rain on snow events leading to an increase in peak flows likely. The problem was further exacerbated by the Biscuit Fire which created large areas in the TSZ devoid of vegetation.

In general, low summer stream flow is not an issue of concern in this watershed. However, past management could have affected summer flows. Summer stream flows are expected to increase, as a result of managing in accordance with the Northwest Forest Plan Standards and Guidelines. Intensity and frequency of peak flows will diminish as vegetation regrows in previously harvested and burned areas. Potential indirect adverse effects of altered peak flows on salmonid production and survival should diminish.

5.2.6. Stream Channels

Channel conditions and sediment transport processes in the North Fork Silver Creek watershed have likely changed since Euro-Americans arrived in the 1850s. This was primarily a result of mining, road building, and logging. The watershed's stream system is primarily a high gradient, stable system. Width depth ratios at a local level, i.e., near the mouth of Sourgrass Creek, have increased. The first 0.6 miles of Sourgrass Creek are wide and shallow, with low complexity

(pools) and large woody debris (USDI 1998).
Sediment is mainly transported from road surfaces, fill slopes, streambanks and ditch lines. Increased sediment due to roads is generally highest five years after construction. However, roads continue to supply sediment to streams as long as the roads exist. Road maintenance, renovation and decommissioning may, in some instances, reduce road related sedimentation. Roads adjacent to streams tend to confine streams and restrict their natural tendency to move laterally. This can lead to down cutting of the stream bed and bank erosion. In such cases, obliteration of streamside roads would improve the situation. Some streambank failure and erosion has been observed this summer at a few sites on main streams (pers. comm. Matthews 2003).

Removal of riparian vegetation and large wood from streams has had a major detrimental effect on the amount of large wood in stream channels. There are low levels of large wood in the analysis area with many areas lacking the potential for short term recruitment. Large wood can help reduce stream velocities during peak flows; trap or slow the movement of sediment and organic matter; and diversify aquatic habitat. Riparian reserves along intermittent or perennial streams (with or without fish) will provide a long term source of large woody material for streams once the vegetation has been restored (USDI 1998). Stream surveys on Class 3 and 4 streams would indicate where large wood is needed.

5.3. VEGETATION

Vegetative structural conditions in the watershed have seldom been constant, changing frequently with historical disturbance patterns. Disturbance has played a vital role in providing a diversity of plant series and seral stages, both spatially and temporally. Fire, insects, disease, drought, and the resultant tree mortality have always been part of ecosystem processes.

Prior to the Biscuit Fire, fire exclusion helped shaped forest structure towards a higher level of complexity in the forest stands. This occurred on the full range of sites including sites where such diversity is not sustainable, such as in areas of historical pine habitat. Due to both timber harvest and fire exclusion, pine has been substantially reduced over the past 50-75 years.

Consideration of the watershed=s vegetation, reference and current condition and successional patterns indicates four distinct areas for consideration.

5.3.1. Plant Series

The Douglas-fir/tanoak series was and is the dominant plant community in the watershed. Douglas-fir is the most common overstory tree species and is frequently associated with other conifers. Nearly 56% of the acres inventoried are tanoak dominated.

Today, approximately 3,165 acres (37% of the watershed) is occupied by white fir associations. Very little white fir is mentioned in the 1920 revestment notes or indicated on 1937 forest type maps. White fir occupies a wide range of site conditions and has encroached into areas that required more frequent fires.

It is difficult to assess changes in specific pine series because the 1937 forest type maps combined areas with all pine species. However, acres identified as large ponderosa pine in 1936 totaled 26% of the watershed. Today, the ponderosa and Jeffrey pine series account for less than 5% of the acres inventoried.

The change in series composition shows a trend: shade tolerant, fire intolerant species are increasing. Tanoak is moving into what would have been Douglas-fir sites, if the historic fire regime had been maintained and pines are being encroached upon by Douglas-fir and white fir.

5.3.2. Late-Successional Forest

There was very little late-successional forest in 1920; 480 acres (5.5% of the watershed) had more than 10,000 board feet per acre. All late-successional forest was located in T35S, R9W. Prior to the Biscuit Fire, 3,649 acres (43%) were classified as mature forest and, due to high canopy closure, tree age and diameter, would have been classified as late-successional forest.

5.3.3. Port-Orford-cedar / Phytophthora lateralis

The fatal root disease caused by *Phytophthora lateralis* threatens the development of large (>21" DBH) POC in the watershed. Infestations exist in the North Fork Silver Creek and downstream from its confluence with Whiskey Creek.

5.3.4. Capability of the System to Meet Management Objectives.

Management objectives should reflect the high diversity offered by the wide range of plant associations in the watershed. Of all the plant associations within the LSR, those in the White fir and Douglas-fir/tanoak series have the greatest potential to provide late-successional forests that will function as late-successional forest habitat. The process for a varied stand structure is in place. Although the size and shape of remaining green trees are without high crown ratios or full bodied crowns, the stand structure is still quite variable and has the potential to produce a range of stand structures in various seral stages. Stands may not be as multi-aged as before the fire but they could be structurally complex and also less susceptible to landscape Biscuit-like fires. With active management, stands with a substantial mid level conifer canopy rather than one that is entirely hardwood could be developed. Regardless of future management objectives, these areas can reliably serve as a source for wood products, wildlife habitat, and fill a variety of social needs.

Plantations served as key locations for back burning during Biscuit Fire suppression. Microsite and variable density planting with subsequent stand development and maintenance practices could also minimize the spread of a future fire and contain it in smaller units. A fire plan could identify key locations for frequent burning such as Jeffrey pine, ponderosa pine, sugar pine and white oak plant associations.

5.4. SPECIES AND HABITATS

5.4.1. Botany

Habitat changes for special status and survey and manage plants have resulted primarily from fragmentation of habitat due to wildfire and timber harvest. Historical fire suppression contributed to the high intensity wildfire that affected at least 74% of the watershed (post-Biscuit satellite data).

The Biscuit fire resulted in a mosaic of dead, burned and green vegetation. Areas with green, relatively unburned vegetation constitute about 26% of BLM land in the watershed. The remaining canopy, no matter what seral stage, will protect moist microsites to some extent. Early seral habitat is not as effective as late seral vegetation at retaining any remnant herbaceous layer in the long run, though it may in the short term protect this layer. Unburned areas may act as important seed refugia for repopulating more intensively burned areas. Unburned areas with unnaturally high fuel levels due to past fire suppression (Fire condition classes 2 and 3) are susceptible to future large fires with increased fire behavior, intensity and effects.

The reduction of previously intact riparian habitat lends uncertainty to the long term health of riparian dependent species. If this habitat continues to shrink, occurrences of special status plants will become more isolated with little chance of expansion. They will also become more susceptible to extirpation by chance events such as intense wildfire, especially on south slopes, that could cause major impacts to numbers of individuals or populations in southwestern Oregon.

The RMP includes the objective of "studying, maintaining or restoring community structure, species composition and ecological processes of special status plants" as well as the requirement to maintain or enhance these types of habitats. This is especially important when considering plant associations that are unique to BLM lands.

Noxious weeds were temporarily controlled in moderately or severely burned areas. However, some weed species could respond to fire by regenerating even more readily. Therefore, weed introduction in the next few years will likely be rapid without an active control program. Simply controlling weeds without restoring native habitat in treated areas would be useless since openings created by these treatments will simply be re-invaded. Restoration plantings need to consist not only of native grasses, but also of trees and shrubs, especially in riparian areas.

Fire in the North Fork Silver Creek RNA has provided ample research opportunities. Since the majority of the RNA is un-entered forest with various plant associations, it could provide a control site in evaluating salvage, weed control, and suppression restoration activities. The area can also be used to fine tune plant associations. In order to be most effective, though, the acreage removed should be returned to the RNA.

5.4.2. Wildlife

Human activities (mining, large scale timber harvesting, road construction and fire suppression) have reduced the historic quantity and distribution of late-successional forest. Road building and timber harvest contributed to fragmentation of late-successional forest patches and created additional "edge" habitat. This has reduced dispersal opportunities at both a local and landscape level. Connectivity facilitates movement and genetic exchange between populations. Connectivity is particularly important for certain fur bearers such as fisher and marten (USDA, USDI 1994), and also for the northern spotted owl which depends on greater canopy closure to move between habitats without predation by great horned owls or red tailed hawks (Foresman 1984). Fragmentation also influences interior forest conditions, allowing generalists to compete with old-growth dependent species. For example, the great horned owl (*Bufo virginianus*) utilizes fragmented landscapes and preys on spotted owls. For big game, roads have allowed for increased disturbance, poaching and decreased habitat effectiveness.

The extirpation of native wildlife from an area alters how the remainder of the community functions. Native species play roles that benefit the community as a whole. Removal of one species may lead to a population imbalance in another. Historically, wolves and grizzly bears served as predators in the watershed. Predation played a critical role in the community. Prey remains not consumed by the wolves or bears were available to a host of other animals. Furthermore, predation kept deer and elk populations in balance with resources.
Species known to be extirpated from the watershed include the grizzly bear and wolf. Wolves have remained on the sensitive species list due to sightings of large canids in southwestern Oregon. Currently, Oregon is not included in the recovery plans for these two species. Species such as the wolverine that have remnant populations in the province may have the ability to self-recover in this watershed due in part to its block federal ownership.

The Fish Hook / Galice LSR encompasses the majority (91%) of the watershed. One key goal of the LSR is to provide a corridor of late-successional habitat between the Kalmiopsis and the Wild Rogue Wilderness areas (USDA USDI 1995). In general, management of habitat for target species such as the spotted owl or red tree vole will depend on the ability to maintain existing late-successional forests while at the same time managing stands to achieve desired LSR stand conditions as quickly as possible. Further loss of late-successional forest habitat would further reduce dispersal opportunities and viability of species associated with this habitat.

The Biscuit Fire also reduced the amount of late-successional forest in this watershed. Severe or moderately burned mature forest stands resulted in the loss of thermal and hiding cover, as well as dispersal, forage, and breeding habitat for many species of animals, including state and BLM listed sensitive species. Severely burned pine stands in the Hobson Horn area represent a loss of nesting habitat, cover and feeding area for the white-headed woodpecker (*Picoides albolarvatus*), a state listed sensitive species, as well as for migratory song birds. Specifically, loss of forest structure could affect dispersal corridors between the North Fork Silver and Sourgrass drainages, north and west to the Rogue River drainage and south into the Kalmiopsis Wilderness.

Species which primarily use early to mid seral stands are expected to increase in areas affected by the Biscuit Fire and/or past management activities. Intact riparian areas in early to mid seral stands should provide dispersal corridors for late-successional dependent species. However, riparian corridors that burned severely (e.g., lower North Fork Silver Creek) represent a loss of foraging habitat and dispersal corridors for forest carnivores such as the fisher (Martes pennanti), a BLM tracking and state vulnerable species. There is also a potential for increased sediment loads in streams affecting amphibians including the tailed frog (*Ascaphus true*), a state listed vulnerable and BLM tracking species.

Snags and coarse woody debris, now plentiful following the Biscuit Fire, are expected to increase as fire killed trees decay and insect infestations occur. Snags and large wood are important for many wildlife species. Species such as bats, woodpeckers, fisher, and small owls will benefit from the higher levels of snags and coarse wood that will be available in the future.

Limited wildlife surveys and habitat assessments were conducted prior to the Biscuit Fire. Therefore, the variety of species and their relative abundance pre-fire were unknown, which makes it difficult to analyze current effects from the Biscuit Fire and determine population trends.

5.4.3. Fisheries

a. Stream and Riparian Trends

Aquatic habitat in the watershed has degraded due to loss of late seral vegetation in riparian zones and reduced amounts of large wood in streams. These changes have been due primarily to logging, roads and wildfire exclusion.

b. Riparian Reserves and Large Wood

The majority (52%) of the BLM lands are Tanoak/Douglas-fir plant series. The white fir plant series (37%) is the second most common plant series. Due to fire exclusion over the last 70 years, tanoak presence has increased. Changes toward more early and mid seral stages due to past management including fire exclusion, has resulted in changes to the character of coarse wood on the ground in the riparian reserves. Early to mid seral stages have less structural and species diversity, less shade, and fewer mature trees as a source of future coarse wood. Logging has reduced the available coniferous coarse wood. Alder, a lower quality coarse wood, has become dominant in some riparian reserves.

The Biscuit fire altered mature conifer forest stand structure. Approximately 44% of the coniferous forests were moderately or severely burned according to post-Biscuit satellite data. Without treatments such as thinning, brushing and prescribed fire, conifer regeneration will be limited and hardwoods/brush will remain dominant for several decades. Because the Biscuit Fire consumed some down coarse wood, all decay classes of woody material may not currently exist in areas (the amount is unknown due to a lack of pre- and post-fire data). Mature size class down wood may become less available over time, as a significant portion of the watershed has been returned to early seral stages.

Roads will be maintained and renovated using current standards of storm proofing. Out sloping, water dipping, and culvert replacement will reduce sediment delivery to streams and restore the natural hydro-period to the watershed, thus reducing peak flow impacts. This will relieve some salmonid population suppression caused by degraded spawning gravels and scoured stream beds.

Active riparian management will often produce large trees faster. Large mature trees will contribute to fish habitat complexity after falling into streams. Age and structural diversity in riparian areas may increase over time in response to the NFP management standards and guides. There is no intent to change forest plan riparian reserve widths at this time. Managing riparian reserves in a manner that promotes attainment of ACS objectives in the long term will be advantageous to fisheries. Examples of beneficial treatments include planting and thinning in the riparian reserves to promote larger trees and stream side shade maintenance.

c. Instream Large Wood

The quantity, quality, and thus function of instream large wood is currently below ODFW benchmark standards for adequate levels. Historical information about LWD levels is not available to compare with current conditions however; logging and road construction have reduced the amount of large wood source from the adjacent slopes. It is possible that large wood had been cleared out of stream channels during road construction and logging and when the wood appeared to block fish passage or pose a risk to culverts or roads.

