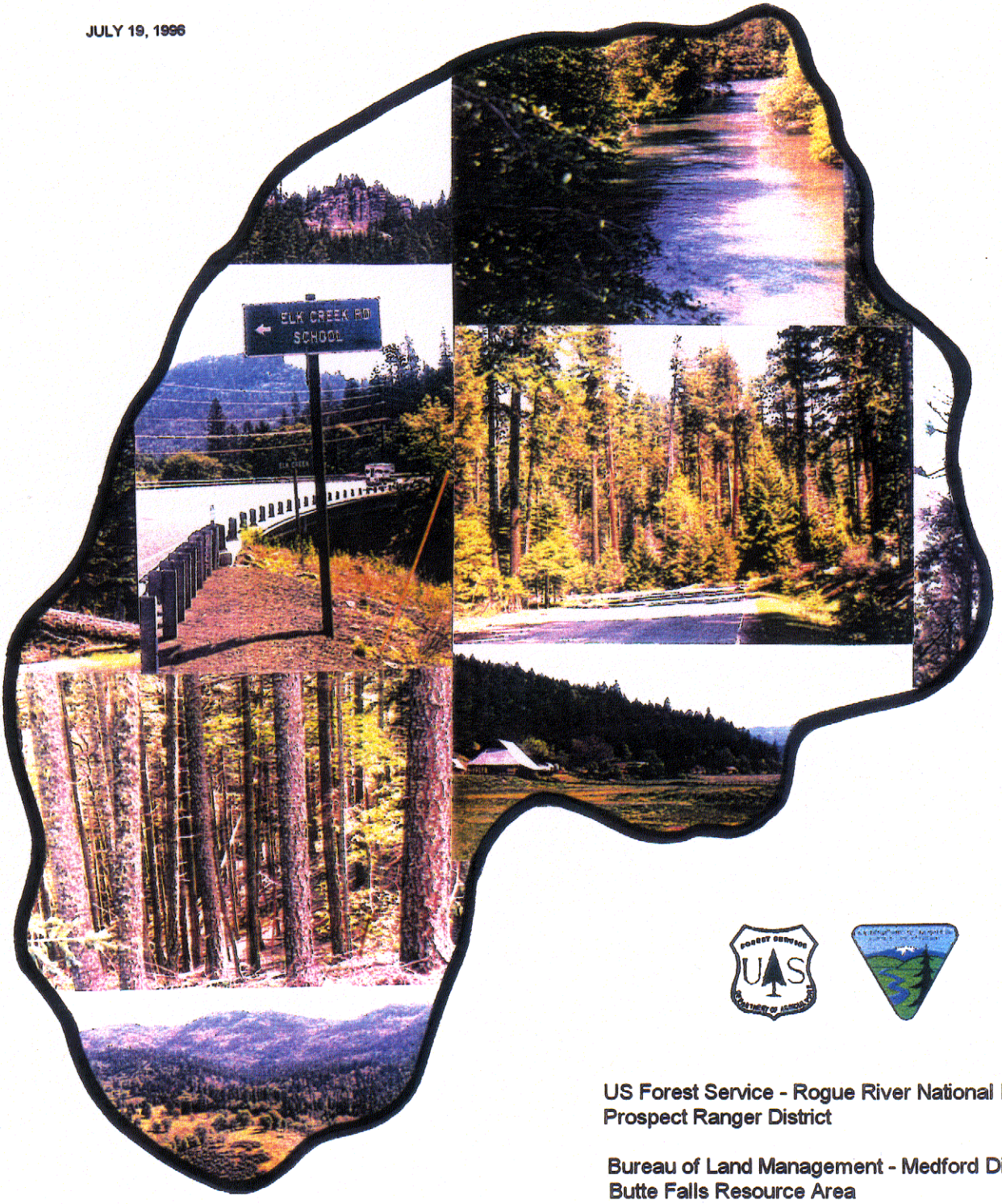
ELK CREEK WATERSHED ANALYSIS

ROGUE RIVER BASIN
UPPER ROGUE SUBBASIN

JACKSON AND DOUGLAS COUNTIES, OREGON

JULY 19, 1996



US Forest Service - Rogue River National Forest
Prospect Ranger District

Bureau of Land Management - Medford District
Butte Falls Resource Area

ELK CREEK WATERSHED ANALYSIS

Rogue River Basin
Upper Rogue Subbasin

Jackson and Douglas Counties, Oregon

July 19, 1996

Butte Falls Resource Area - Medford BLM
Prospect Ranger District - Rogue River N.F.

I. INTRODUCTION

A. OBJECTIVE OF WATERSHED ANALYSIS

The objective of this Watershed Analysis is to look at a "landscape" and describe its "ecosystem" structures and functions. A rudimentary understanding of landscape level processes and interactions is essential to assist federal land managers in making ecologically sound management decisions. This report documents the analysis completed by an interdisciplinary team and their major findings on watershed conditions and trends. It also includes recommendations for maintenance and restoration of ecosystem health and recommendations for future federal management activities within this watershed.

Watershed Analysis is an assessment of the health of an ecosystem at the watershed scale and plays an important role in providing for the protection of aquatic and riparian habitat. This analysis identifies processes and functions occurring within the Elk Creek Watershed that are key to maintaining healthy terrestrial and aquatic ecosystems. The effects of human activities (historic, recent and reasonably foreseeable future) and natural disturbance mechanisms were assessed for their effects on these important processes and functions.

The Record of Decision (ROD) for *Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (Northwest Forest Plan), incorporates the Aquatic Conservation Strategy (ACS). The ACS is a basis for Standards and Guidelines, designated for the attainment of this strategy and focuses on restoring and maintaining the ecological health of watersheds and aquatic ecosystems on all public lands. A system of "Key" Watersheds is identified in this strategy to serve as a refuge for maintaining and recovering habitat for at-risk stocks of anadromous fish species. The Elk Creek Watershed is designated under the ROD as a "Tier 1", Key Watershed.

This analysis and report are not decision documents under the National Environmental Policy Act (NEPA) and there is no action being implemented with this analysis. This analysis is not being conducted as, and will not meet the requirements for a Late-Successional Reserve Assessment under the Northwest Forest Plan (see Section E, this Chapter).

B. HOW THIS ANALYSIS WAS CONDUCTED

The Elk Creek Watershed Analysis was conducted by a Federal Interagency Team working cooperatively. The team consisted of Forest Service (FS) and Bureau of Land Management (BLM) resource specialists, as well as resource skills from other groups and individuals. This team followed guidance contained in the *Federal Guide for Watershed Analysis, Version 2.2*, dated August 1995. The Elk Creek Watershed Analysis Team included interagency and interdisciplinary resource specialists, appropriate to the land management responsibilities and watershed issues. This Watershed Analysis addressed all lands (public and private) within the Elk Creek Watershed; management recommendations apply only to federally managed lands.

The Elk Creek Watershed Analysis Team was chartered by the Prospect District Ranger (Bob Wilcox) for the Forest Service (FS) and by the Butte Falls Area Manager (Lance Nimmo) for the Bureau of Land Management (BLM). This Charter directed the analysis team to accomplish this initial version of Watershed Analysis without lengthy data gathering (including field work) or model building. Gaps in data and information were to be considered acceptable and needed only to be identified. Analysis was conducted primarily utilizing existing or known data and information.

The Charter directed the team to accomplish this task via the use of a Core Team, who had the primary responsibility to gather data, conduct resource analysis, work together in an interdisciplinary manner, obtain input and coordinate with Resource Consultants and prepare the Watershed Analysis Report and Appendices. Core Team members included: Jon Brazier (FS Hydrologist), Paula Trudeau (FS Vegetation Ecologist), Jon Raby (BLM Fisheries Biologist), Jim Harper (BLM Wildlife Biologist), John Dinwiddie (BLM Fire & Fuels Specialist), Carol Spinos (FS Planner - Human Dimension) and Brendan White (US Fish & Wildlife Service).

A Support Group was responsible for providing data and assistance to the Core Team, including Geographical Information System (GIS) data, and writing and editing. The Support Group included a Team Leader: Ken Grigsby (FS Planner), a BLM Liaison: Jean Williams (BLM Planner), and GIS support from both agencies: Don Boucher (FS) and Phil Ritter (BLM). The ELK CARE Team (A Forest Service team with stewardship responsibilities within the Elk Watershed) also provided assistance with logistics, graphics and writing/editing.

Team Resource Consultants were generally responsible in specific resource areas for input and analysis. Team Consultants also included people from other Federal Agencies and the public. Consultants included: Jack Sizemore (FS), Jim Welden (BLM), Bob Budesa (BLM), George Badura (FS), Mark Prchal (FS), Fred Wahl (FS), Jeff LaLande (FS), Dave Bowen (FS), Melanie Anderson (FS), Don Goheen (FS), Ron Miyamoto (BLM), Dick Styrwold (FS), Chris Dent (FS), and Cheryl Gruenthal (Boise Cascade Corporation).

Public involvement associated with this process included development of a multi-media "flyer" which explained the watershed analysis process, who was conducting this analysis, how it was being conducted and how the public could be involved. This flyer was mailed to several hundred addresses that were obtained from tax lot records. Certain specific agencies, corporations or organizations also received the flyer or were contacted during the analysis for information. Please see Appendix B for more information and a copy of the public involvement flyer.

C. REPORT ORGANIZATION

Landscape analysis and design processes used in this analysis are based on the methodology outlined in *Ecosystem Analysis at the Watershed Scale: a Federal Guide for Watershed Analysis, Version 2.2*, dated August, 1995. This process divides the analysis into six steps: characterization, issues and key questions, current conditions, reference conditions, interpretation and recommendations.

While the analysis team generally followed the process outlined in the Federal Guide, documentation varied slightly to facilitate this team's interactions and for efficiency. Table 1. compares the suggested report format (Federal Guide, page 23), and the report format used by the Elk analysis team.

Table 1. Comparison of Suggested Format with the Elk Creek Watershed Analysis Report Format.

Watershed Analysis Guide - Suggested Format	Elk Creek Watershed Analysis - Report Format
Executive Summary	Summary
1) Characterize the Watershed	Summary; Chapter I and II
2) Identify Issues and Key Questions	Chapter III
3) Describe Current Conditions	Chapter II
4) Describe Reference Conditions	Chapter II
5) Synthesize and Interpret Results	Chapter III and IV
6) Develop Recommendations	Chapter IV
Appendices	Appendices (bound in a separate document)

An important result of this analysis is in the data gathered and stored in Specialist's Reports, data bases, and the GIS maps and products used for this analysis. The maps shown in this report are of small scale. Maps and data are intended to show general information. While this information is available for site-specific project planning, much of this data would need to be supplemented for specific projects.

This report focuses on the "high points" of the analysis concerning functions and processes, issues, areas of concern, findings and recommendations. Greater detail can be found in the Specialist's Reports, from which this integrated report was prepared. A listing and synopsis of the Specialist's Reports are available at the end of this report. The reports themselves are contained in the Elk Creek Watershed Analysis Report Appendices, which is a separately bound document. The Appendices contain information that is more detailed and technical in nature.