The quality of instream large wood has been reduced as mature trees have been removed and streamside forests become dominated by smaller trees. Smaller material decays sooner and is flushed out of streams more easily. Where conifers have been removed and hardwoods are more prevalent, large wood quality has been degraded because hardwoods decay rapidly in water. For example, tanoak and alder produce lower quality large wood in areas where they now dominate, such as lower Sourgrass Creek and portions of North Fork Silver Creek.

The function of large woody material in the watershed has been degraded as the amount and quantity of instream wood have decreased. Streams have become ecologically simplified and less effective in dissipating stream flow energy, scouring pools, providing complex habitat for fish, amphibians and invertebrates, and providing organic detritus. Deforested slopes may fail as a result of road failure or natural causes, but in either case, the debris flow no longer carries large wood to the stream along with the sediment load. This represents a break in an important watershed mechanism for supplying the system with large wood. Channelized stream sections which have been straightened and disconnected from the floodplain cannot hold large wood in place as well as natural channels so it leaves the system sooner. When the wood cannot function to shape the channel, fewer meanders and side channels develop to provide needed rearing habitat. The disruption of this channel development process is evident along North Fork Silver Creek where BLM road 35-9-1 parallels and confines approximately four miles of channel.

Another change from the reference condition is the presence of POC root disease. The loss of POC from riparian reserves will remove what was probably a historically important source of large wood for the North Fork Silver Creek system.

Biscuit Fire rehabilitation and stabilization monitoring surveys indicate that the levels of key pieces of large woody debris are below the ODFW “adequate” benchmark level. Some streams do contain adequate numbers of pieces and volume of large wood. A significant portion of the watershed was returned to an early seral stage after the Biscuit Fire. This could reduce the amount of future large wood recruitment.

The greatest potential for improvement in complexity of fish habitat over the long term will be the rehabilitation of instream large wood and future large wood recruitment. All streams in the watershed will become more effective at dissipating stream flow energy, creating scouring pools, providing complex habitat for fish, amphibians and invertebrates, and retaining organic detritus. Boulders and rubble (rather than large wood) play major roles in creating fish habitat in larger streams (>3rd order). However, large woody debris continues to be important in steeper streams by dissipating stream energy (i.e., forming a stepped channel profile), controlling the movement of sediment and small organic matter, and proving habitat for fish and amphibians.

g. Aquatic Species

Approximately 13.6 miles of stream are used by resident trout. This small amount of habitat may be due to steep streams with falls and cascades that are not fish passable. These streams may also have flashy flows and few pools suitable as holding habitat for over-wintering fish. Removal of riparian vegetation can exacerbate the impact of fires and floods, preventing the retention of large woody debris in the system. The loss of instream structure can accelerate streambed scouring, which decreases the amount and diversity of aquatic insects available to salmonids as food.

Implementation of the Aquatic Conservation Strategy on federal land will improve watershed health. The loss of stream complexity has affected rearing habitat. In the recovery of coho and steelhead, refugia on federal land will be extremely important. Silver Creek and lower North Fork Silver Creek are accessible to fall chinook, coho and steelhead. Prioritizing restoration in key watersheds will allow remnant stocks of coho to survive while drainages that have been disturbed by past practices recover. As a tributary to the Silver Creek, this is relevant to N. Fork Silver Creek.

More sediment and temperature intolerant aquatic insect taxa will increase as watershed conditions improve. Collector-dominated communities in these small streams would gradually shift to scrapers and shredders as canopy closure and the conifers increase. In the North Fork Silver Creek mainstem, increased woody material will retain detritus and encourage communities of macro invertebrates intolerant of scouring and degraded conditions.

The removal of fish passage barriers (culverts) that hinder fish passage (See Table B-2 in the Appendix) will make more habitat accessible to both juvenile and adult fish. This should increase productivity and survival as fish gain access to spawning and rearing areas.

5.5. FIRE

Following the Biscuit Fire, the risk for a large scale, high severity wildfire within the next 5-10 years is low. The risk for human caused fires is also low due to the watershed's remote location, rugged topography, and federal ownership.

Ground fuel loading in the watershed is low following the Biscuit Fire. As snags and poles rot they will fall and likely settle in a crisscross or jack straw pattern increasing the ground fuel loading and make access difficult and dangerous for firefighters. In addition, green trees will drop leaves, needles, and limbs producing fine fuel and brush and hardwood species will regrow from seeds and sprouts.

If future fuels are not reduced and fires continue to be quickly suppressed, condition classes will gradually return to pre-Biscuit conditions. Due to the low risk of fire starts in the watershed and aggressive fire suppression policies, vegetation and forest litter would accumulate for decades until another catastrophic fire occurs.

5.6. HUMAN USE

Changes that have occurred in the watershed include catastrophic fire, timber harvest, road building and other development. Josephine County is increasing in population due to the influx of out-of-state individuals purchasing property. With greater population comes increased use of public lands. The type of recreational use is also changing from non-motorized to motorized (before roads, there were mainly trails to access the area).

As previously noted, fire frequency and intensity has been greatly altered since the interruption of Native American periodic burning of specific plant communities and since fire suppression activities were vigorously implemented.

Miners cut trees to build flumes, trestles, dams, cabins, waterwheels, and to reinforce tunnels. They also tended to burn around claims to improve access to mining areas. Burning by miners and other Euro-Americans amounted to an "ecological transition" which changed the distribution of habitats and seral communities across the landscape and may have contrasted sharply with communities that resulted from Indian burning.

Decades of fire suppression also influenced the composition and structure of plant communities. Following WWII, new techniques such as smoke jumping and easy access to previously unroaded areas allowed for more efficient fire suppression. Furthermore, when fires do occur, given past effective suppression, they tend to be large, stand replacing events.

Burning by miners, fire suppression, and the natural fire frequency of the area can lead to questions regarding the degree and intensity of Native American burning. Is it possible to distinguish between the effects of Native American habitat management and naturally occurring fire? If we consider the time frame in which native people used fire, possibly thousands of years in some habitats, we can posit that a number of plant communities (e.g., pine-oak savannahs and meadows) were primarily anthropogenic, owing their extended existence to the periodic and systematic use of fire by Native Americans. In this context, prescribed fire would play a key role in maintaining long term watershed vitality and restoring some pre-settlement plant communities.

Early placer and hydraulic mining damaged riparian and other habitats. These sites are in various degrees of recovery today. The North Fork Silver Creek watershed, however, has not been as severely impacted by mining as some neighboring watersheds due to lower mineral potential.

6.0. MANAGEMENT RECOMMENDATIONS

The purpose of this section is to bring the results of the previous steps to conclusion by focusing on recommendations that are responsive to watershed processes identified in the analysis. Recommendations also document logic flow through the analysis, linking issues and key questions from step 2 with the step 5 interpretation of ecosystem understandings. Recommendations also identify monitoring and research activities that are responsive to the issues and key questions and identify data gaps and limitations of the analysis (*Federal Guide for Watershed Analysis, Version 2.2, 1995).* The recommendations outlined in this section are typically resource specific. They may not be based on the results of the give and take of an interdisciplinary team or resource specialists as occur during project level NEPA analysis. Therefore, each recommendation may not serve multiple resource needs and recommendations may conflict. They should be viewed only as place of departure for consideration in project planning and prioritization and as the basis for interdisciplinary team based project planning.

6.1. RECOMMENDATIONS

Tables 30 and 31 list management action recommendations for the North Fork Silver Creek watershed. Recommendations are grouped according to Northwest Forest Plan land allocation. Actions that are required by the RMP, NFP, or other decisional document may not be included in these recommendations tables.

It is important to keep in mind that these recommendations are **not** management decisions. The recommendations may conflict or contradict one another. They are intended as a point of departure for project specific planning and evaluation work. Project planning then includes the preparation of environmental assessments and formal decision records as required by the National Environmental Policy Act (NEPA). It is within this planning context that resource conflicts would be addressed and resolved and the broad recommendations evaluated at the site specific or project planning level. Project planning and land management actions would also be designed to meet the objectives and directives of our Medford District Resource Management Plan (RMP).

Table 29: Recommendations - All Land Allocations

Issue	Core Topic	Recommendation
Big Game	Species and Habitat (Wildlife)	Minimize permanent road construction and restrict management activities between November 15 and April 1.
Mines	Species and Habitat (Wildlife)	Prevent or minimize disturbance to mines through the use of closures, buffers and seasonal restrictions.
Meadows, Deciduous Oak, and Pine	Species and Habitat (Botany, Wildlife), Vegetation	Identify and restore meadows, pine (especially western white, sugar and Jeffrey pine) and oak communities. Appropriate methods may include thinning, brushing and burning. Use native plant materials where possible.
Noxious Weeds	Species and Habitat (Botany), Vegetation	Institute annual noxious weed control by surveying fire areas and treating known sites.
Special Status Plants	Species and Habitat (Botany), Vegetation	Monitor vegetation recovery in California pitcher plant fens including noxious weed treatment. Follow annual changes in productivity for *Darlingtonia californica*, *Cypripedium californicum* and *Leucothoe davisiae*.
Road Closures	Fire	Collaborate with ODF for gate closures and signing during periods of very high or extreme fire danger.

Table 29: Recommendations - All Land Allocations		
Issue	**Core Topic**	**Recommendation**
Road Closures	Vegetation (Port-Orford-cedar)	Reduce vehicle access to uninfected Port-Orford-cedar locations.
High Intensity Fire Occurrence	Fire, Erosion Processes, Species and Habitat (Fisheries, Wildlife)	Prioritize and implement fuel hazard reduction treatments at strategic locations throughout the watershed. Maintain a low intensity fire regime in Biscuit Fire burned areas by treating fast growing and resprouting species (tanoak, madrone, manzanita and ceanothus) with prescribed fire, manual and mechanical treatments. Remove salvageable trees to prevent heavy ground fuel buildup.
Helispots/ Pump Chances	Fire	Maintain existing helispots and pump chances.
Fire Hazard	Fire, Human Uses, Species and Habitat	Pursue both mechanical and prescribed fire treatments on BLM lands to reduce fire hazard, such as fuel breaks and fuel management zones. Focus on high priority areas such as ridge lines and existing fire control lines to aid firefighters in the suppression of fires that escape initial attack. Comply with LSR guidelines to maintain connectivity and enhance late-successional habitat characteristics.
Dispersed Recreation	Human Uses	Encourage cooperative agreements and MOUs between BLM and other government agencies to promote recreation opportunities.
Botanical restoration	Species and Habitat (Botany)	Maintain or improve habitats using such techniques as prescribed fire while balancing the risks to other S&M or special status species. Use experimental methodologies to burn near special status plants to study the effects of burning or avoid burning near populations known to be fire intolerant.
Plant species composition	Vegetation, Species and Habitat (Wildlife, Botany)	Conduct density management in natural and planted stands. Objectives should include reduction of stem numbers and species selection to provide a species mix that more closely resembles that thought to occur prior to fire exclusion and logging. Use prescribed fire to reduce activity fuels (slash) created by density management. Strive to mimic natural disturbance while maintaining special status species and structural diversity. Comply with LSR guidelines to maintain connectivity and enhance late-successional habitat characteristics.
Special Status species habitat	Species and Habitat (Botany)	Monitor vegetation recovery in California pitcher plant fens including noxious weed treatment. Track annual changes in productivity for *Darlingtonia californica, Cypripedium californicum* and *Leucothoe davisiae.*
Port-Orford-cedar	Vegetation, Water Quality, Species and Habitat (Aquatic)	Prevent export of POC root disease to uninfested sites. Follow guidance in the USDA, USDI publication, *Supplemental Environmental Impact Statement for the Management of Port-Orford-Cedar in Southwest Oregon* which is anticipated to be published in early 2004.
Species composition	Vegetation, Fuels, Botany, Fisheries, Wildlife, Hydrology	Enhance species diversity and advance seral progression by reducing tanoak and other brush species that will dominate pioneer and early seral stages of the burn area if left unchecked.
Transient Snow Zone (TSZ) / Peak Stream Flows	Erosion Processes, Water Quality, Vegetation	Minimize rapid runoff from rain-on-snow events as exacerbated by severely burned areas. Reduce high erosion and extreme peak flow potential in those areas that have high tree mortality due to the Biscuit Fire by encouraging high levels of coarse wood recruitment without increasing the fire hazard. Interrupting surface water flow will improve infiltration and moisture retention for plant growth.
Access	Fire, Vegetation, Species and Habitat (Fisheries)	Consider land allocation, long term access needs for management, maintenance limitations, and environmental concerns when developing TMOs. Maintain or reduce road mileage in accordance with the RMP. pp. 23 and 34 (USDI 1995). Reduce road maintenance levels on spur roads in accordance with long term land management needs.
Late-successional Habitat and Connectivity	Vegetation / Species and Habitat (Wildlife, Botany)	- Design vegetation treatments to promote late-successional habitat that was altered in the Biscuit Fire. Maintain highly functioning, resilient late-successional habitat. Comply with LSR guidelines to maintain connectivity and enhance late-successional habitat characteristics. - Identify areas that are highly functioning or at risk. Update GIS McKelvey rating data to facilitate this. - Maintain and promote connectivity between the Kalmiopsis Wilderness and the Rogue River.

Table 29: Recommendations - All Land Allocations

Issue	Core Topic	Recommendation
		Identify the range of seral stages in the watershed to begin developing a dynamic and resilient late-successional reserve and habitat. Build bridges/connections between currently functional habitat areas. Develop stand resilience to absorb disturbance (fire, insects, etc.).
Mines, Shafts, Adits	Species and Habitat, Human Uses	Inventory mining shafts and other structures to determine wildlife habitat suitability, access and safety.
Coarse woody debris	Species and Habitat, Soil Productivity	Promote snag and down wood recruitment in old clearcuts by leaving snags on forested margins adjacent to clearcuts and encouraging them to fall into clearcuts. Directionally fall snags into clearcuts at their margins when not contrary to wildlife objectives.
Spotted Owl Habitat	Species and Habitat	In spotted owl activity centers where less than 40% of the home range is suitable habitat, maintain and develop late-successional habitat conditions. In spotted owl activity centers where more than 40% of the home range is suitable, increase habitat by thinning stands less than 80 years old to accelerate development of the older forest component.
Matrix land allocation	Species and Habitat	Conduct matrix treatments that complement neighboring LSR conditions. If an LSR objective is to establish late-successional characteristics or maintain small openings, a complementary matrix treatment could be fuel hazard reduction, maintenance of connectivity corridors, or maintaining small matrix openings.

Table 30: Recommendations - Riparian Reserves and Special Areas

Issue	Related Core Topic	Recommendation
Riparian Reserve Mgmt., Reserve widths	Species and Habitat	Retain interim riparian reserve widths outlined in the NFP and RMP. Based on site conditions and project level analysis, actively manage vegetation and conditions inside riparian reserves to promote or accelerate attainment of ACS objectives, especially long term. Use thinning, prescribed fire or other mechanical treatments to reduce fuels.
Ponds	Human Uses (Fire), Species and Habitat (Wildlife)	Maintain and improve ponds (located mostly in the upper end of the watershed) to enhance their value to wildlife and for fire suppression.
Large Woody Material (instream and riparian)	Species and Habitat (Aquatic), Erosion Processes, Water Quality / Quantity	Where appropriate based on local site conditions, improve instream complexity by adding key pieces of wood. Retain large standing dead trees in riparian areas for future coarse wood recruitment.
Fish passage / Culverts / Barriers	Species and Habitat (Aquatic), Human Uses	Replace culverts that impede juvenile and adult fish passage. Culverts should match the natural stream gradient and incorporate a natural stream bottom.
Water Temps	Water Quality, Species and Habitat (Aquatic)	In early to mid seral communities near creeks, treat vegetation to expedite tree growth to improve stream shading and stream temperature for summer fish rearing and other aquatic organisms. This may be incorporated in a Water Quality Management Plan.
Sediment and Roads	Human Uses, Erosion Processes, Water Quality	Conduct sediment and stream encroachment evaluations considering road surfacing, reduction of drainage ditch flow into natural tributaries and road prism adjustments. Focus on road 35-9-1.
Ecological Value	Species and Habitat	- Complete a management plan for the North Fork Silver Creek RNA. - Through the next Resource Management Plan amendment process, consider returning the North Fork Silver Creek RNA to its original nominated acreage.
Ecological Value	Fire	Use the NF Silver Creek RNA as a study area for restoration treatments. This un-entered area, which burned under varying severities, can be used to compare planting scenarios in non-plantation units, for thinning and/or salvage treatments or for riparian restoration.

6.2. DATA GAPS

Table 31: Data Gaps

Core Topic	Information Needs
Soils	- Principal soil erosion sources by location and mechanism. - Information regarding soil dependent biological communities. - Field surveys for mass movement features in highly susceptible areas and for streambank erosion. - Inventory and monitoring for compaction and disturbance. - Productivity changes due to compaction and disturbance.
Vegetation	- Plant series data combined with vegetative condition class to determine management opportunities. For example, information on acres in the Douglas-fir series is available as is information on acres of pole stands, but not Douglas-fir pole stands. A second example is acres of Ponderosa pine and white oak being encroached upon by Douglas-fir.
Botany	- Special status and Survey and Manage plants (vascular and nonvascular) distribution / presence. - Vascular and non-vascular plant surveys on approximately two thirds of the watershed. - Noxious weed distribution / abundance. - The potential RNA along the North Fork Silver Creek needs to be surveyed. Only 25 acres of the entire section (which is all BLM) have been surveyed. - Riparian reserve species surveys.
Fisheries	Stream and riparian surveys including physical habitat surveys for most streams. Surveys and to assess benthic macroinvertebrates are needed and should be repeated every 5-10 years to identify trends.
Water Quality, Species and Habitat (Aquatic)	- Stream surveys including proper functioning condition, coarse wood, stream class, riparian vegetation, reaches subject to instability, etc. Class 3 and 4 streams are the highest priority. - Site specific standards for down wood densities. - Headwater conditions regarding sediment production, water contribution and riparian potential. - Quantitative stream flow data for North Fork Silver Creek and its tributaries - Hydrologic cumulative effects analysis (extent of equivalent clear cut area, compacted area, TSZ, and road density by subwatershed).
Wildlife	- Surveys to identify the distribution, abundance and presence of the majority of species, including special status species. - Special status species habitat surveys. - Mining shaft/adit locations and quality as habitat. - Riparian reserves species surveys. - Accurate McKelvey rating data to analyze suitable spotted owl habitat including new surveys to analyze the current condition of suitable spotted owl habitat and monitoring to assess the habitat recovery.
Human Use	- BLM noncapitalized road and skid trail inventories. - Recreation use inventories. - Recreation Opportunity Spectrum inventory of existing recreational opportunities. - Dispersed recreation trails and mining ditches inventories. - Mining shafts/adit access and safety inventories. - Cultural resources inventories.

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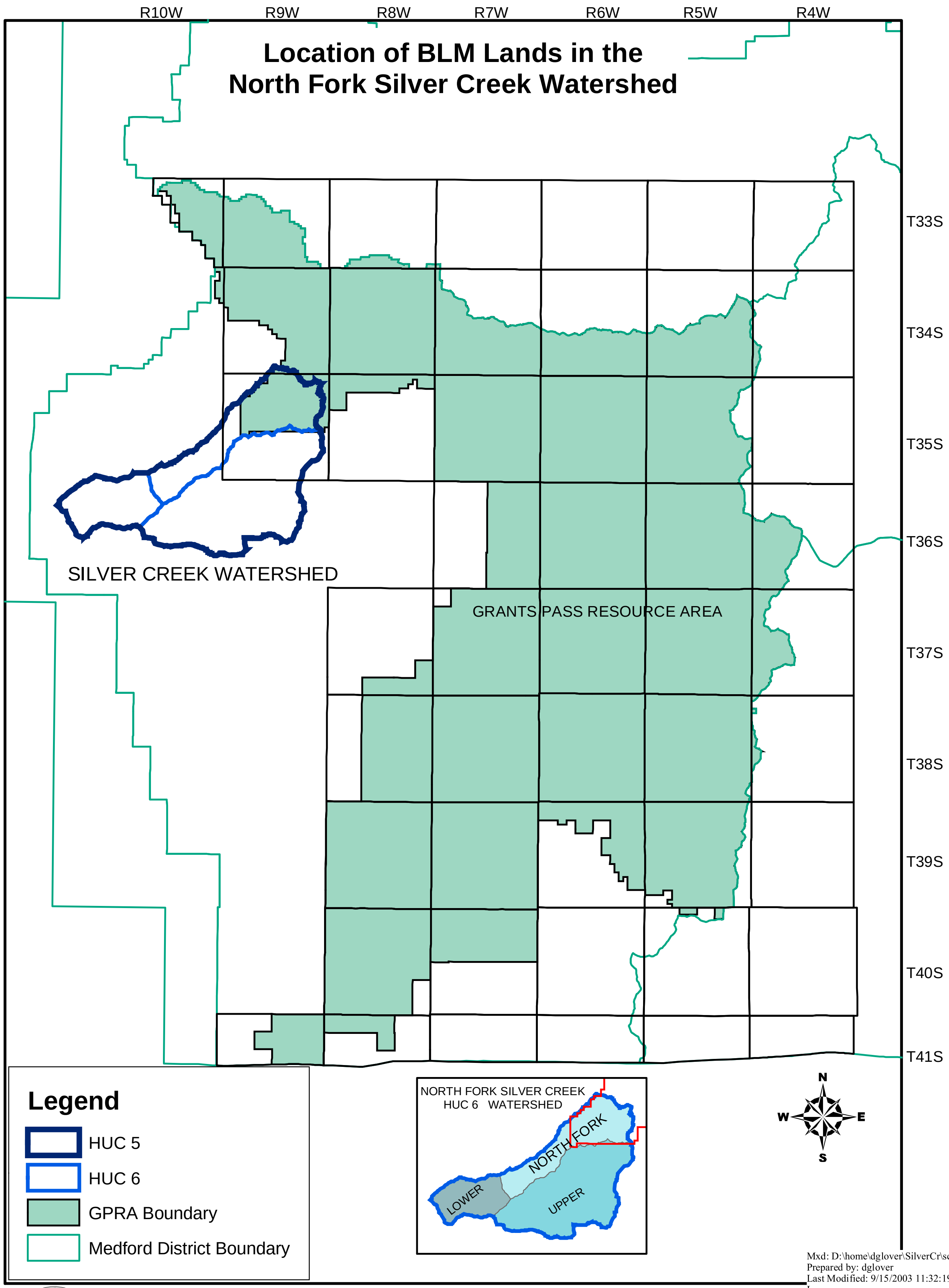
Appendix A: Maps

Map 1: North Fork Silver Creek Watershed
Map 2: Land Use Allocations and Roads in the North Fork Silver Creek Watershed
Map 3: Higher Order Streams in the North Fork Silver Creek Watershed
Map 4: Vegetation Types in the North Fork Silver Creek Watershed
Map 5: Plant Series in the North Fork Silver Creek Watershed
Map 6: Botanical Resources in the North Fork Silver Creek Watershed
Map 7: Fish Distribution in the North Fork Silver Creek Watershed
Map 8: Biscuit Fire Burn Severity in the North Fork Silver Creek Watershed
Map 9: Vegetation Type and Burn Severity in the North Fork Silver Creek Watershed



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Map 1

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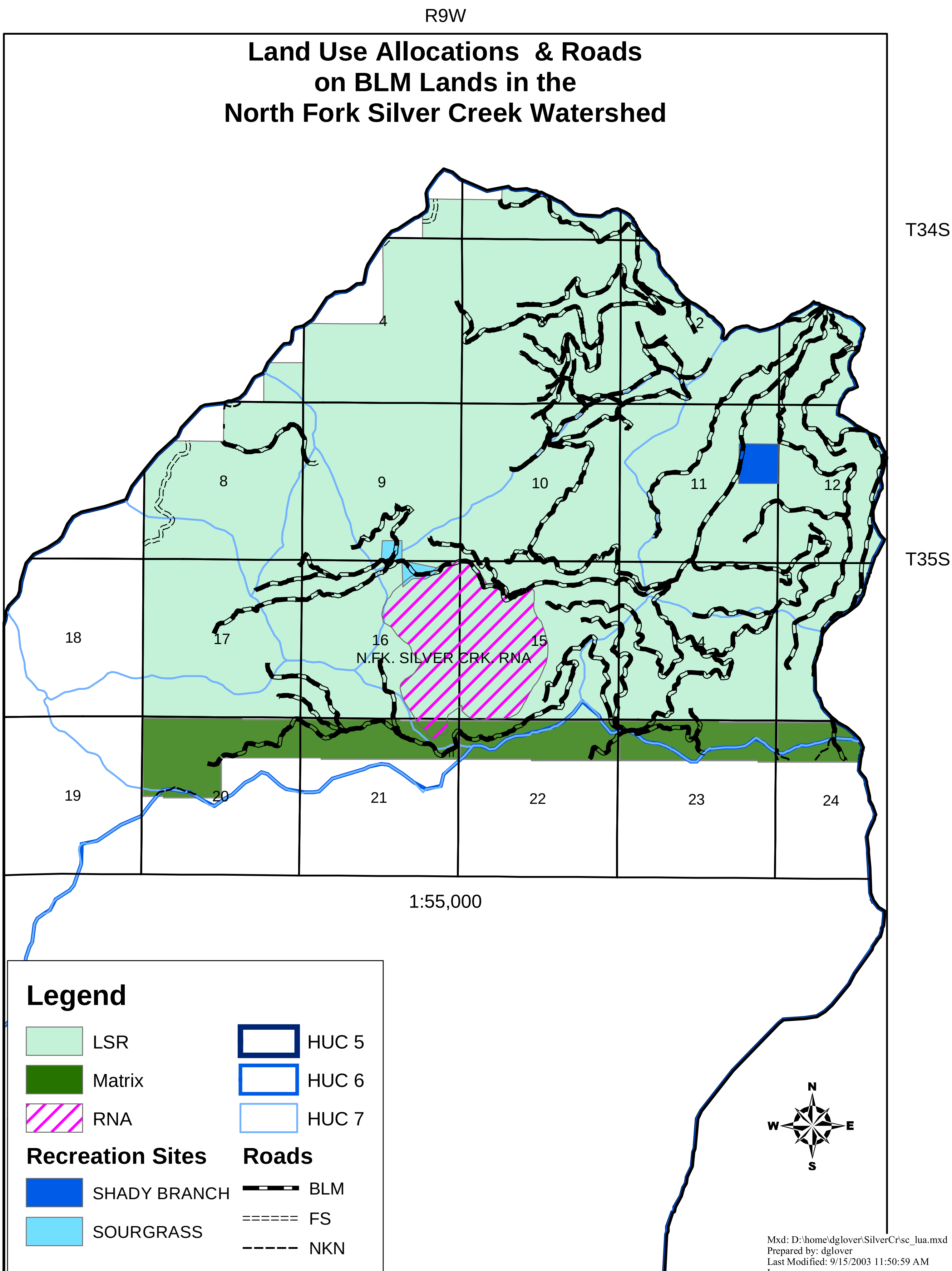
Land Use Allocations & Roads on BLM Lands in the North Fork Silver Creek Watershed