Copies of this Watershed Analysis Report and its Appendices (two separately bound documents) are available from the Forest Service - Prospect Ranger District or the Supervisor's Office in Medford, and the Medford BLM office.

D. LANDSCAPE LOCATION OF ELK CREEK WATERSHED

The Elk Creek Watershed is an 85,362 acre area, tributary to the Rogue River. This watershed is categorized as being within the Pacific Northwest Region, the Oregon-Washington Coastal Subregion, the Rogue River Basin (Southwest Oregon Coastal), and the Upper Rogue Subbasin, as described by the US Geological Survey, 1987, and McCammon 1994. The hydrologic Unit Code for the watershed is 1710030705.

MAP 1

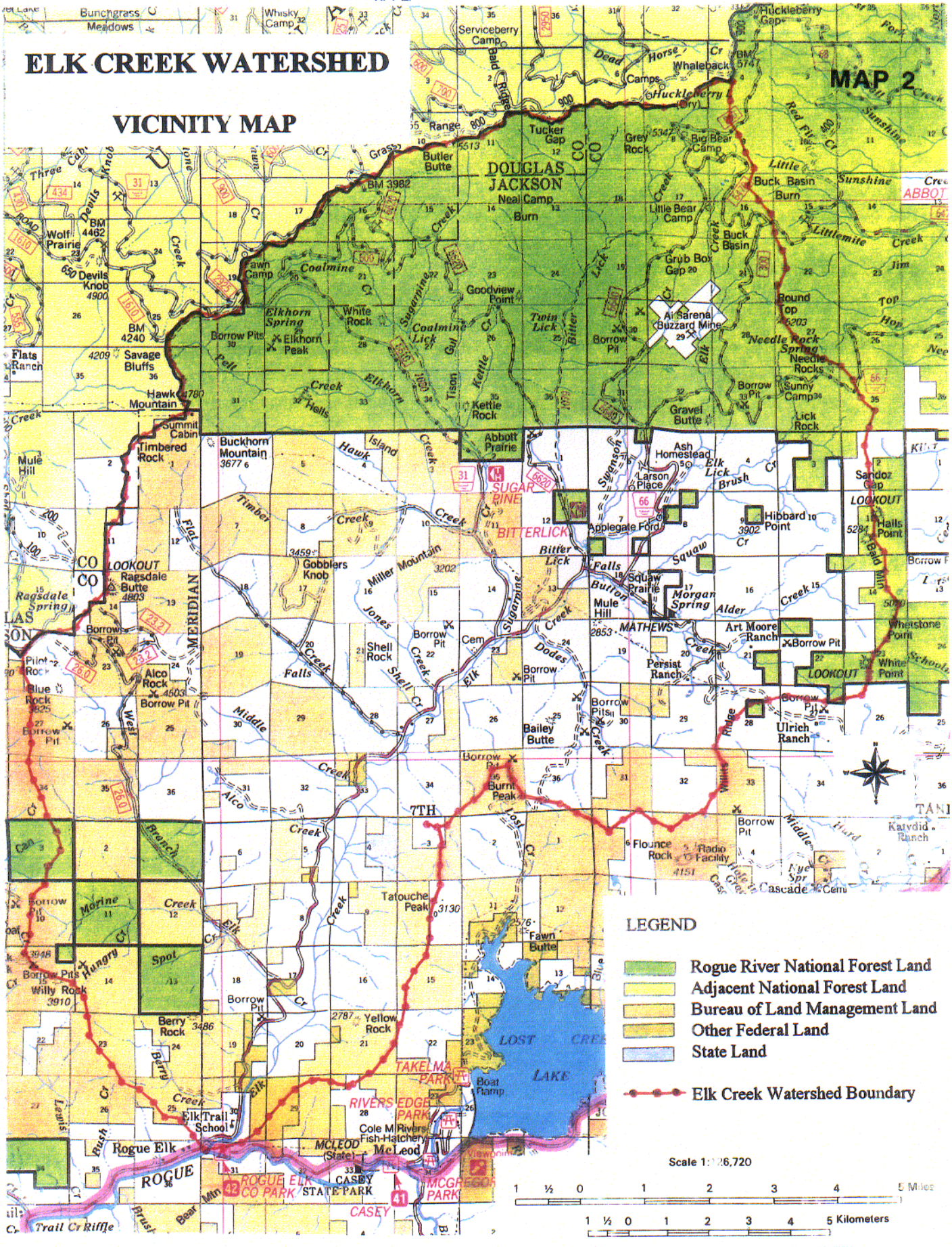
Elk Creek Watershed
Vicinity Map

The Elk Creek Watershed is located northeast of Medford and north of State Highway 62. Elk Creek meets the Rogue River near Highway 62, approximately 5 ½ miles upriver from Shady Cove and adjacent to the Rogue Elk Campground, a facility operated by Jackson County. Please see vicinity map (Map 2) for the Elk Creek Watershed

ELK CREEK WATERSHED

VICINITY MAP

MAP 2



LEGEND

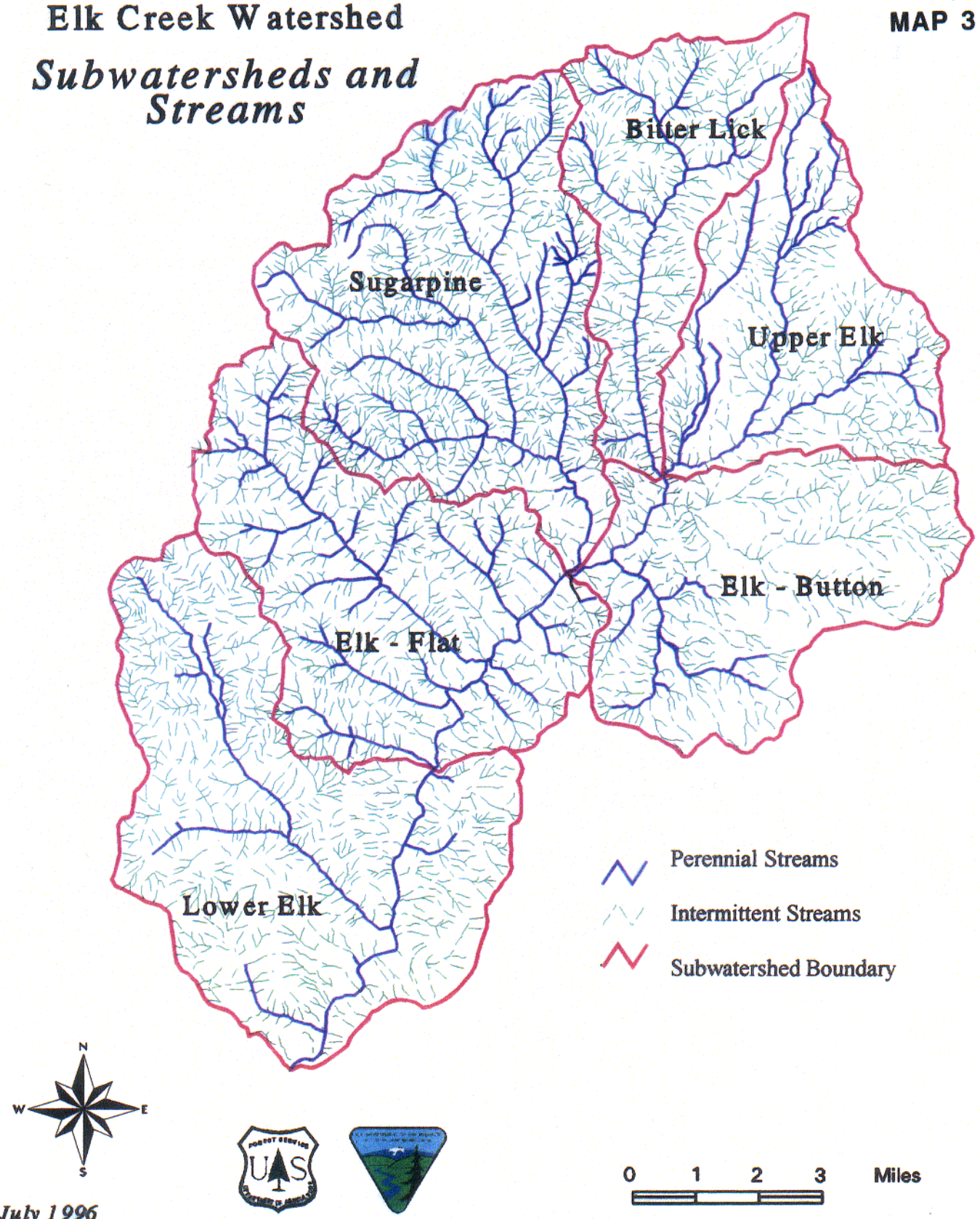
- Rogue River National Forest Land
- Adjacent National Forest Land
- Bureau of Land Management Land
- Other Federal Land
- State Land
- Elk Creek Watershed Boundary

There are numerous tributaries to the Elk Creek ranging from first to fifth order or higher in size. Of these, the largest are the West Branch of Elk Creek (Lower Elk), Flat Creek (Elk Flat), Sugarpine Creek, Bitter Lick Creek, Upper Elk, and Button Creek (Elk Button). These are displayed on Map 3, which portrays the subwatershed boundaries and streams within the Elk Creek Watershed. Other notable streams are Berry Creek, Alco Creek, Jones Creek, Middle Creek, and Dodes Creek.

Elk Creek Watershed

MAP 3

Subwatersheds and Streams



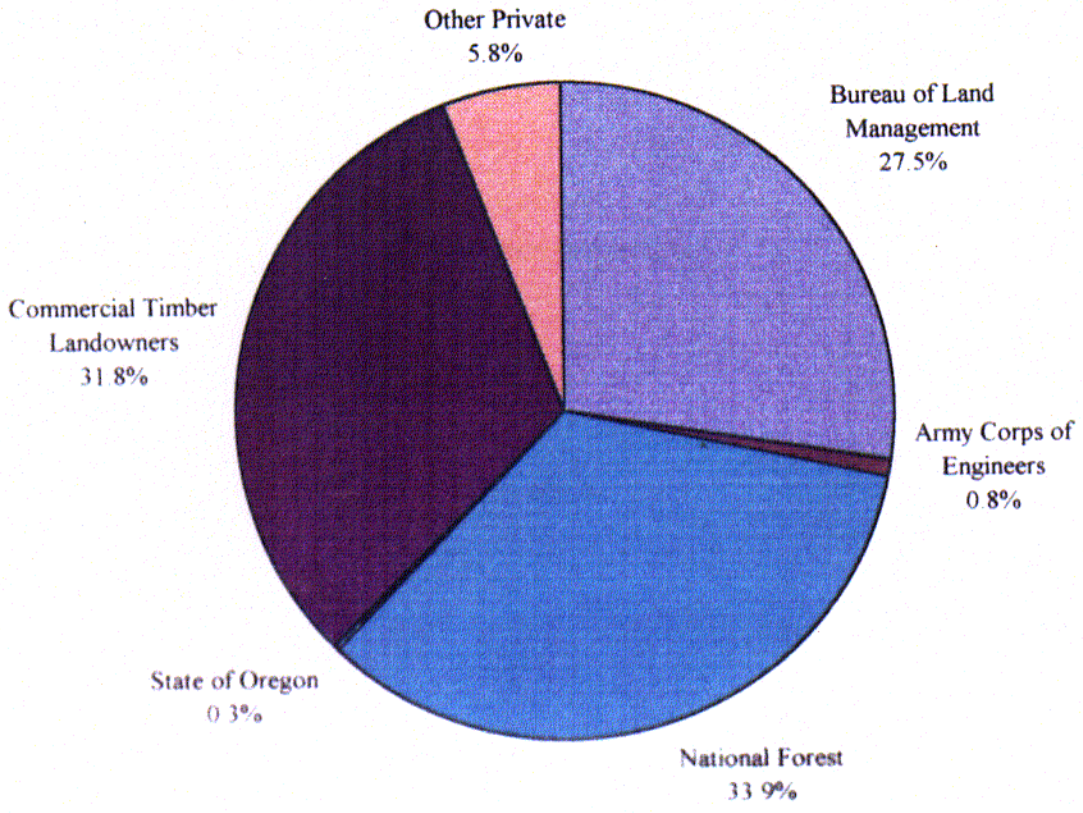
July 1996

The approximate upper third of the Elk Creek Watershed is National Forest lands managed by the USDA Forest Service in a mostly contiguous block (T.31S., R.01W., and R.02E), another approximate third is lands managed by the USDI Bureau of Land Management (T.32 & 33S., R.1W., R.1 & 2E.) in a predominately "checkerboard" pattern and the remaining approximate third is owned by timber companies and private individuals. The Elk Creek Watershed is primarily within Jackson County, with a small area in the northern portion being within Douglas County, Oregon. There are some lands managed by the Army Corps of Engineers and the State of Oregon. Map 4. portrays the ownership distribution within the watershed and Table 2. displays the acres. Figure 1. shows the percent of watershed ownership or management responsibility.

Table 2. Acres by Ownership or Management Responsibility.

Ownership/Responsibility	Acres Within Elk Creek Watershed
Bureau of Land Management	23,455
National Forest	28,946
Army Corp. of Engineers	661
State of Oregon	225
Total: Major Commercial Timber Landowners	27,155
Total: All Other Private Lands	4,920
Total: Elk Creek Watershed	**85,362**

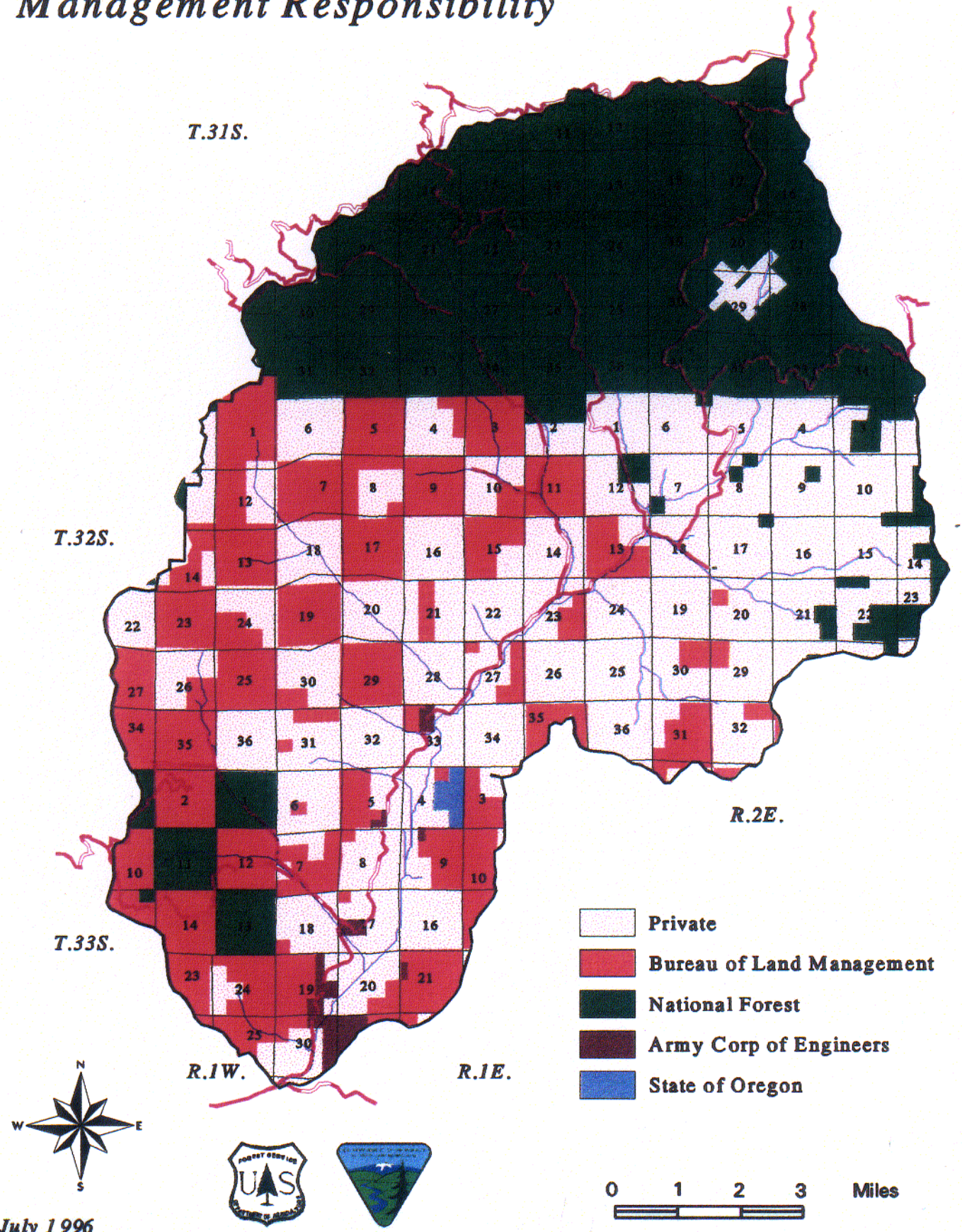
Figure 1. Watershed Percent by Ownership/Responsibility.



MAP 4

Elk Creek Watershed

Ownership/ Management Responsibility



July 1996

E. MANAGEMENT DIRECTION

Map 5. shows the distribution of land allocations for Federal lands within the Elk Creek Watershed. This direction comes from the Northwest Forest Plan, the Resource Management Plan for Medford District BLM and the Rogue River National Forest Land and Resource Management Plan. It shows the dominant or "most restrictive" allocation, but not overlapping ones. All three plans provide guidance for the management of federal lands, including habitat protection for biodiversity, aesthetic, recreational and economic goals, among others. Some allocations, such as Late-Successional Reserves (LSRs), provide very specific objectives for managing landscapes. Others are less specific. Overall "top-down" direction does not always reflect an area's specific conditions, such as the existing seral stage distribution, reforestation, operations, rare or unique habitats, fire risk or hazard, and other issues. Nevertheless, this direction does provide an important framework for this analysis and recommendations for Federal lands.

It should be noted that the merging of the existing resource management plans with the Northwest Forest Plan is still in progress. Map 5. displaying land allocations is a dynamic product and minor changes are expected as the merging process is finalized and as ground verification of land allocations, such as Riparian Reserves, takes place.

1. Late-Successional Reserves

Approximately 48,614 acres of Federal lands, located within the Elk Creek Watershed are designated as Late-Successional Reserve (LSR). LSRs are intended to serve as habitat for Late-Successional related species, with natural processes allowed to function to the extent possible. The goal of the landscape pattern and structure is a relatively un-fragmented mature forest, except where natural openings or conditions that preclude the development of mature forest structure exist. Management activities that improve or accelerate development of late seral conditions are allowed.

Before habitat manipulation activities can be designed and implemented within LSRs, a management assessment is required. LSR Assessments focus on Late-Successional habitat and associated species while watershed analysis is a broader look at all processes and functions occurring within a watershed. LSR Assessments also provide recommendations on strategies for the management of LSRs in meeting and obtaining Northwest Forest Plan goals and objectives.

LSR boundaries are not based on hydrologic boundaries but are based on species migration and dispersal needs and habitat connectivity. Therefore, the Elk Creek Watershed Analysis Area boundary does not coincide with overall LSR allocations; it overlaps them. Map 6. shows the overall LSR Network in relation to the Elk Creek Watershed and Southern Oregon and Northern California. Two designated LSRs largely coincide with the boundary of the Elk Creek Watershed. They are identified as LSR #RO 224 (BLM south half) and #RO 222 (FS north half). At the time of this first iteration of watershed analysis, a concurrent interagency effort at a broad scale LSR Assessment was being conducted for the Southern Cascades, which include LSRs 222 through 227. While the tiering of information between processes has occurred, coordination was minimal as the South Cascades LSR Assessment was scheduled to be completed subsequent to the completion of the Elk Creek Watershed Analysis (Fall 1996).

2. Riparian Reserves

Riparian Reserves apply to Federally managed lands and generally parallel the stream network. These are buffer areas for streams, wetlands and unstable terrain. Their purpose is to protect the aquatic system and to provide dispersal habitat for late-successional species. Generally, the goal is also to grow mature forest structure, with an emphasis on species that enhance aquatic conditions. Riparian Reserve widths vary by stream type and fish-bearing status. There are approximately 24,013 acres of Federal Riparian Reserves, please see the map and discussions on Riparian Reserves widths, contained in Chapter IV.