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Map 2

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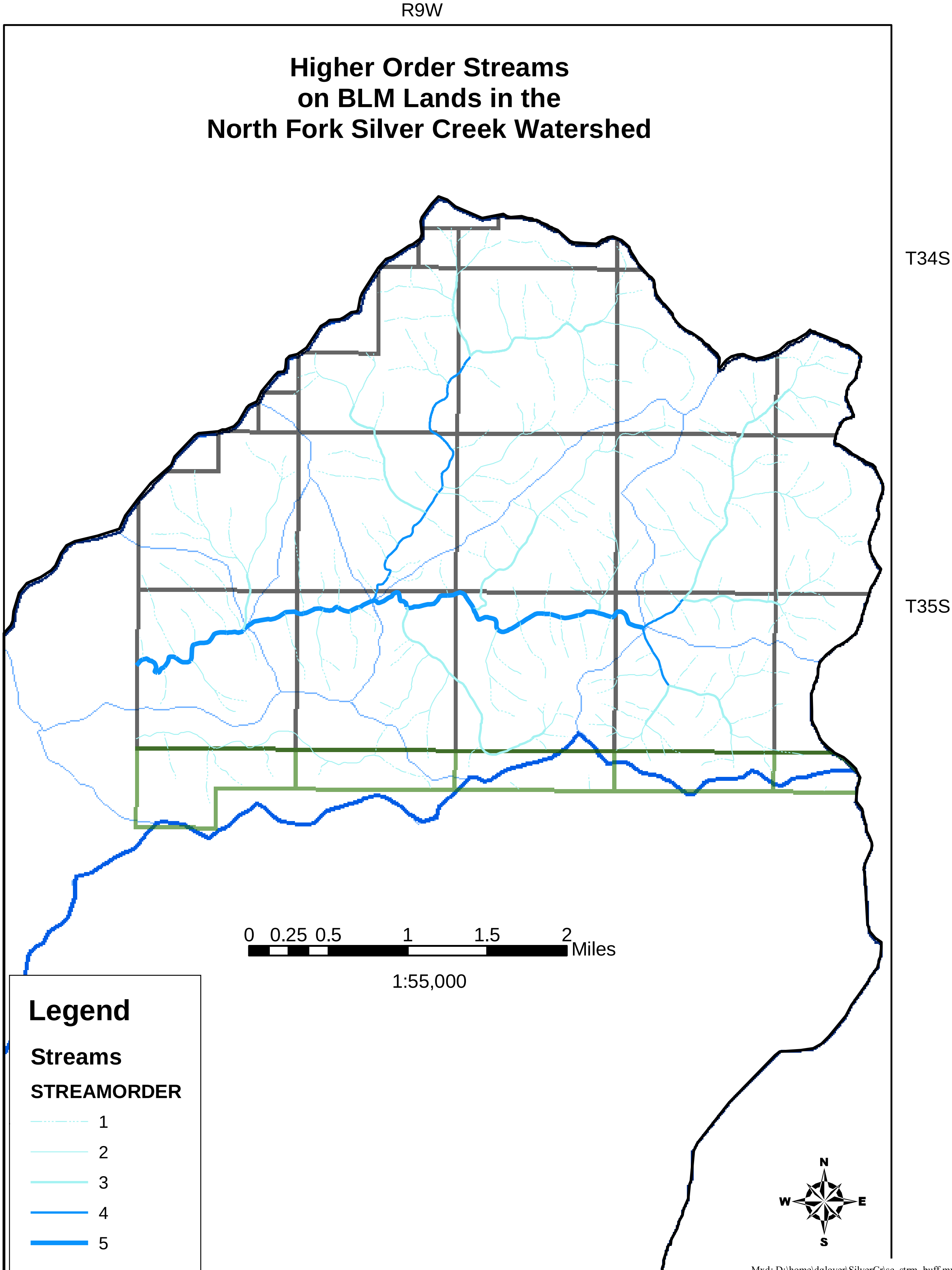
Higher Order Streams on BLM Lands in the North Fork Silver Creek Watershed



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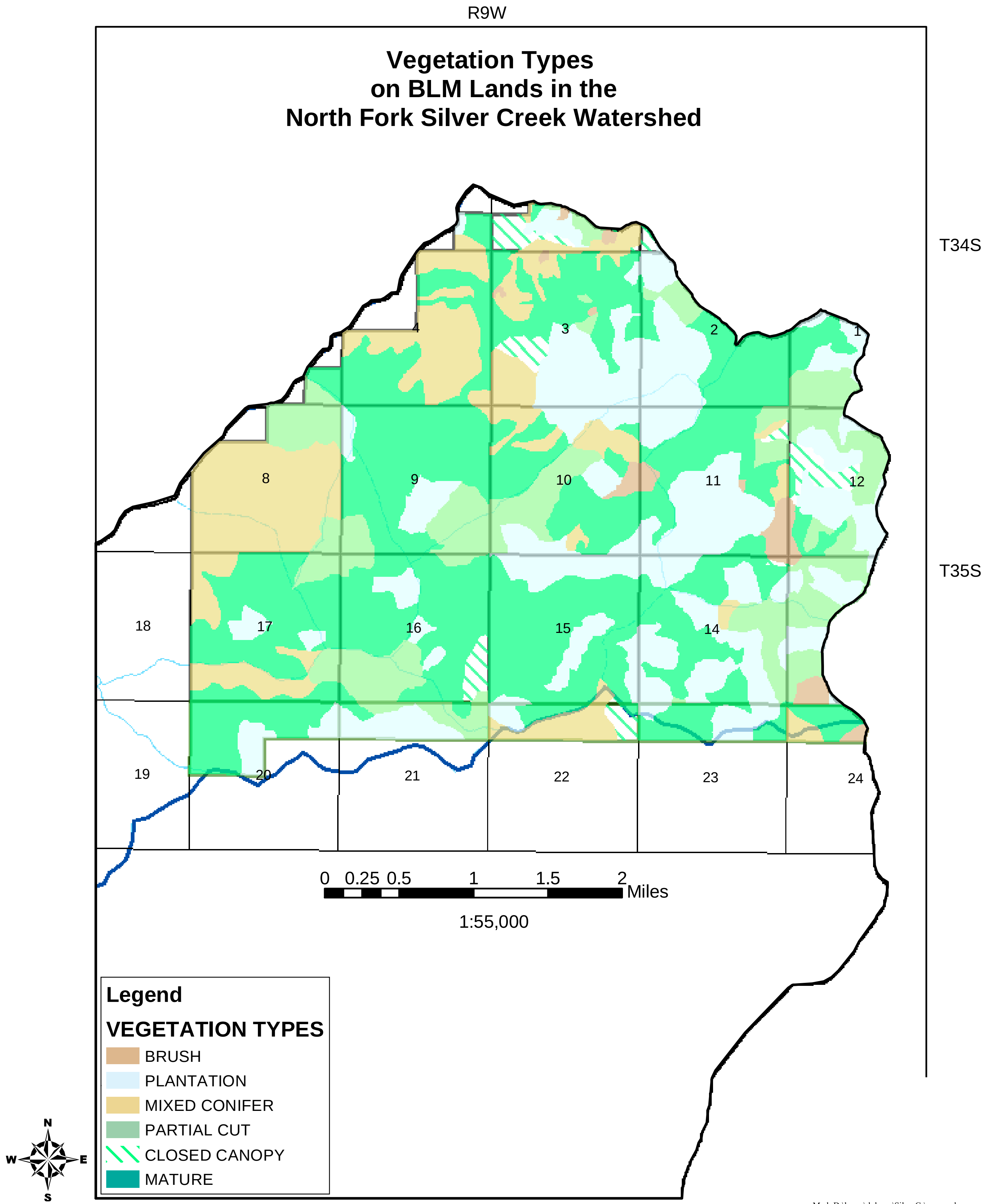
Map 3



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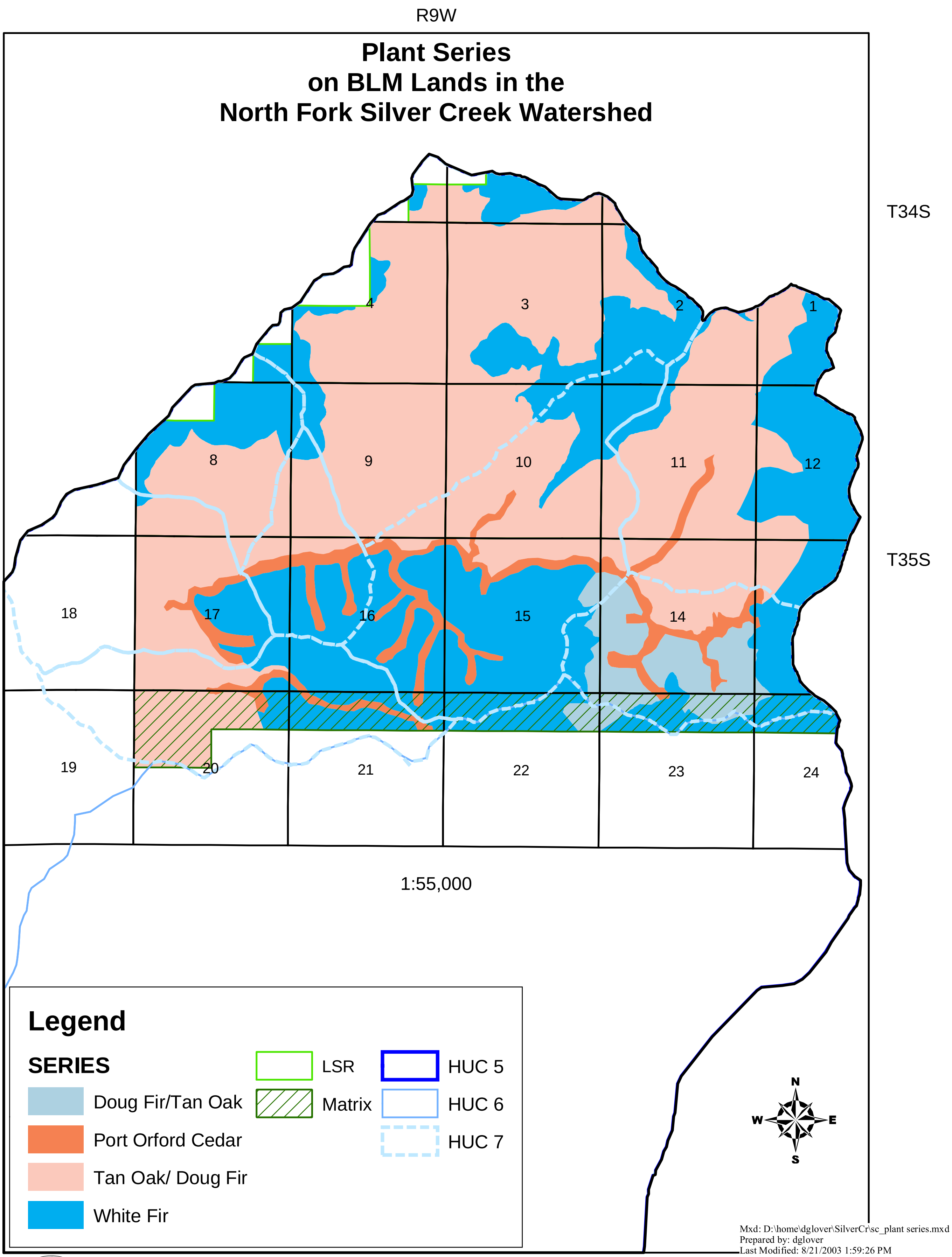
Plant Series on BLM Lands in the North Fork Silver Creek Watershed