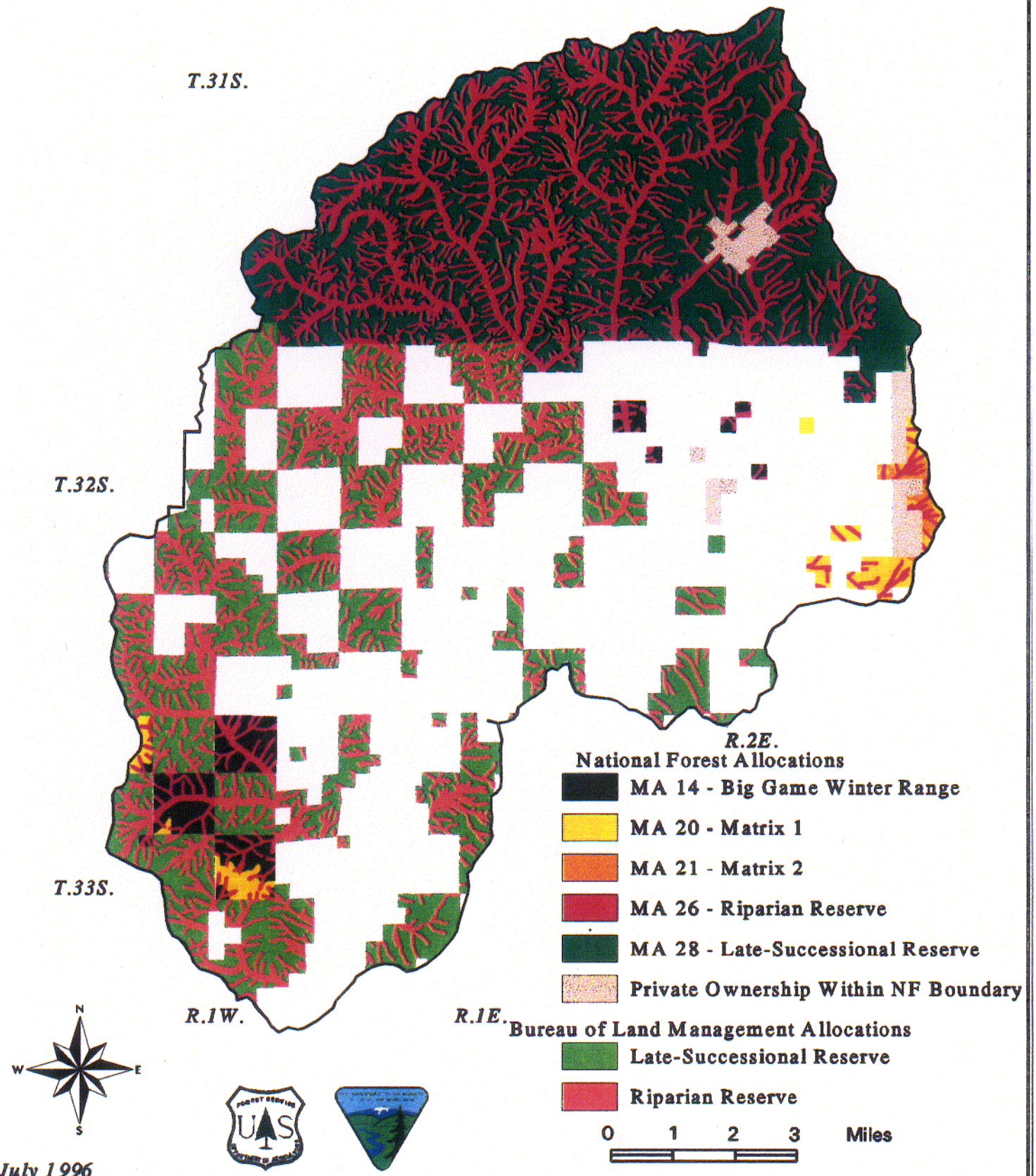
3. Matrix

The Matrix is the Federal lands outside of the other allocations. This is the area in which regulated timber harvest and most other silvicultural activities are conducted. The Matrix does contain non-forested areas as well as forested areas that may be technically unsuited for timber production. In this watershed, the Matrix area (approximately 2,074 acres) occurs exclusively on National Forest lands. As merged with the Northwest Forest Plan, the Rogue River Land and Resource Management Plan further refines the Matrix to include Management Areas (MA) identified as Matrix 1 and 2 (MA 20 & 21) and Big Game Winter Range (MA 14). Please see the Rogue River National Forest Land and Resource Management Plan for more information on these Management Areas.

MAP 5

Elk Creek Watershed

Federal Land Allocations



July 1996

LSR Network
S. Oregon/N. California

Hwy 62

Elk Creek Watershed

I-5

Medford

Oregon

California

July 1996

4. **Special Designations**

Although not specifically land allocations, there are some specially designated areas associated with Federal lands within the Elk Creek Watershed, associated with the respective Resource Management Plans. As previously noted, the entire watershed is a Tier 1 Key Watershed, from the Northwest Forest Plan. This and other special designations are shown on Map 7.

On National Forest land, there is an Unroaded (or Roadless) area associated with the second Roadless Area Review and Evaluation (RARE II). The Bitter Lick Roadless Area (06144) is 6,605 acres and is contained within this watershed. Please see the Appendix C of the FEIS for the RRNF Land and Resource Management Plan for more information on this designation.

On BLM administered lands, there are four subareas of the Middle Elk Creek Subwatershed, within the Elk Creek Watershed, that are deferred from management activities, including timber harvest and other surface-disturbing activities for ten years. These areas include Alco-Middle (1,271 acres), Flat Creek (4,099 acres), Miller-Jones (759 acres), and Yellow Rock (1,482 acres). These areas were deferred due to their currently high cumulative effects, resulting from past management. Please see the Medford District BLM Resource Management Plan (page 42) for more information on this designation

F. WATERSHED ANALYSIS UPDATE AND REVISION

It is important to note that watershed analysis is widely described as an "iterative" process. The analysis document remains dynamic and open to revision as experience is gained and data gaps are addressed. Stewardship and maintenance of the analysis and documentation will be very important in establishing its effectiveness as a working tool. Shifting social values and the availability of new information about the watershed means that this analysis is never "completed." This report is a dynamic document and will be revised and updated as new information becomes available for the Watershed.

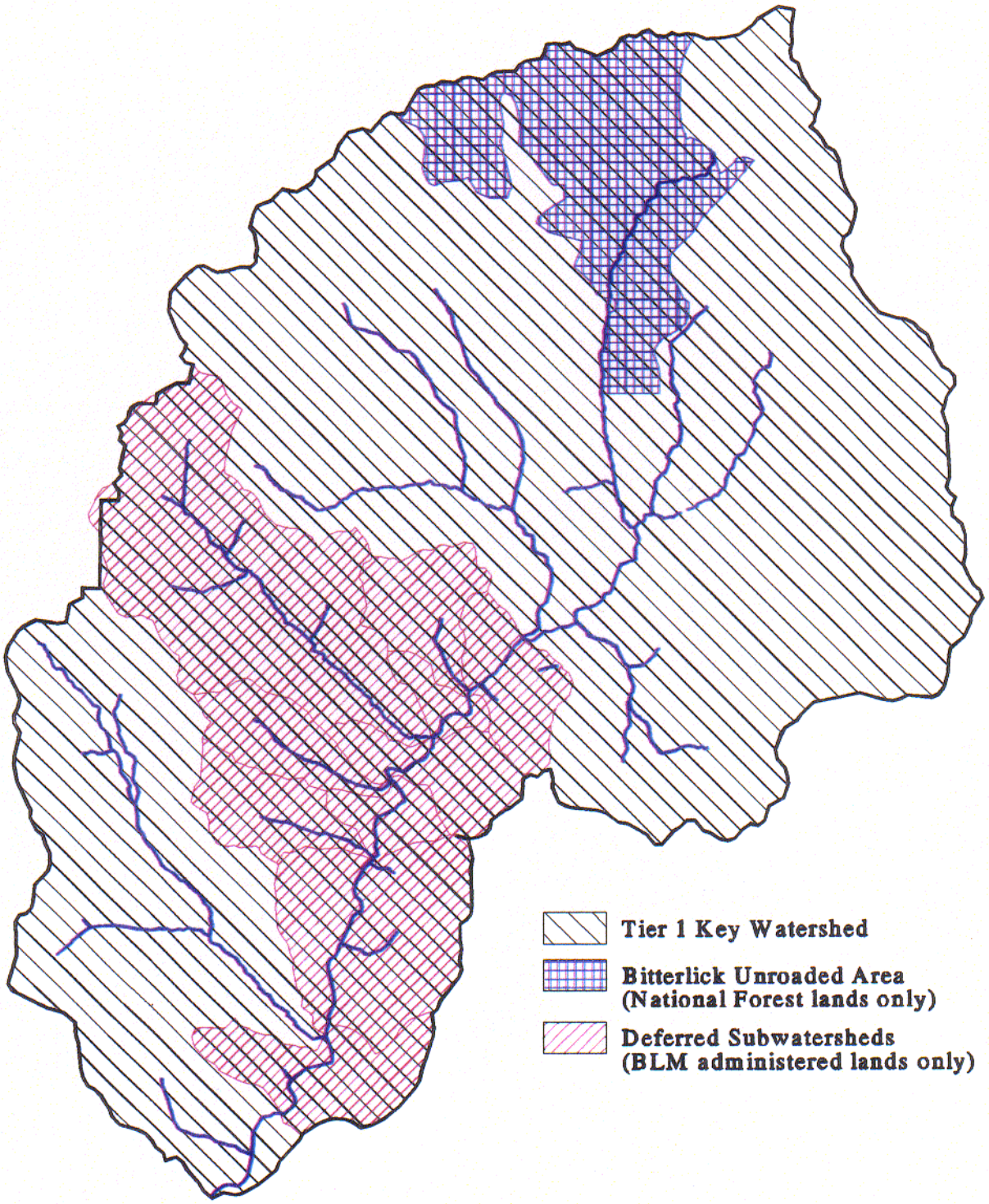
Updates of this document may include the following types of information: resource data collected at the project level, monitoring data and analysis results, and questions and answers, pertaining to clarification of findings and recommendations contained in this report. Revisions of this document are warranted when new data and information collected indicate important changes in watershed conditions or trends.