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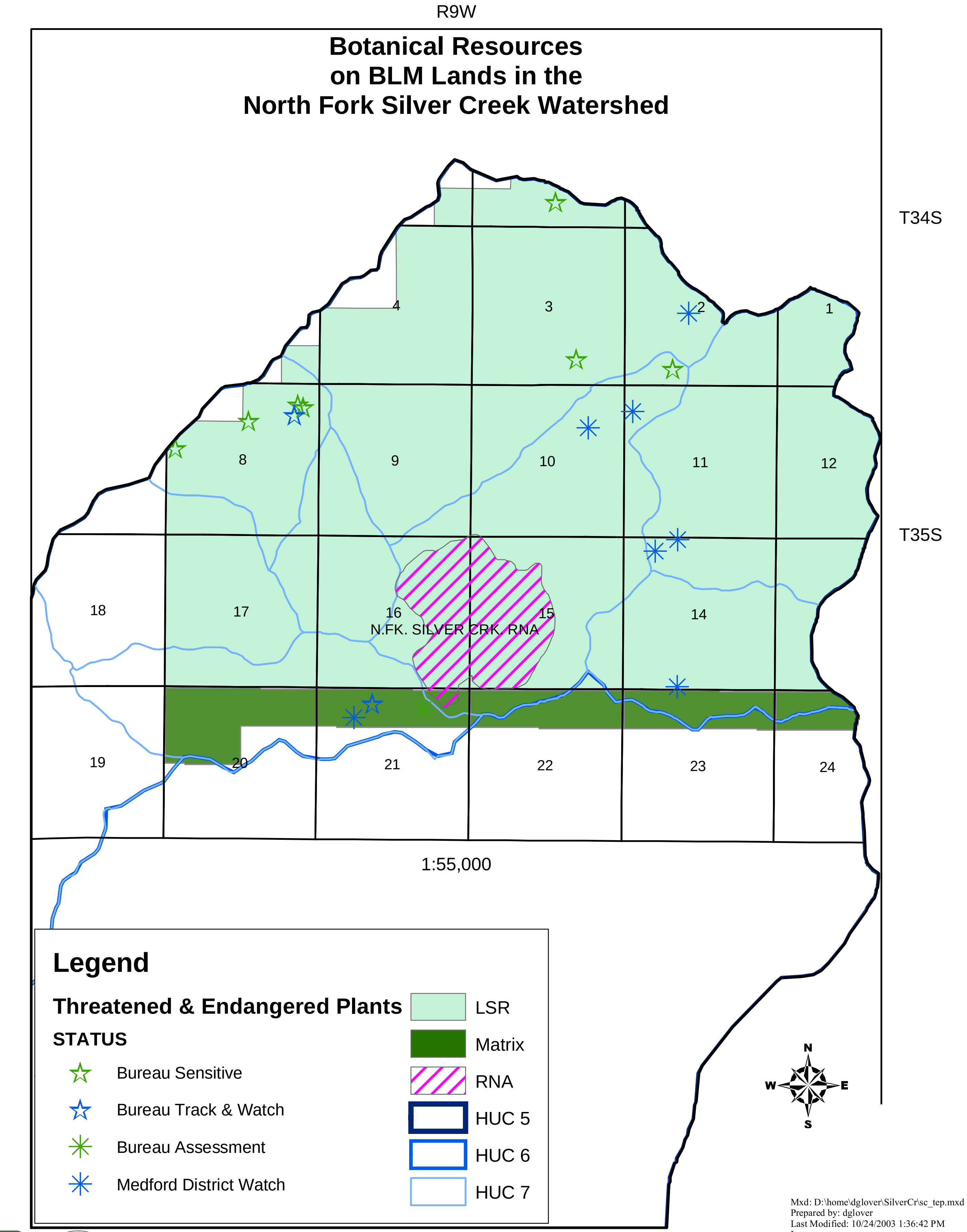
MAP 5

Botanical Resources on BLM Lands in the North Fork Silver Creek Watershed



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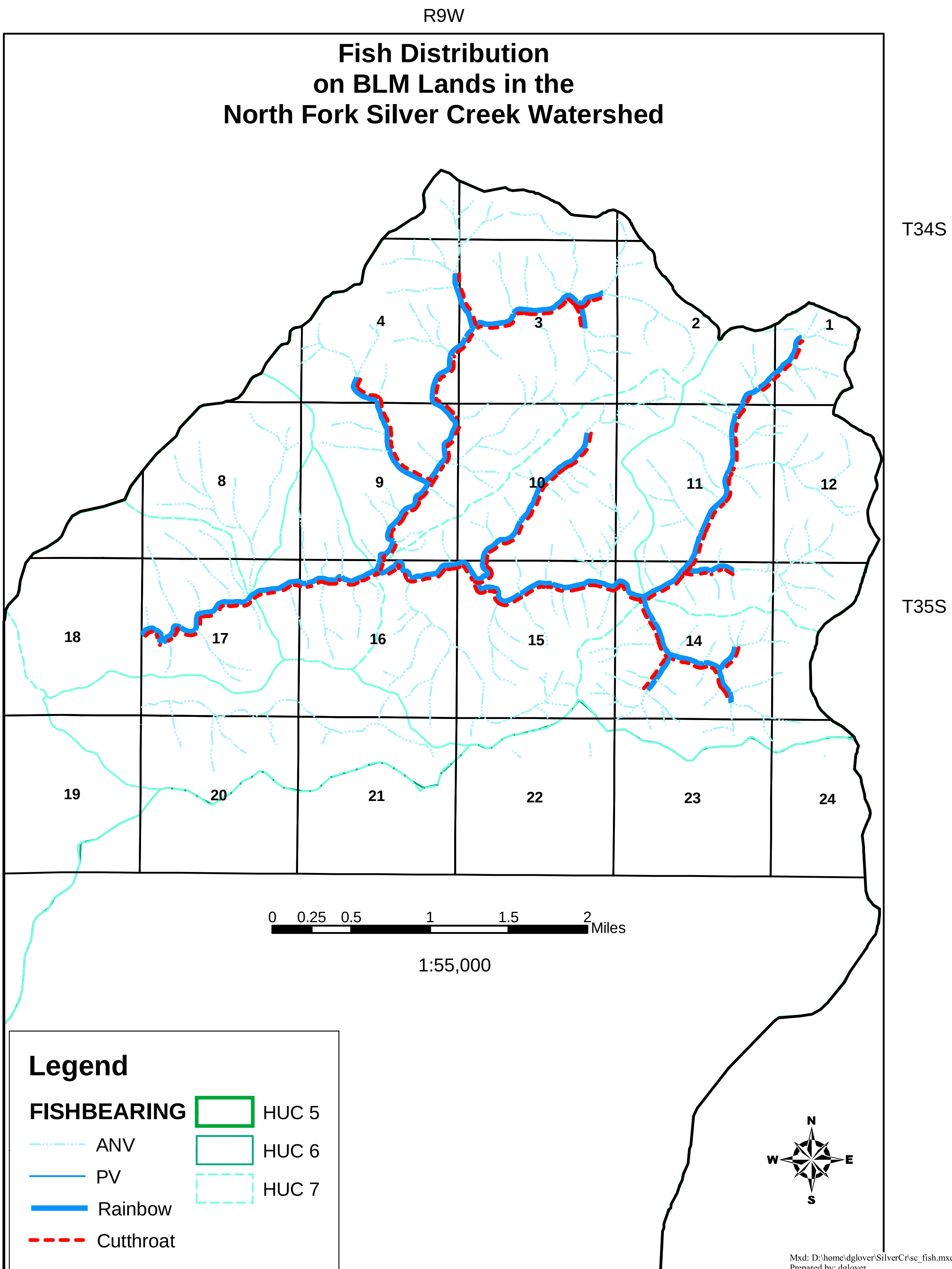
Map 6

Fish Distribution on BLM Lands in the North Fork Silver Creek Watershed



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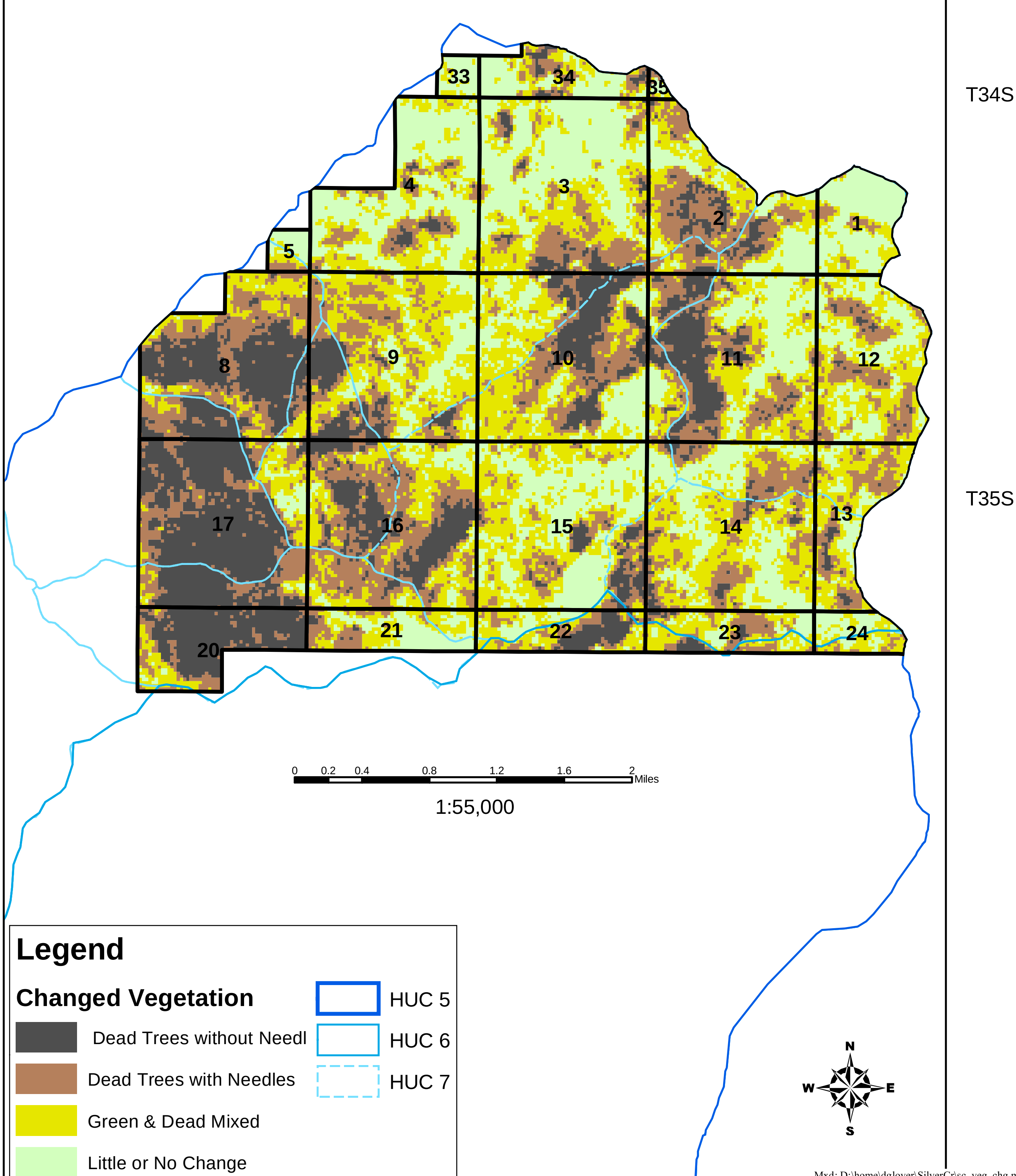
Biscuit Fire Burn Severity on BLM Lands in the North Fork Silver Creek Watershed



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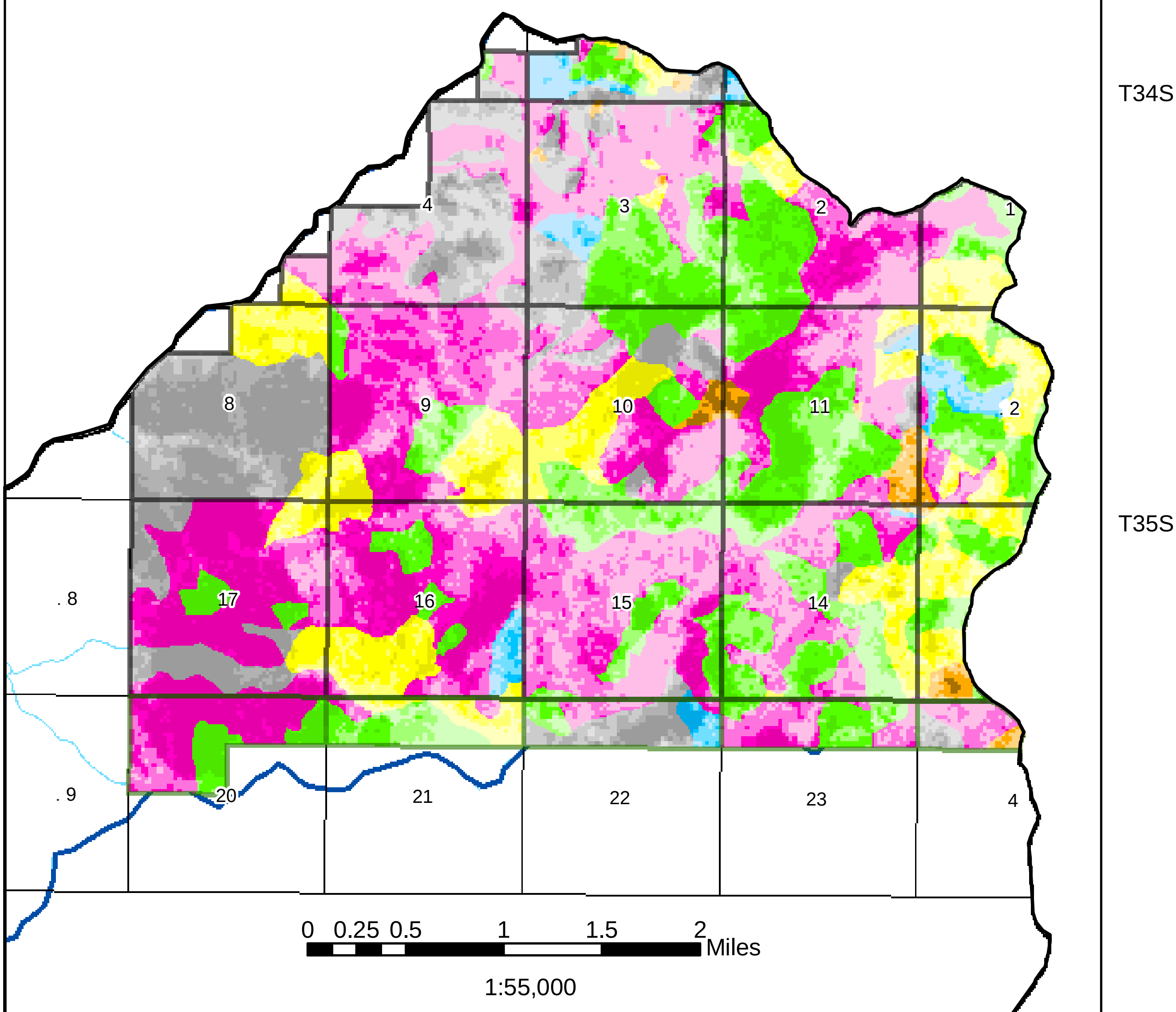
R9W