Bitter Lick Roadless Area

MAP 7

Elk Creek Watershed

Special Designations



July 1996

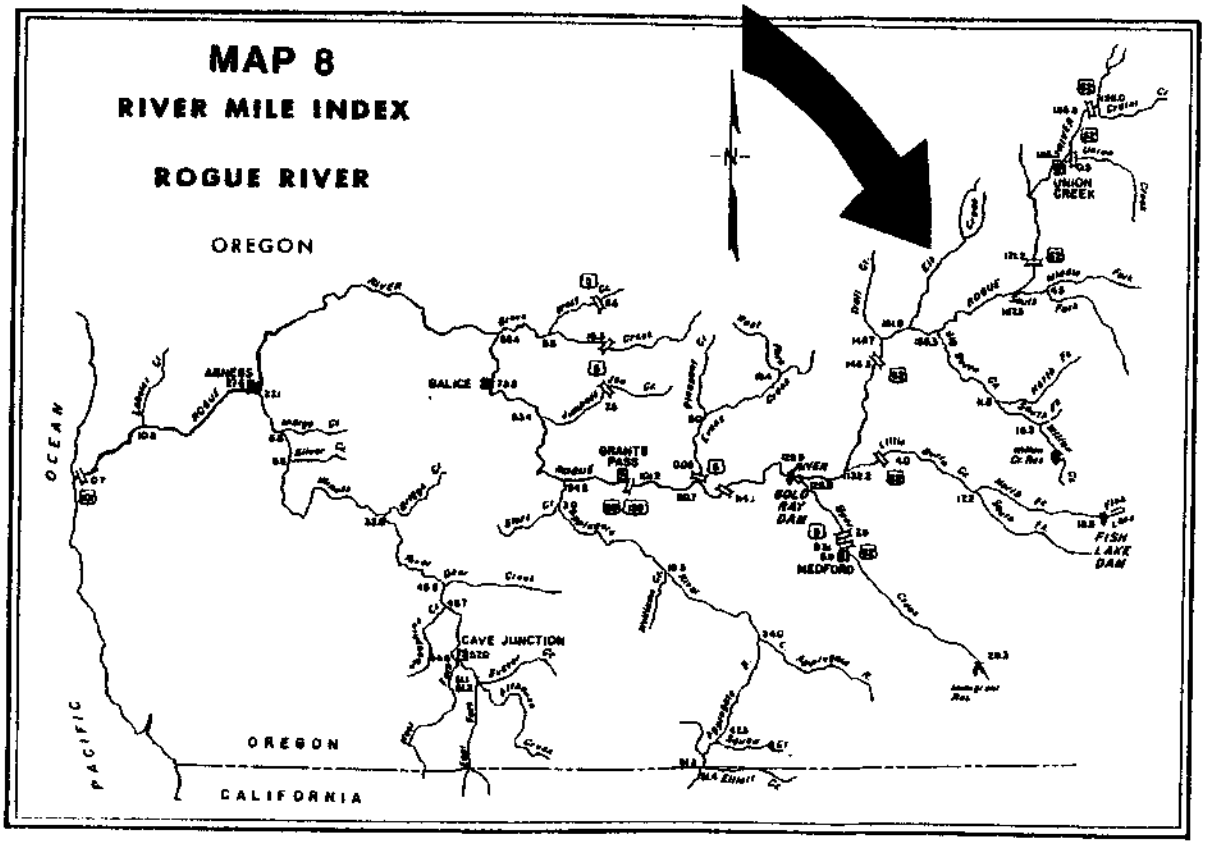
II. CHARACTERIZATION OF THE WATERSHED

A. INTRODUCTION TO THIS CHAPTER

This chapter presents and identifies the dominant physical, biological and human processes or features that affect ecosystem functions or conditions within the Elk Creek Watershed. It combines the description of current conditions and reference conditions and will focus on the Core Topics, as described in the Federal Guide. Core Topics are the basic ecological conditions, processes, and interactions (elements) at work in this and every watershed. It also includes some synthesis, interpretation of information and trends, as related to the Core Topics. Discussions on the major watershed Issues and Key Questions (those that are unique to this watershed) are contained in Chapter III. Recommendations for Federal land managers are contained in Chapter IV.

B. GENERAL PHYSIOGRAPHIC CHARACTERIZATION

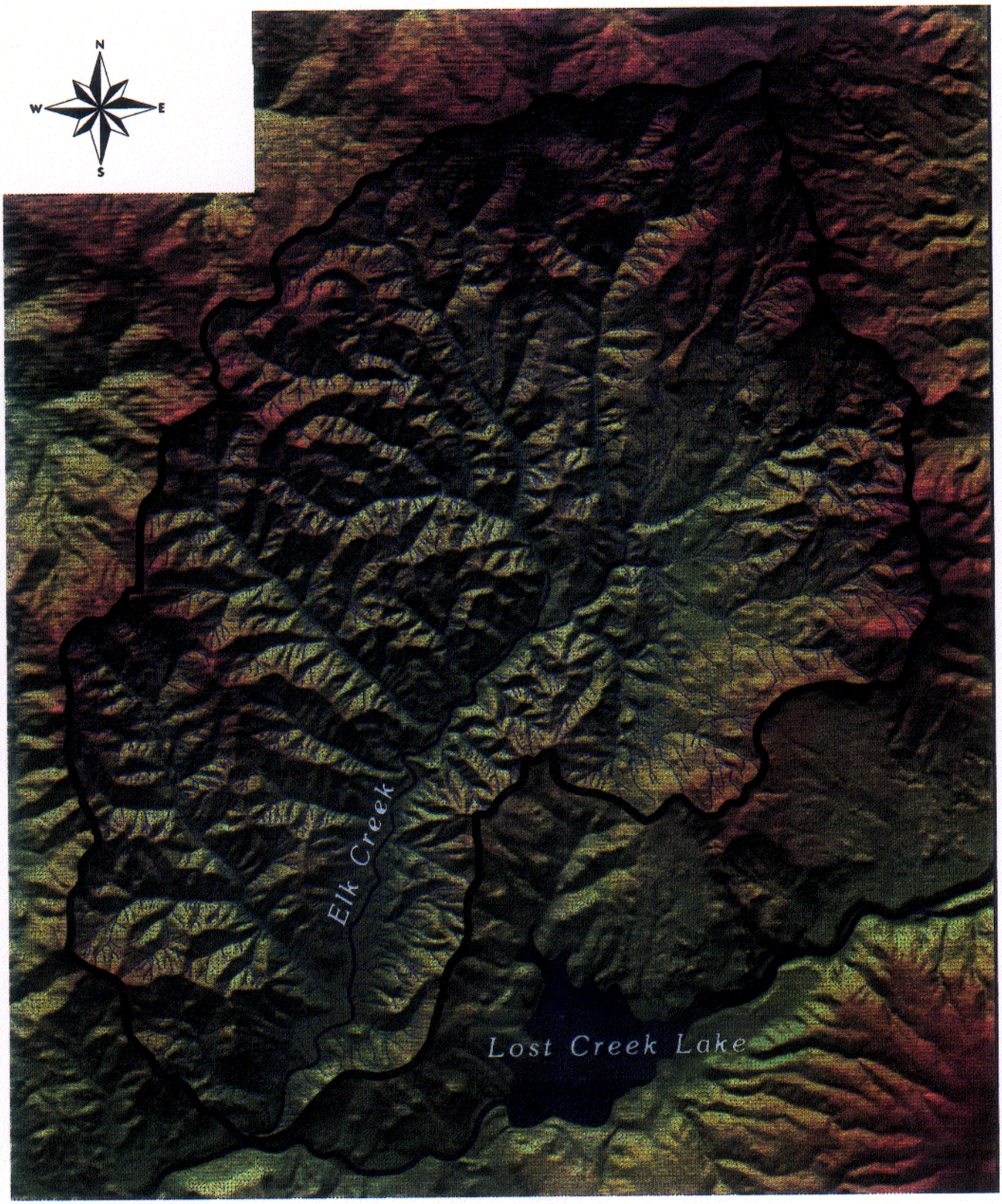
Elk Creek is an 85,362 acre watershed in southwestern Oregon. It is tributary to the Rogue River at river mile 151.9 (Map 8). Elk Creek heads in the High Cascades physiographic province and flows through the Western Cascades Sub-province of the Cascade Geologic Province to its confluence with the Rogue River near Trail. Approximately 122 square miles of the 132-square-mile Elk Creek watershed lie in the Western Cascades geologic province. The remaining 10 square miles, including the uppermost reaches of the watershed lie within the High Cascades province (Source: Environmental Impact Statement for Elk Creek Dam, Supplement. No. 2). Watershed elevations range from 1475 feet to 5500 feet.



Elk Creek watershed is characterized by mountainous terrain with long rounded ridgetops, steep slopes, and moderate to high stream gradients. These physiographic characteristics are typical of the Western Cascades which extend through western Washington and Oregon into northern California. Map 9. shows the overall physiographic conditions in color relief; this map was generated using USGS digital elevation model data and ARC-INFO geographic information system (GIS) computers.

Elk Creek Watershed

Color Relief Map



Source: USGS digital elevation data edited 1990

0 1 2 3 Miles

June 1996

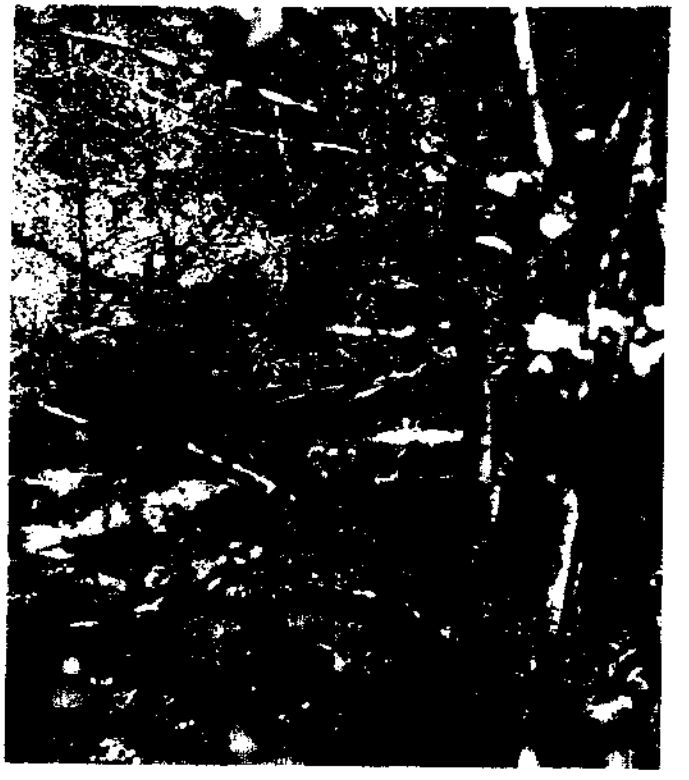
The Western Cascade Range is composed of many overlapping volcanic and sedimentary units. Individual layers extend either for short distances or as much as several tens of miles. These form a complex package of volcanic and sedimentary rocks about 5500 meters (18,000 feet) thick. Sixty percent of these rocks are pyroclastics, which easily weather to clay-rich soils. The rocks are soft and often highly weathered (Prchal, 1996). Map 10. shows the basic geologic rock types within Elk Creek.

In general, the upper elevations in the headwaters have relatively flat slopes with clay soils that drain poorly. These soils drain so slowly that the soil is wet at a shallow depth for significant periods during the growing season.

The slopes below the ridgetops are steep and commonly highly dissected, indicating either bedrock structure or differences in bedrock weathering or materials. This bedrock structure often supports the flat clay-topped ridges, inhibiting mass movement. These slopes are often broken with landslide benches or are underlain by more resistam bedrock that has withstood the down cutting of natural landscape evolution. Resulting soils exhibit a wide variety of textures depending if they are residual from the resistant rock or deposits of colluvium from the slopes above.

The valley bottoms in streams tributary to the upper portion of Elk Creek are narrow for the most part and have little deposits of sediment as valley fill due to the colloidal nature of the soils from the rock sources. These finer soils usually are not deposited in the tributary streams, but are carried out of the watershed during high stream flows. The upper reaches of the tributaries can have a higher content of coarse fragments within the stream channels, as result of debris avalanches. The valley bottom deposits generally are sandy loams with gravel in places and pockets of clay. The main valley of Elk Creek does have extensive alluvial deposits. (Badura, 1996)

Drainage in the watershed forms an asymmetrical dendritic pattern with stream channels on the east being about 1 mile long, while on the west they extend more than 4 miles. Slopes on floodplains along the major tributary streams and on the main stem of Elk Creek, range between <1 and 3 percent. Foothill slopes in the basin range from about 10 percent up to about 35 percent with vertical walled erosional remnants scattered throughout the watershed. Although ridgetops are somewhat broad and rounded, sideslopes exceed 60 percent slopes in many places in the upper portions of the watershed. Map 11 shows the typical slopes in the watershed, in five slope break classes.

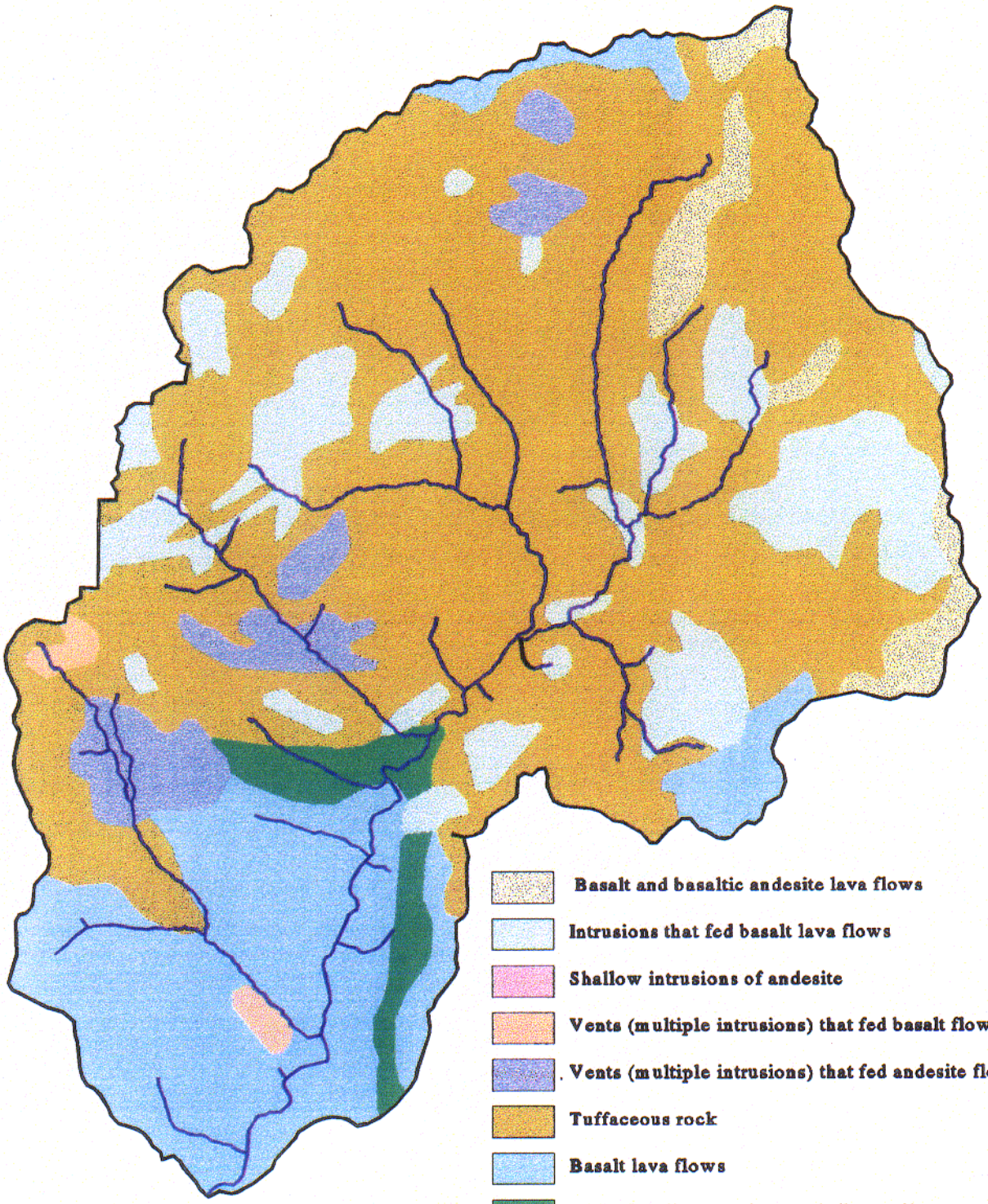


Upper Reach of Elk Creek, near Forest Road 64

Elk Creek Watershed

Geologic Rock Type Map

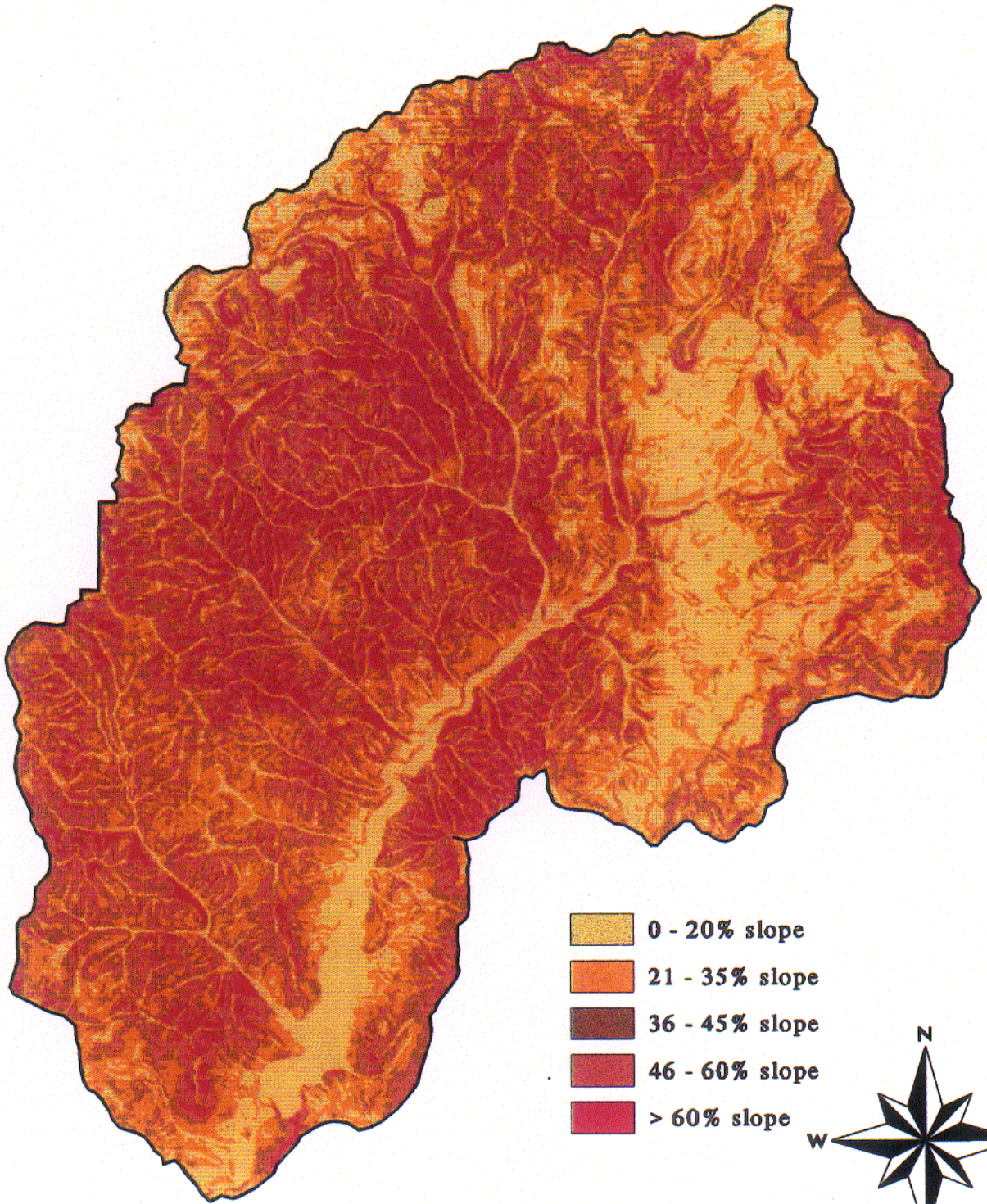
Source: Geologic Map of Oregon, 1991



July 1996

Elk Creek Watershed

Slope Class Map

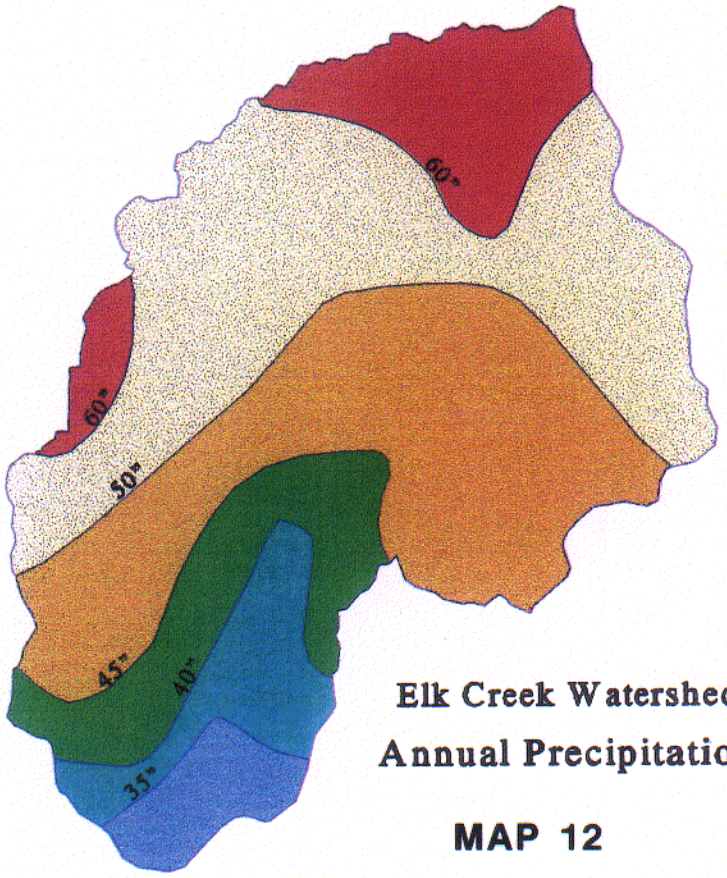


Source: USGS digital elevation data edited 1990

July 1996

1. Climate - Precipitation

The climate of the Rogue River Basin is characterized by mild, wet winters and warm, dry summers. During the winter months, the general southward displacement of the Aleutian (Gulf of Alaska) low pressure system results in a predominant westerly flow of moist air from the Pacific Ocean. The area is subject to frequent winter storms of varied intensities. Winter precipitation in the higher elevations generally occurs as snow, with rain predominating in the lower elevations. During summer months, the area is dominated by the Pacific high pressure system, resulting in hot dry summers. Summer rainstorms occur occasionally and are usually of short duration and limited areal coverage. Climate during the spring and fall months is transitional between the summer and winter extremes. Average annual precipitation varies by location within the watershed. Expected annual precipitation in the watershed ranges from less than 35 inches to more than 60 inches. Map 12. shows general annual precipitation (isohyetal lines) in inches per year.