Vegetation Types & Burn Severity on BLM Lands in the North Fork Silver Creek Watershed



Legend

- Shrub, Little
- Shrub, Low
- Shrub, Moderate
- Shrub, High
- Partial Cut, Little
- Partial Cut, Low
- Partial Cut, Moderate
- Partial Cut, High
- Plantation, Little
- Plantation, Low
- Plantation, Moderate
- Plantation, High
- Unentered Mixed Conifer, Little
- Unentered Mixed Conifer, Low
- Unentered Mixed Conifer, Moderate
- Unentered Mixed Conifer, High
- Unentered Closed Canopy, Little
- Unentered Closed Canopy, Low
- Unentered Closed Canopy, Moderate
- Unentered Closed Canopy, High
- Mature, Little
- Mature, Low
- Mature, Moderate
- Mature, High

N
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Map 9

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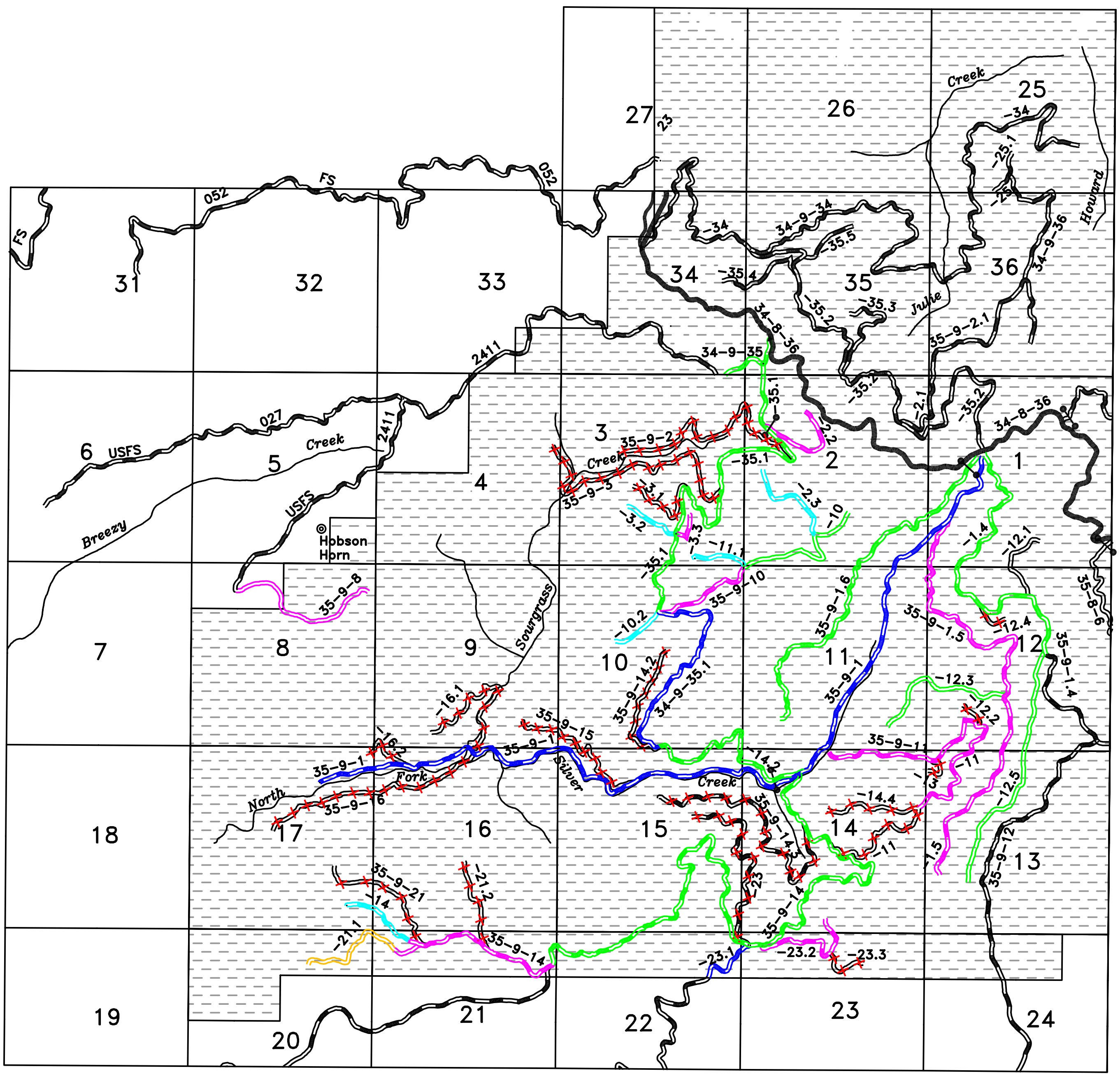
NORTH FORK SILVER CREEK PROPOSED TMO CHANGES



- UCG = No changes in existing road status
- IMP = Road to be improved
- OMLD = Road to remain open & there will be a downward change in maintenance level
- CFD = Road to to be closed permanently & fully decommissioned
- CDR = Road to to be closed long term

0 1/2 1
SCALE IN MILES

Appendix B: Road Data

1. Definitions

BLM Capitalized Roads: The BLM analyzes Bureau-controlled roads to determine capitalized or noncapitalized classification. During this analysis, the BLM considers many elements including present and future access needs, type of road, total investment, and road location. Each capitalized road has a BLM road number and a capitalized value. BLM capitalized roads are managed and controlled by the BLM.

BLM Noncapitalized Roads and Skid Trails: BLM noncapitalized roads and skid trails are not assigned a capitalized value. Noncapitalized roads are generally jeep roads and spur roads that exist due to intermittent public and administrative use. Skid trails are ground disturbances, created under a timber sale, that have not been restored to their natural condition.

Non-BLM Roads and Skid Trails: Non-BLM roads and skid trails are administered by private land owners or other governmental agencies. The BLM has no control over these roads.

Quarries: Quarries are areas of land suitable for use as a rock source to develop aggregate material for the surfacing of roads, rip rap for slope protection, rock for stream enhancement projects, and for other miscellaneous uses. Types include active or depleted quarries.

Road Data Elements: Information on data elements is available through the Medford District road record files, right-of-way (R/W) agreement files, easement files, computer road inventory program, GIS maps, transportation maps, aerial photos, and employee knowledge of existing road systems. Field data will be gathered to eliminate data gaps or to verify/update existing information. Some information on private roads does exist, but the majority will need to be researched by the BLM through privately authorized field investigations and answers to BLM's request for information from private land owners. Examples of data elements for roads: road density, road surface, surface depth, road use, road drainage, road condition, road grade, gates, R/W agreements, easements, maintenance levels, and barricades.

Transportation Management Objectives (TMOs): The TMO recommends one or several management actions for each Bureau controlled road within an analysis area as determined by present and future road management needs. TMOs support the attainment of many of the *Standards and Guidelines* of the Northwest Forest Plan as well as the Management Action/Direction of the Districts= ROD/RMPs (Western Oregon Transportation Management Plan, June 1996). TMO acronyms used in the tables in this section are as follows:

NULL No recommendation - the TMO has not been completed or no decision has been made yet.
UCG No change of existing road status.
IMP Road to be improved or reconstructed.
OMLU Road to remain open and there will be an upward change in the maintenance level.
OMLD Road to remain open and there will be an downward change in the maintenance level.
OR2T Road to be converted to a trail and left open.
CSC Road to be closed on a seasonal basis.
CST Road to be closed temporarily (from one to five years).
CDR Road to be closed long term (for more than five years).
CFD Road to be closed permanently and fully decommissioned.
COB Road to be closed permanently and completely obliterated.
RFI Road to be removed from inventory. (Decommissioned, not built, no access, etc.)

2. Definition of Columns in Watershed Road Information Tables

T = Township, R = Range, Sec = Section, Seg = Road Segment
These columns describe the road number, location of the beginning point of the road, and the road segment. Example of a road number: 35-7-24 A.

Name — Name of the road.
Total Miles — Total length of the road in miles.
TMO Recommended:
<u>Improve:</u> may include installing culverts, drainage dips or water bars for erosion control, out sloping the road prism, and aggregate surfacing or re-surfacing.
<u>Decommission road:</u> includes installing a berm/log barricade and allowing the road surface to naturally revegetate**.**
Surface Type — Road surface type.
NAT = Natural, PRR = Pit Run, GRR = Grid Rolled, ABC = Aggregate Base Course, ASC = Aggregate Surface Course, BST = Bituminous Surface Treatment
Road Width — Subgrade width of the road in feet.
Surface Depth — Road surfacing depth in inches.
Who Controls — Who controls the road.
BLM = Bureau of Land Management, PVT = Private, OTA = Other agency.
Access Rights — Who has access rights on the road.
BA = BLM administrative use only, BP = BLM and public use, PVT = Private but access allowed to BLM, UKN = Unknown

BLM Maintenance Levels (Under Column for Cus. Mtn. and Opr. Mtn):

Level 1: This level is the minimal custodial care as required to protect the road investment, adjacent lands, and resource values. Normally, these roads are blocked and not open for traffic or are open only to restricted traffic. Traffic would be limited to high clearance vehicles. Passenger car traffic is not a consideration. Culverts, waterbars / dips and other drainage facilities are to be inspected on a three year cycle and maintained as needed. Grading, brushing, or slide removal is not performed unless they affect roadbed drainage. Closure and traffic restrictive devices are maintained.

Level 2: This level is used on roads where management requires the road to be opened seasonally or for limited passage of traffic. Traffic is generally administrative with some moderate seasonal use. Typically these roads are passable by high clearance vehicles. Passenger cars are not recommended (user comfort and convenience and are not considered priorities). Culverts, waterbars / dips and other drainage facilities are to be inspected annually and maintained as needed. Grading is conducted as necessary <u>only</u> to correct drainage problems. Brushing is conducted as needed (generally on a three year cycle) only to facilitate passage of maintenance equipment. Slides may be left in place provided that they do not affect drainage and there is at least 10 feet of usable roadway.

Level 3: This level is used on intermediate or constant service roads where traffic volume is significantly heavier approaching a daily average of 15 vehicles. Typically, these roads are native or aggregate surfaced, but may include low use bituminous surfaced road. This level would be the typical level for log hauling. Passenger cars are capable of using most of these roads by traveling slow and avoiding obstacles that have fallen within the travelway. Culverts, waterbars / dips and other drainage facilities are to be inspected annually and maintained as needed. Grading is conducted annually to provide a reasonable level of riding comfort. Brushing is conducted annually or as needed to provide concern for driver safety. Slides affecting drainage would receive high priority for removal, otherwise they would be removed on a scheduled basis.

Level 4: This level is used on roads where management requires the road to be opened all year and has a moderate concern for driver safety and convenience. Traffic volume is approximately a daily average of 15 vehicles and will accommodate passenger vehicles at moderate travel speeds. Typically, these roads are single lane and bituminous surfaced, but may also include heavily-used aggregate surfaced roads. The entire roadway is maintained on an annual basis, although a preventative maintenance program may be established. Problems are repaired as soon as discovered.

Level 5: This level is used on roads where management requires the road to be opened all year and has a high concern for driver safety and convenience. Traffic volume exceeds a daily average of 15. Typically, these roads are double or single lane bituminous, but may also include heavily used aggregate surfaced roads as well. The entire roadway is maintained on an annual basis and a preventative maintenance program is also established. Brushing may be conducted twice a year as necessary. Problems are repaired as soon as discovered.

Road Closure information:

Closure status:

OP - Open
SC - Seasonal closure - Temporary
ST - Short term closure - Temporary (1-5 yrs)
DR - Decommission of road - Long term (more than 5 yrs)
FD - Full decommission of road - Permanent
OB - Obliteration of road - Permanent

Closure reason:

WLD - Wildlife / big game hunting concerns
OWL - Northern Spotted Owl
FSH - Fisheries
REC - Recreation
MNT - Maintenance problem
OTE - Other threatened & endangered species
ADM - Administrative reasons
POC - Port-Orford-cedar protection
NOX - Noxious weed control
OTH- Other

Closure device:

BLD- Boulders
CBL - Cable
EBM - Earth berm
GT - Gate (location if other than this road)
INA - Inaccessible (vegetation or other blockage)
LOG - Log barricade
GR - Guard rail
JW - Concrete (jersey wall)
FNC - Fence
SGN - Sign
OTH- Other

Table 32: Roads Data Report for North Fork Silver Creek Watershed

Road Number	Road Name	TMO Recommend.	O&C Miles	PD Miles	Other Miles	Total Miles	Surface Type	Road width	Surface Depth	Who Controls	Access Rights	Maint. Level	Who Maintains	Road Class
34 S 09 W 35.00	Sourgrass Saddle	UCG	0.15	0.00	0.00	0.15	ASC	14'	6"	BLM	BP	3	BLM	COL
34 S 09 W 35.01A	Lower Sourgrass	UCG	2.56	0.00	0.00	2.56	ASC	14	6"	BLM	BP	3	BLM	COL
34 S 09 W 35.01B	Lower Sourgrass	IMP	1.30	0.00	0.00	1.30	ABC	14'	6”	BLM	BP	2	BLM	LOC
35 S 09 W 01.00A	N Fk Silver Ck	IMP	2.18	0.00	0.00	2.18	ABC	14'	6"	BLM	BP	3	BLM	COL
35 S 09 W 01.00B	N Fk Silver Ck	IMP	3.06	0.00	0.00	3.06	GRR	14'	8"	BLM	BP	3	BLM	LOC
35 S 09 W 01.04A	Hansen Saddle	UCG	1.88	0.00	0.00	1.88	ABC	14	6"	BLM	BP	3	BLM	LOC
35 S 09 W 01.05	Cedar Mtn	OMLD	2.70	0.00	0.00	2.70	ABC	14'	6"	BLM	BP	3	BLM	LOC
35 S 09 W 01.06	Silver Ridge Road	UCG	2.23	0.00	0.00	2.23	ABC	14'	6"	BLM	BP	3	BLM	LOC
35 S 09 W 02.00	Upper Sourgrass	DR	1.40	0.00	0.00	1.40	NAT	16'		BLM	BP	1	BLM	LOC
35 S 09 W 02.02	Upper Sourgrass Sp	OMLD	0.60	0.00	0.00	0.60	GRR	16'	8"	BLM	BP	3	BLM	LOC
35 S 09 W 02.03	Sourgrass Sp	CDR	0.56	0.00	0.00	0.56	GRR	16	8"	BLM	BP	3	BLM	LOC
35 S 09 W 03.00	Upper Sourgrass	DR	1.54	0.00	0.00	1.54	NAT	16'		BLM	BP	1	BLM	LOC
35 S 09 W 03.01	Upper Sourgrass Sp3	DR	0.52	0.00	0.00	0.52	NAT	16'		BLM	BP	1	BLM	LOC
35 S 09 W 03.02	Upper Sourgrass Sp	CDR	0.32	0.00	0.00	0.32	GRR	16'	8"	BLM	BP	3	BLM	LOC
35 S 09 W 03.03	Upper Sourgrass Sp	CDR	0.20	0.00	0.00	0.20	GRR	16'	8"	BLM	BP	3	BLM	LOC
35 S 09 W 08.00	Hobson Horn	OMLD	0.90	0.00	0.00	0.90	NAT	14'		BLM	BP	2	BLM	LOC
35 S 09 W 10.00A	Sourgrass Sp	OMLD	0.56	0.00	0.00	0.56	ASC	16'	6"	BLM	BP	3	BLM	LOC
35 S 09 W 10.00B	Sourgrass Sp	UCG	0.96	0.00	0.00	0.96	NAT	16'		BLM	BP	2	BLM	LOC
35 S 09 W 10.02	Sourgrass Sp	CDR	0.31	0.00	0.00	0.31	GRR	16'	8"	BLM	BP	3	BLM	LOC
35 S 09 W 11.00A	Silver Loop	OMLD	1.90	0.00	0.00	1.90	ABC	14'	6"	BLM	BP	3	BLM	LOC
35 S 09 W 11.00B	Silver Loop	DR	0.52	0.00	0.00	0.52	NAT	14'		BLM	BP	1	BLM	LOC
35 S 09 W 11.01	Sourgrass Sp	CDR	0.30	0.00	0.00	0.30	GRR	16'	8"	BLM	BP	3	BLM	LOC
35 S 09 W 12.02	Silver Loop Sp 2	DR	0.15	0.00	0.00	0.15	NAT	14'		BLM	BP	1	BLM	LOC
35 S 09 W 12.03	Silver View	UCG	0.84	0.00	0.00	0.84	NAT	17'		BLM	BP	1	BLM	LOC
35 S 09 W 12.04	Hansen Saddle A Sp	DR	0.18	0.00	0.00	0.18	NAT	17'		BLM	BP	1	BLM	LOC
35 S 09 W 12.05	Hansen Mountain	UCG	1.42	0.00	0.00	1.42	NAT	17'		BLM	BP	2	BLM	LOC
35 S 09 W 13.00	Silver Loop Sp I	DR	0.20	0.00	0.00	0.20	NAT	14'		BLM	BP	1	BLM	LOC
35 S 09 W 14.00A	Cedar Swamp	UCG	0.62	0.00	0.00	0.62	ABC	14'	6"	BLM	BP	3	BLM	COL
35 S 09 W 14.00B	Cedar Swamp	UCG	1.44	0.00	0.00	1.44	ABC	14'	6"	BLM	BP	3	BLM	COL
35 S 09 W 14.00C	Cedar Swamp	UCG	2.22	0.00	0.00	2.22	PRR	14'	8"	BLM	BP	3	BLM	LOC
35 S 09 W 14.00D	Cedar Swamp	OMLD	1.50	0.00	0.00	1.50	GRR	14'	8"	BLM	BP	3	BLM	LOC
35 S 09 W 14.02A	Lower Sourgrass	UCG	1.04	0.00	0.00	1.04	ABC	16'	6”	BLM	BP	2	BLM	LOC
35 S 09 W 14.03	Lower Silver Slopes	DR	1.66	0.00	0.00	1.66	GRR	14'	8"	BLM	BP	1	BLM	LOC
35 S 09 W 14.04A	Silver Cedar	DR	0.19	0.00	0.00	0.19	ABC	14'	6"	BLM	BP	1	BLM	LOC
35 S 09 W 14.04B	Silver Cedar	DR	0.33	0.00	0.00	0.33	NAT	14'		BLM	BP	1	BLM	LOC
35 S 09 W 15.00	Lower Sourgrass	DR	0.90	0.00	0.00	0.90	NAT	16'		BLM	BP	1	BLM	LOC
35 S 09 W 16.00	N Fk Silver Ck Sp2	DR	1.40	0.00	0.00	1.40	NAT	14'		BLM	BP	1	BLM	LOC
35 S 09 W 16.01	N Fk Silver Ck Sp3	DR	0.80	0.00	0.00	0.80	NAT	14'		BLM	BP	1	BLM	LOC
35 S 09 W 16.02	N Fk Silver Ck Sp4	DR	0.30	0.00	0.00	0.30	NAT	14'		BLM	BP	1	BLM	LOC
35 S 09 W 21.00	Hawk Ck Sp1	DR	0.44	0.00	0.00	0.44	NAT	14'		BLM	BP	1	BLM	LOC
35 S 09 W 21.01A	Hawk Sp 2	OMLD	0.15	0.00	0.00	0.15	ABC	14'	6"	BLM	BP	3	BLM	LOC
35 S 09 W 21.01B	Hawk Ck Sp2	CFD	0.95	0.00	0.00	0.95	NAT	14'		BLM	BP	2	BLM	LOC

Table 32: Roads Data Report for North Fork Silver Creek Watershed

Road Number	Road Name	TMO Recommend.	O&C Miles	PD Miles	Other Miles	Total Miles	Surface Type	Road width	Surface Depth	Who Controls	Access Rights	Maint. Level	Who Maintains	Road Class
35 S 09 W 21.02	Hawk Ck	DR	0.59	0.00	0.00	0.59	NAT	17'		BLM	BP	1	BLM	LOC
35 S 09 W 23.00	Upper Silver Slopes	DR	1.18	0.00	0.00	1.18	GRR	14'	8"	BLM	BP	1	BLM	LOC
35 S 09 W 23.01	Browns Gul Ex B # 10	IMP	0.42	0.00	0.00	0.42	NAT	14'		BLM	BP	3	PVT	LOC
35 S 09 W 23.02	South Cedar	OMLD	0.74	0.00	0.00	0.74	ABC	14'	6"	BLM	BP	3	BLM	LOC
35 S 09 W 23.03	South Cedar Sp	DR	0.14	0.00	0.00	0.14	NAT	17'		BLM	BP	1	BLM	LOC

Table 33: Supplemental Road Data Report

Road Number	Road Grade				Road Drainage							Brush	Comments
	0-10%	*10-20%*	*20+%*	for 20+% ADV/FAV	18" CMP	24" CMP	36" CMP	48" CMP	60" + CMP	Water Dips	Condition G/F/P/U	Yes/No	
34 S 09 W 35.00	0.15	0	0	0	1						G	Y	Provides access to Forest Service and Quarry
34 S 09 W 35.01A	2.56	0	0	0	21		1				G	Y	Gate at M.P. 0.6
34 S 09 W 35.01B	0.72	0.58	0	0	2		1				F	Y	Need drainage structures, rock fall in road
35 S 09 W 01.00A	2.18	0	0	0	14	2	2		1		G	Y	Main access to Silver creek, wash board. Contains 3 culverts which impede or block fish passage.
35 S 09 W 01.00B	0.16	2.90	0	0	16	4	1		6’x4’		F	Y	Road within riparian reserve damaged CMPs
35 S 09 W 01.04A	1.56	0.32	0	0	17						G	Y	Washboard, used for Galice slide bypass
35 S 09 W 01.05	2.14	0.56	0	0	22	1					F	Y	Alder in ditchline, heavy brush
35 S 09 W 01.06	1.39	0.84	0	0	16						G	Y	Gate at M.P. 0.05 Access to mining claim
35 S 09 W 02.00	1.4	0	0	0							U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 02.02	0.60	0	0	0	1					3	F	Y	Access to Heli Spot/Fire safety zone
35 S 09 W 02.03	0.14	0.42	0	0						2	F	Y	Narrow Road with debris in road
35 S 09 W 03.00	1.54	0	0	0							U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 03.01	0.52	0	0	0							U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 03.02	0.07	0.25	0	0						2	F	Y	Ridge top road with steep grade
35 S 09 W 03.03	0.2	0	0	0							F	Y	Ridge top road
35 S 09 W 08.00	0.90	0	0	0	6					5	F	Y	Heavy burn area, rocky narrow road
35 S 09 W 10.00A	0.25	0.31			3						G	Y	
35 S 09 W 10.00B	0.96									3	G	Y	
35 S 09 W 10.02	0.31										F	Y	Brush in traveled way, ridge top road
35 S 09 W 11.00A	1.44	0.46			19	3	1		6’x8’		G	Y	Shot gun culverts need repair. Contains 1 culvert that blocks fish passage.
35 S 09 W 11.00B	0.52										U	Y	Earthberm not drivable Formerly 35-9-14.1, VRD
35 S 09 W 11.01	0.21	0.09									F	Y	Rocky road
35 S 09 W 12.02	0.15										U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 12.03	0.84										U	Y	Earthberm being driven around - repair VRD
35 S 09 W 12.04	0.18										U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 12.05	1.42									8	F	Y	Large subsurface rock and rutts – ridge top road
35 S 09 W 13.00	0.20										U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 14.00A	0.62				6				7’x10’		G	Y	Contains 3 culverts which impede or block fish passage.

Table 33: Supplemental Road Data Report

Road Number	Road Grade				Road Drainage							Brush	Comments
	0-10%	*10-20%*	*20+%*	for 20+% ADV/FAV	18" CMP	24" CMP	36" CMP	48" CMP	60" + CMP	Water Dips	Condition G/F/P/U	Yes/No	
35 S 09 W 14.00B	1.18	0.26			9		2				G	Y	
35 S 09 W 14.00C	1.10	1.12			18						G	Y	Some shotgun culverts - rockfall
35 S 09 W 14.00D	1.50				6						G	Y	
35 S 09 W 14.02A	1.04				12	1					G	Y	Gate at 0.01 - drainage problem at JCT
35 S 09 W 14.03	1.66										U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 14.04A	0.19									1	F	Y	
35 S 09 W 14.04B	0.33									1	U	Y	Earthberm at M.P. 0.15 can not drive VRD
35 S 09 W 15.00	0.90										U	Y	Overgrown with heavy brush can not drive VRD
35 S 09 W 16.00	1.40										U	Y	Drivable for 0.04 miles then crosses creek VRD
35 S 09 W 16.01	0.80										U	Y	Replace or remove incorrect road sign Overgrown and Earthberm can not drive VRD
35 S 09 W 16.02	0.30										U	Y	Overgrown with 4-6" DBH trees – can not drive VRD
35 S 09 W 21.00	0.44										U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 21.01A	0.15					2					F	Y	
35 S 09 W 21.01B	0.28	0.67			5					8	P	Y	Plugged culverts and narrow road due to rock fall
35 S 09 W 21.02	0.59										U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 23.00	1.18										U	Y	Overgrown and Earthberm can not drive VRD
35 S 09 W 23.01	0.12	0.30			2	1					P	Y	Heavy log haul has deteriorated surface. Provides access to FS and mining claim
35 S 09 W 23.02	0.18	0.56			9						F	Y	Steep rocky road. Access to Matrix
35 S 09 W 23.03	0.14										U	Y	Earthberm can not drive VRD