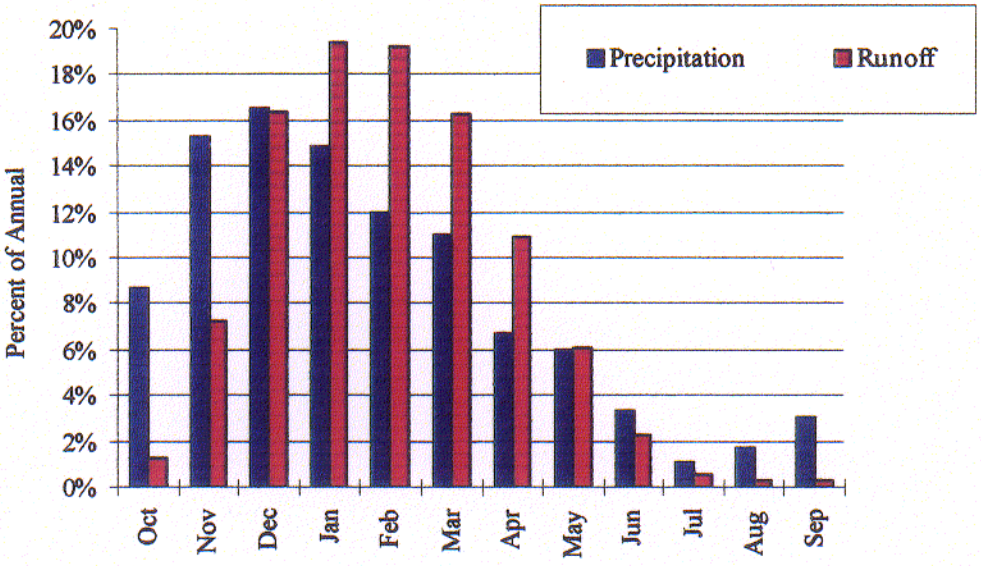
Elk Creek Watershed

Annual Precipitation

MAP 12

The streamflow regime of the Rogue River and tributaries is similar to the precipitation pattern. However, runoff generally lags behind precipitation by about a month. Low flows normally prevail from July through September or October, the period of low precipitation. Moderate to high flows, which may fluctuate widely, exist during the remainder of the year. The high flow period begins about mid-November and lasts generally through April. Stream flows during the months of May and June are augmented by melting snowpack. The historic extreme high flows have been produced by rain-on-snow events where warm rains have melted the snowpack thereby producing large amounts of runoff.

Figure 2. Precipitation and Runoff Patterns.



The range in flows from low to high is very large in this watershed. The historic low and high flows both occurred in water year 1964. In that year, the winter storm produced a flow of 19,200 cubic feet per second (cfs). Later that year, the discharge dropped to 0.40 cfs. Over the past 50 years, the average discharge in Elk Creek has been 233 cfs or about 168,800 acre-feet annually. (US Geological Survey)

C. EROSION PROCESSES

Erosion can generally be classified as sheet, rill, or gully erosion, or as mass movement. All of these processes occur to some extent within the Elk Creek Watershed. Erosion generally occurs in response to movement of water. However, it can also be a response to wind, gravity, or mechanical actions such as use of equipment for logging or construction.

Erosion of the soil surface is a major concern where management activities destroy the duff and litter layer. The concern occurs mainly where the underlying bedrock is massive or highly weathered and also where there are slow infiltration rates such as on shallower soils and southern aspects. On gentle slopes, eroded soil is frequently not transported far. However, the continual movement of soil particles from one location to another lowers the productivity of the sites and lengthens the time for revegetation. On steeper sites, the eroded soil is transported off-site and usually ends up in stream channels, where it can degrade aquatic habitats.

Rill and gully erosion are a problem where roads and skid roads have intercepted natural runoff or ground water and concentrated it into an erodible force on sideslopes. This can also occur below road culverts where water is concentrated and emptied into a drainage of insufficient size for the volume of water. Rill and gully erosion also occur from skid roads on steep slopes. Water can be concentrated on these sites and then run off the sides creating rills and gullies below.

Debris torrents, flows or avalanches are examples of mass movement and are common on the highly dissected slopes. Virtually all stream channels on slopes greater than 20% in the Cascades were carved by multiple debris flows. These processes move large amounts of soil and rock and will often remove all vegetation and scour channels to bedrock. The mobilized material can damage downstream resources, such as fish habitat, vegetation and human-created structures.

Soil ravel is found in patches in this watershed and throughout the Cascades. This steady downhill movement of soil and rock debris deposits material in draws and streams. Movement of particles is slowed by forest litter (leaves, needles, branches, fallen trees, etc.). Removal of this litter by burning or other forest management practices can accelerate the erosion of these soil and rock particles. As these deposits accumulate, they become unstable. It is mainly in intermittent stream drainages that mass movement in the form of debris slides, channel gutting, simple slumps, and piping occurs.

As material moves downhill it temporarily accumulates in flatter areas, draws, and intermittent stream channels. Material accumulates both in and adjacent to channels. In time, this accumulation passes a threshold where these materials become unstable and the entire accumulation of debris liquefies and flows down channel , scouring the channel to bedrock. Debris flows are often initiated by minor slumping on slopes adjacent to these channels in combination with saturation from a major storm.

Volcanic rock, especially pyroclastic deposits, weather to clay-dominated soils. As these clay-rich soils become thick (10 to 100 feet) and heavy with moisture, gravity causes them to ooze slowly downhill as a type of landslide called an earthflow. Massive landslide scarps, benches and related geomorphic features indicative of earth flows are still present. These features are generally inactive except for the break-in-slope of benches and streams adjacent to these features. Reactivation may occur through improper road and culvert location and, in some instances, by timber harvest practices that intensely disturb the soil.

Map 13. depicts relative risk for erosion based on soil types. These risk classes are based on a combination of soil type and slope. Overall, about two thirds of the watershed id identified as having a high potential risk for erosion. These types were derived from the *Soil Resource Inventory for the Rogue River National Forest* (Badura and Jahn 1977), and the *USDA Soil Conservation Service, Soil Survey of Jackson County Oregon* 1993. The National Forest Soil Resource Inventory depicts landtypes, while the Soil Survey of Jackson County is based on soil types. Because these are slightly different systems, there is an inherent difference is the way they show erosion risks. That is why there is such an abrupt change along the National Forest boundary. There are also some data gaps due to edge matching differences in this area.

Land management practices can accelerate any of the erosion processes. On forested land, road construction can expose large amounts of soil to the erosive forces of wind and water. Likewise, logging and subsequent site preparation can expose soil to the same forces. The amount of soil exposed during logging depends on the logging system. While generally occurring on flatter, less erosive land, agricultural activities can result in significant soil erosion. Since agriculture commonly takes place near to streams, the eroded material is more often transported directly into stream channels

The current watershed trend is one of healing of many of the disturbed forested areas affected by land management. The amount of logging on Federally administered lands has dramatically declined in recent years. The classification by the Northwest Forest Plan of most of the public lands in the watershed as Late-Successional Reserve, assures that the rate of intensive timber harvest will remain low into the future. Additionally, the emphasis in the Northwest Forest Plan on watershed restoration should allow the land to recover and erosion rates to decrease.

Process links:

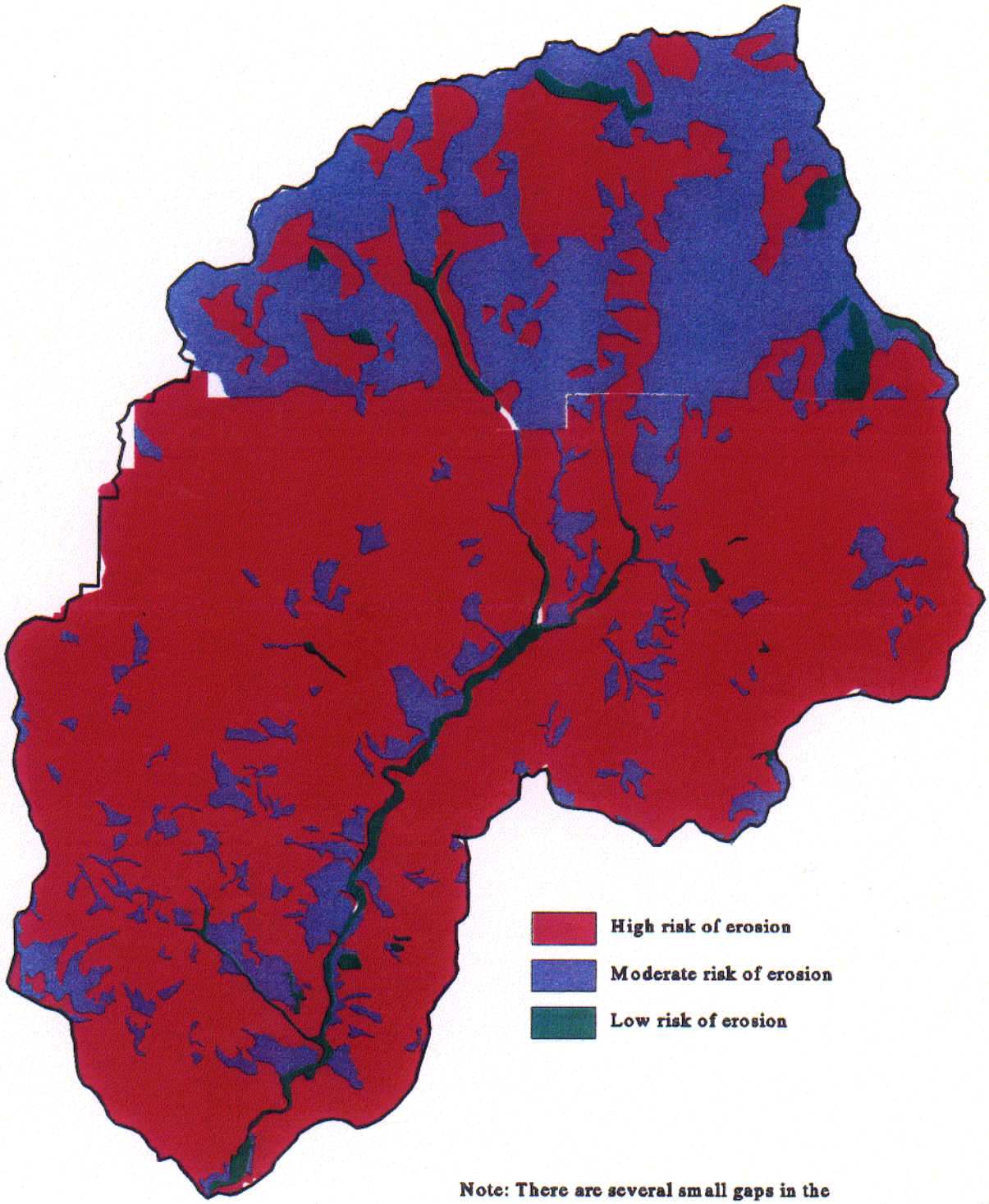
- Turbid runoff is linked to topography, erosion hazard, soil type, road construction, logging, grazing, storm events, fires.