VRD = Validate Road Drainage is functioning correctly

Table 34: Transportation Management Objectives

Road Number	Road Name	TMO	Closure Status	Closure Reason	Road Width	Maint. Level	O&C Miles	PD Miles	Other Miles	Surface Type
34 S 09 W 35.00	Sourgrass Saddle	UCG			14'	3	0.15	0.00	0.00	ASC
34 S 09 W 35.01A	Lower Sourgrass	UCG			14	3	2.56	0.00	0.00	ASC
34 S 09 W 35.01B	Lower Sourgrass	IMP			14'	2	1.30	0.00	0.00	ABC
35 S 09 W 01.00A	N Fk Silver Ck	IMP			14'	3	2.18	0.00	0.00	ABC
35 S 09 W 01.00B	N Fk Silver Ck	IMP			14'	3	3.06	0.00	0.00	GRR
35 S 09 W 01.04A	Hansen Saddle	UCG			14	3	1.88	0.00	0.00	ABC
35 S 09 W 01.05	Cedar Mtn	OMLD			14'	3	2.70	0.00	0.00	ABC
35 S 09 W 01.06	Silver Ridge Road	UCG	ST	ADM	14'	3	2.23	0.00	0.00	ABC
35 S 09 W 02.00	Upper Sourgrass	DR			16'	1	1.40	0.00	0.00	NAT
35 S 09 W 02.02	Upper Sourgrass Sp	OMLD			16'	3	0.60	0.00	0.00	GRR
35 S 09 W 02.03	Sourgrass Sp	CDR			16	3	0.56	0.00	0.00	GRR
35 S 09 W 03.00	Upper Sourgrass	DR			16'	1	1.54	0.00	0.00	NAT
35 S 09 W 03.01	Upper Sourgrass Sp3	DR			16'	1	0.52	0.00	0.00	NAT
35 S 09 W 03.02	Upper Sourgrass Sp	CDR			16'	3	0.32	0.00	0.00	GRR
35 S 09 W 03.03	Upper Sourgrass Sp	CDR			16'	3	0.20	0.00	0.00	GRR
35 S 09 W 08.00	Hobson Horn	OMLD	ST	ADM	14'	2	0.90	0.00	0.00	NAT
35 S 09 W 10.00A	Sourgrass Sp	OMLD			16'	3	0.56	0.00	0.00	ASC
35 S 09 W 10.00B	Sourgrass Sp	UCG			16'	2	0.96	0.00	0.00	NAT
35 S 09 W 10.02	Sourgrass Sp	CDR			16'	3	0.31	0.00	0.00	GRR
35 S 09 W 11.00A	Silver Loop	OMLD			14'	3	1.90	0.00	0.00	ABC
35 S 09 W 11.00B	Silver Loop	DR	FD	ADM	14'	1	0.52	0.00	0.00	NAT
35 S 09 W 11.01	Sourgrass Sp	CDR			16'	3	0.30	0.00	0.00	GRR
35 S 09 W 12.02	Silver Loop Sp 2	DR	FD	ADM	14'	1	0.15	0.00	0.00	NAT
35 S 09 W 12.03	Silver View	UCG			17'	1	0.84	0.00	0.00	NAT
35 S 09 W 12.04	Hansen Saddle A Sp	DR	FD	ADM	17'	1	0.18	0.00	0.00	NAT
35 S 09 W 12.05	Hansen Mountain	UCG	ST	ADM	17'	2	1.42	0.00	0.00	NAT
35 S 09 W 13.00	Silver Loop Sp I	DR	FD	ADM	14'	1	0.20	0.00	0.00	NAT
35 S 09 W 14.00A	Cedar Swamp	UCG			14'	3	0.62	0.00	0.00	ABC
35 S 09 W 14.00B	Cedar Swamp	UCG			14'	3	1.44	0.00	0.00	ABC
35 S 09 W 14.00C	Cedar Swamp	UCG			14'	3	2.22	0.00	0.00	PRR
35 S 09 W 14.00D	Cedar Swamp	OMLD			14'	3	1.50	0.00	0.00	GRR
35 S 09 W 14.02A	Lower Sourgrass	UCG			16'	2	1.04	0.00	0.00	ABC
35 S 09 W 14.03	Lower Silver Slopes	DR	FD	ADM	14'	1	1.66	0.00	0.00	GRR
35 S 09 W 14.04A	Silver Cedar	DR			14'	1	0.19	0.00	0.00	ABC
35 S 09 W 14.04B	Silver Cedar	DR	FD	ADM	14'	1	0.33	0.00	0.00	NAT
35 S 09 W 15.00	Lower Sourgrass	DR			16'	1	0.90	0.00	0.00	NAT
35 S 09 W 16.00	N Fk Silver Ck Sp2	DR			14'	1	1.40	0.00	0.00	NAT
35 S 09 W 16.01	N Fk Silver Ck Sp3	DR	FD	ADM	14'	1	0.80	0.00	0.00	NAT
35 S 09 W 16.02	N Fk Silver Ck Sp4	DR			14'	1	0.30	0.00	0.00	NAT
35 S 09 W 21.00	Hawk Ck Sp1	DR	FD	ADM	14'	1	0.44	0.00	0.00	NAT
35 S 09 W 21.01A	Hawk Sp 2	OMLD			14'	3	0.15	0.00	0.00	ABC
35 S 09 W 21.01B	Hawk Ck Sp2	CFD			14'	2	0.95	0.00	0.00	NAT
35 S 09 W 21.02	Hawk Ck	DR	FD	ADM	17'	1	0.59	0.00	0.00	NAT
35 S 09 W 23.00	Upper Silver Slopes	DR	FD	ADM	14'	1	1.18	0.00	0.00	GRR
35 S 09 W 23.01	Browns Gul Ex B # 10	IMP			14'	3	0.42	0.00	0.00	NAT
35 S 09 W 23.02	South Cedar	OMLD			14'	3	0.74	0.00	0.00	ABC
35 S 09 W 23.03	South Cedar Sp	DR	FD	ADM	17'	1	0.14	0.00	0.00	NAT

Appendix C: Wildlife Habitat Needs

Special Status Species

Special status species are animals that are recognized by the federal or state government as needing particular consideration in the planning process, due to low populations (natural and human caused), restricted range, threats to habitat and for a variety of other reasons. This list includes species officially listed or proposed for listing. State listed species are those species identified as threatened, endangered, or pursuant to ORS 496.004, ORS 498.026, or ORS 546.040. Also included are Bureau assessment species which are plant and animal species that are found on List 2 of the Oregon Natural Heritage Database (1995) and those species on the Oregon List of Sensitive Wildlife Species (ORS 635-100-040) and are identified in BLM Instruction Memo No. OR-91-57. Bureau sensitive species are those species eligible for federal listing, state listing, List 1 in the Oregon Natural Heritage Database (1995), or as approved by the BLM state director.

- Northern Spotted Owl

Table 35: Spotted Owl Sites Located on Forest Service where Provincial Home Ranges include BLM Lands.

Site Name	Level of Protection
Sourgrass	Activity Center

- Special status species and their habitat needs

Table 37 lists the species status that are known to occur in the watershed or that could potentially occur there.

Table 36: Special Status Species and Habitat Needs

Species	Habitat Association	Special Habitat Feature
Grey wolf	Generalists	Large blocks of unroaded habitat
Red tree vole	Mature/old growth conifer	Mature Douglas-fir trees
Fisher	Mature/old growth riparian	Down wood/snags
California wolverine	Generalists	Large blocks of unroaded habitat
American martin	Mature/old growth	Down wood, living ground cover, near streams
Ringtail	Generalists	Rocky terrain, caves, mine adits
Townsend=s big-eared bat	Generalists	Mine adits, caves
Fringed myotis	Generalists	Rock crevices and snags
Yuma myotis	Generalists	Large live trees with crevices in the bark
Brazilian free-tailed bat	Generalists	Buildings, caves, mine adits
Long-eared myotis	Generalists	Large live trees with crevices in the bark
Long-legged myotis	Generalists	Large live trees with crevices in the bark
Pacific pallid bat	Generalists	Snags, rock crevices
Peregrine falcon	Generalists	Cliff faces
Bald eagle	Lacustrine/rivers	Large mature trees with large limbs near large bodies of water
Northern spotted owl	Mature/old growth	Late-successional mature forest with structure
Northern goshawk	Mature/old growth	High canopy closure forest for nest sites
Mountain quail	Generalists	Shrub dominated communities
Pileated woodpecker	Large trees	Large diameter snags
Lewis' woodpecker	Pine/oak woodlands	Large oaks, pines and cottonwoods adjacent to openings
White-headed woodpecker	Pine/fir mountain forests	Large pines living and dead
Flammulated owl	Pine/oak woodlands	Pine stands and snags
Purple martin	Generalists	Snags in burns with excavated cavities
Great grey owl	Pine/oak /fir/mixed conifer	Mature forest with adjoining meadows
Western bluebird	Meadows/ open areas	Snags in open areas
Acorn woodpecker	Oak woodlands	Large oaks

Table 36: Special Status Species and Habitat Needs

Species	Habitat Association	Special Habitat Feature
Tri-colored blackbird	Riparian	Wetlands, cattail marshes
Rufous Hummingbird	Early seral forests	Nectar plants and open space for aerial courtship display
Black-backed woodpecker	Pine	Snags and pine
Bank swallow	Riparian	Sand banks near open ground or water
Western pond turtle	Riparian/uplands	Marshes, sloughs ponds
Del Norte salamander	Mature/old growth	Talus
Foothills yellow-legged frog	Riparian	Permanent streams with gravel bottoms
Red-legged frog	Riparian	Marshes, ponds and streams with limited flow
Tailed frog	Riparian	Cold fast flowing streams in wooded area
Clouded salamander	Mature	Snags and down logs
Southern Torrent salamander	Riparian	Cold, clear seeps and springs
Black salamander	Generalists	Down logs, talus
Sharptail snake	Valley bottoms low elevation	Moist rotting logs
California mountain kingsnake	Habitat generalists	Habitat generalists
Common kingsnake	Habitat generalists	Habitat generalists
Northern sagebrush lizard	Open brush stands	Open forests or brush with open understory

Appendix D: Macroinvertebrate Results

North Fork Silver Creek above Sourgrass Creek in section 16 was sampled in 1992. A well developed shredder community was present. To support a diverse shredder community, there must be a diverse set of detrital microhabitats that have sufficient stability in time for invertebrates to complete their life cycles, which may be two years or longer. There was a rich and abundant cool water adapted fauna. The erosional habitat invertebrate community indicated that embedded conditions leading to a loss of crevice space and hyporheic habitat limits habitat complexity and taxa richness (the hyporheic zone is the area below the bed or lateral to the main channel where water is present). Scour also appeared to limit community development. Coarse sand/fine gravel embedded substantial amounts of the stream bottom. In 1996, the reach exhibited moderate habitat complexity, no large instream wood and high seasonal scour, down to bedrock in places. Negative indicator taxa were rare or absent. Positive indicator taxa were somewhat scarce and the associated community moderately developed.

North Fork Silver Creek, just upstream of the 35-9-11 road crossing, was sampled in 1994. The cold water invertebrate biota indicated that water temperatures were probably fully supportive of salmonids. Cold water taxa richness was very high, though abundance was not as high. Highly tolerant taxa associated with lower gradient and warmer basin/valley streams and rivers were absent. Long-lived taxa richness was low to moderate, indicating disturbance to substrates may be periodically high, and that habitat complexity and retention mechanisms were not optimal.

North Fork Silver Creek, at end of road 35-9-16, was sampled in 1995. Rare taxa or taxa associated with small streams were relatively well represented, considering this is a mid-order stream. The cold water invertebrate biota was well developed at this site which indicates that water temperatures were fully supportive of salmonids. Abundance and richness of tolerant invertebrates was very low. Highly tolerant taxa associated with lower gradient or riverine habitats were absent. Most habitat parameters evaluated were high or good. Overall habitat complexity was moderate. Scour was relatively high during most winters. Detrital habitats were moderately complex, with moderate retention capability. This site was also sampled in 1991. Changes in bioassessment scores for the margin and detritus habitats were minor. There was a moderate increase in the erosional habitat total score.

North Fork Silver Creek just upstream of Cedar Swamp Creek was sampled in 1996. Moderate habitat complexity was found with no large woody debris in stream and evidence of high seasonal scour. In some places the stream bottom was scoured to bedrock. Negative indicator taxa were generally rare or absent. Positive indicator taxa were somewhat scarce, except in margin habitat, where positive indicator taxa were moderately rich.

Appendix E: Fire Hazard, Risk, and Values at Risk

A. HAZARD

Hazard ratings are based on the summation of points using the six elements as follows:

		Points
Slope percent	0-19	5
	20-44	10
	45+	25
Aspect (degrees)	316-360, 0-67	5
	68-134, 294-315	10
	135-293	15
Slope position	Upper 1/3	5
	Midslope	10
	Lower 1/3	25
Fuel Model	Grass 1, 2, 3	5
	Timber 8	5
	Shrub 5	10
	Timber 9	15
	Shrub 6	20
	Timber 10	20
	Slash 11	25
	Shrub 4	30
	Slash 12, 13	30

Ladder Fuels: Use when forest vegetation has DBH of 5" or greater (vegetation condition class 6). Exceptions are possible based on stand conditions.

	Points
Ladder fuel absent.	0
Ladder fuel present on:	
<1/3 of area.	5
1/3 to 2/3; vertical continuity is <50%.	15
1/3 to 2/3; vertical continuity is >50%.	25
>2/3; vertical continuity is <50%.	30
>2/3; vertical continuity is > 50%.	40

Summary Rating:

POINTS	HAZARD RATING
0-45	LOW
50-70	MODERATE
75-135	HIGH

B. RISK

Risk is based on human presence, use and on lightning occurrence.

High: Human population areas are within 1/4 mile of the area. Access is good with many roads. Incidence of lightning is relatively high and human use is high.

Moderate: The area is relatively easily accessed and use is informal. The area may be used during summer and fall as a main travel route or for infrequent recreational activities. Lightning occurrence is typical for the area and not notably higher.

Low: Access is limited and use, infrequent. Human caused fire is rare.

C. VALUES AT RISK

Values at risk are best assigned through an interdisciplinary process. Values are based on human and resource values in a given area and can be based on land allocations, special use areas, human improvements/monetary investment, residential areas, agricultural use, structures, soils, vegetative conditions, and habitat.

Examples:

High: ACECs, RNAs, LSRs, Special status species present, critical habitats, recreation area, residential areas, farming, vegetation condition and McKelvey ratings of 81, 82, 71, 72; vegetation condition of 4 and 5. Caves, cultural resources, riparian areas or monetary investments may be present.

Moderate: Granitic soils, informal recreation areas and trails. Vegetation and McKelvey ratings of 85, 75, 65.

Low: Vegetation condition class 1, 2, 3; and vegetation 5, 6, 7 with McKelvey rating 4.