- Sediment is linked to topography, drainage density, climatic events, natural and human caused disturbances, fires, roads, maintenance of roads.

Elk Creek Watershed

Erosion Risk

Source: RRNF Soil Resource Inventory, 1977 and Jackson County Soil Survey, 1993



Note: There are several small gaps in the data due to edge matching problems between the RRNF Soil Resource Inventory and the Jackson County Soil Survey

July 1996

D. HYDROLOGIC CHARACTERISTICS

This section will discuss the dominant hydrologic characteristics (e.g., total discharge, peak flows, minimum flows) and major hydrologic features present within the Elk Creek Watershed.

Four U. S. Geological Survey stream gaging stations are located in the Elk Creek watershed. These have been operated for a number of years; the longest being the station near Trail which has been in continuous operation since 1945. The Elk Creek @ Cascade Gorge Station is located at river mile 10.7 on Elk Creek and is .01 mile downstream from Sugarpine Creek. Elk Creek below Alco Creek is at river mile 6.1 on Elk Creek and is 500 feet downstream from Alco Creek. West Branch Elk Creek is about 300 feet above Spot Creek. Elk Creek "near Trail" is at river mile 1.2 on Elk Creek and is 3.7 miles from Trail. Table 3. summarizes information for the four stations.

Table 3. Gaging Station - Flow Data.

Station	Period of Record	Drainage Area - Mi^2	Peak Flow - cfs	Minimum Flow - cfs	Average Flow - cfs	Average Runoff Acre-Feet
Elk Cr. @ Cascade Gorge	1973-1995	78.8	6,780	0.45	132	95,740
Elk Cr. Below Alco Cr. 1/	1986-1995	111	---	0.54	---	----
W. Branch Elk Cr.	1974-1995	14.2	1,410	.018	18.7	13,560
Elk Cr. Near Trail	1945-1995	133	19,200	0.40 2/	216	156,300

1/ Low flow station only. No estimate of flows in excess of 480 cfs.
2/ During construction of Elk Creek Dam on 10/8/87 the flow dropped to 0.01 cfs.
(Source: U.S. Geological Survey, 1995)

Runoff from the watershed is typical of a rain-dominated system where stream discharge is a response to precipitation. Figure 3. shows the average monthly discharge for Elk Creek near its confluence with the Rogue River. Runoff peaks in the winter months in response to precipitation. Generally, the increase in flow lags behind the increase in precipitation by about a month. This is in contrast to flow in the upper Rogue River which has its highest average annual peak flows in April-May, in response to melt of the annual snowpack in the higher elevations.

The range in discharge between high and low on an annual basis can be extreme. For the period of record for Elk Creek near Trail, the highest and lowest flows occurred in the same water year -- 1965 (10/1/64 -- 9/30/65). In that year, the floods of December 1964 produced a peak of 19,200 cfs. The flow in August of 1965 was 0.40 cfs. This is a difference in magnitude of 48,000 times.

Summer low flows in Elk Creek reflect both the low rainfall amounts during May to September and the demands for water from the stream. Demand for water for irrigation, stock watering and domestic use exceeds the amount of water available in the summer and often causes flows to be lower at downstream locations than higher up in the watershed. Figure 4. illustrates summer flow conditions when discharge at the station of Elk Creek below Alco Creek is lower than at the Cascade Gorge stations, even though the subwatershed tributary to the Alco Creek station is more than 20,000 acres larger.

Figure 3. Average Monthly Discharge in Elk Creek, near Trail.

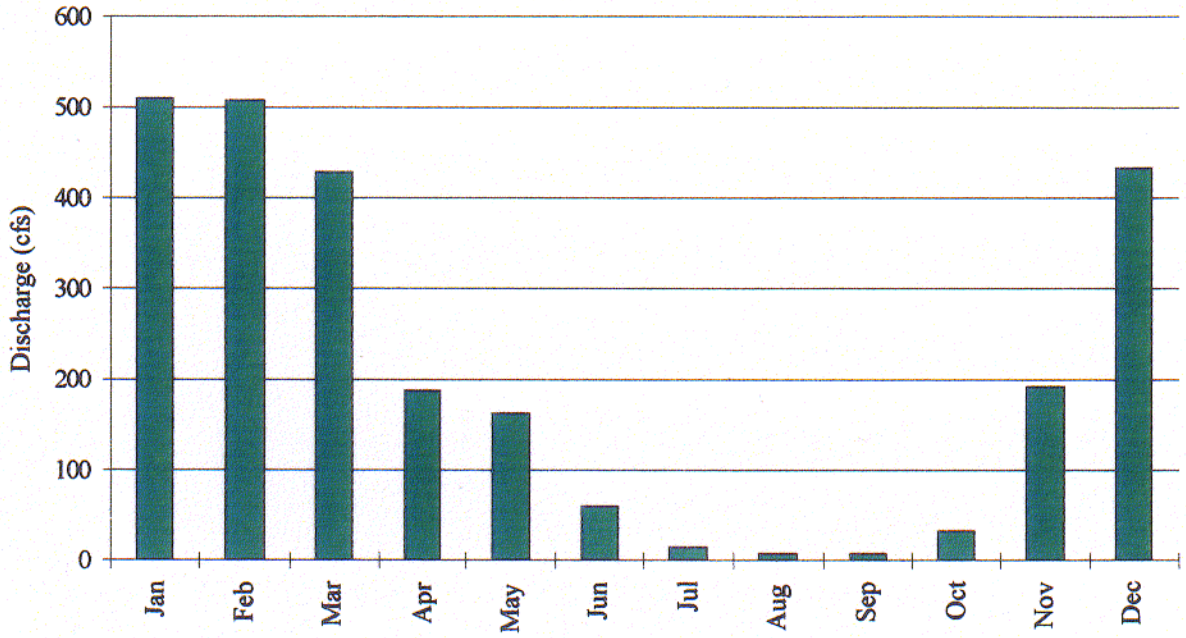


Figure 4. Average Monthly Discharge: Three Mainstem Gaging Stations.

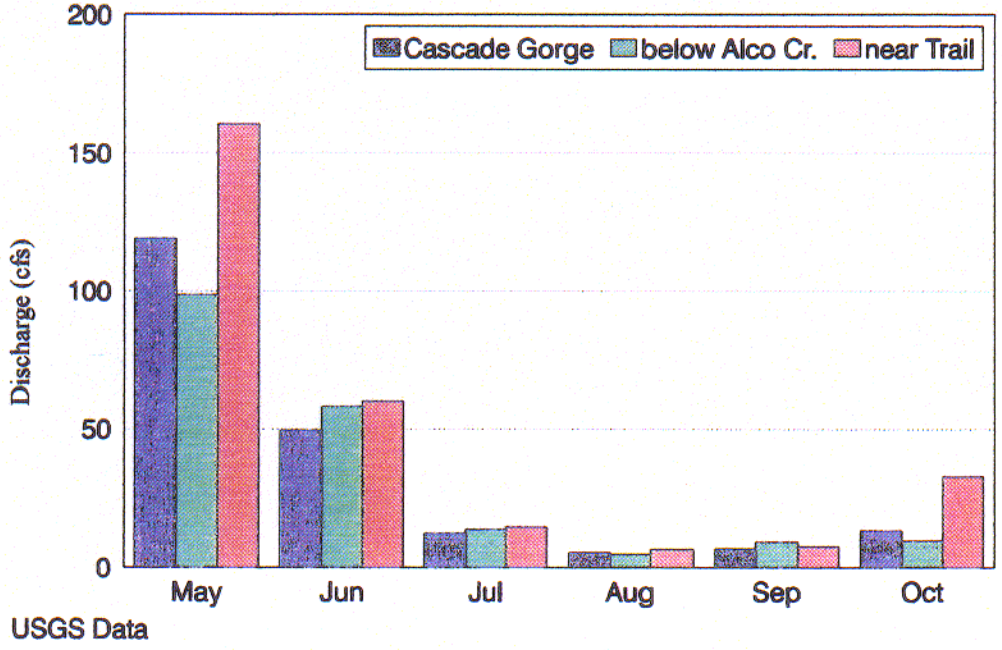
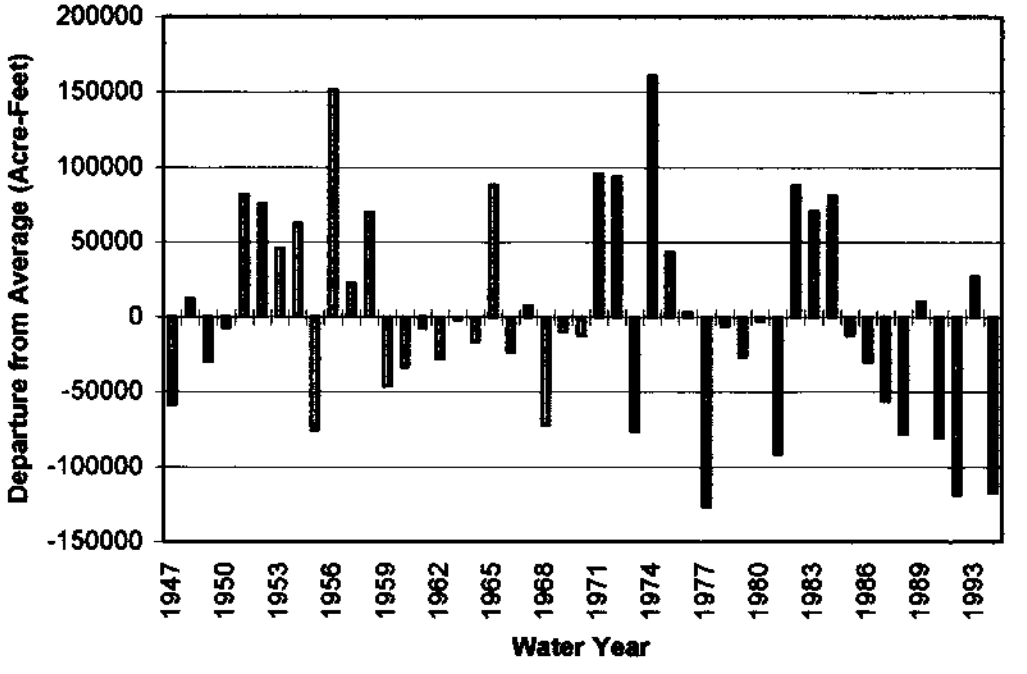


Figure 5. Annual Runoff in Elk Creek, near Trail.



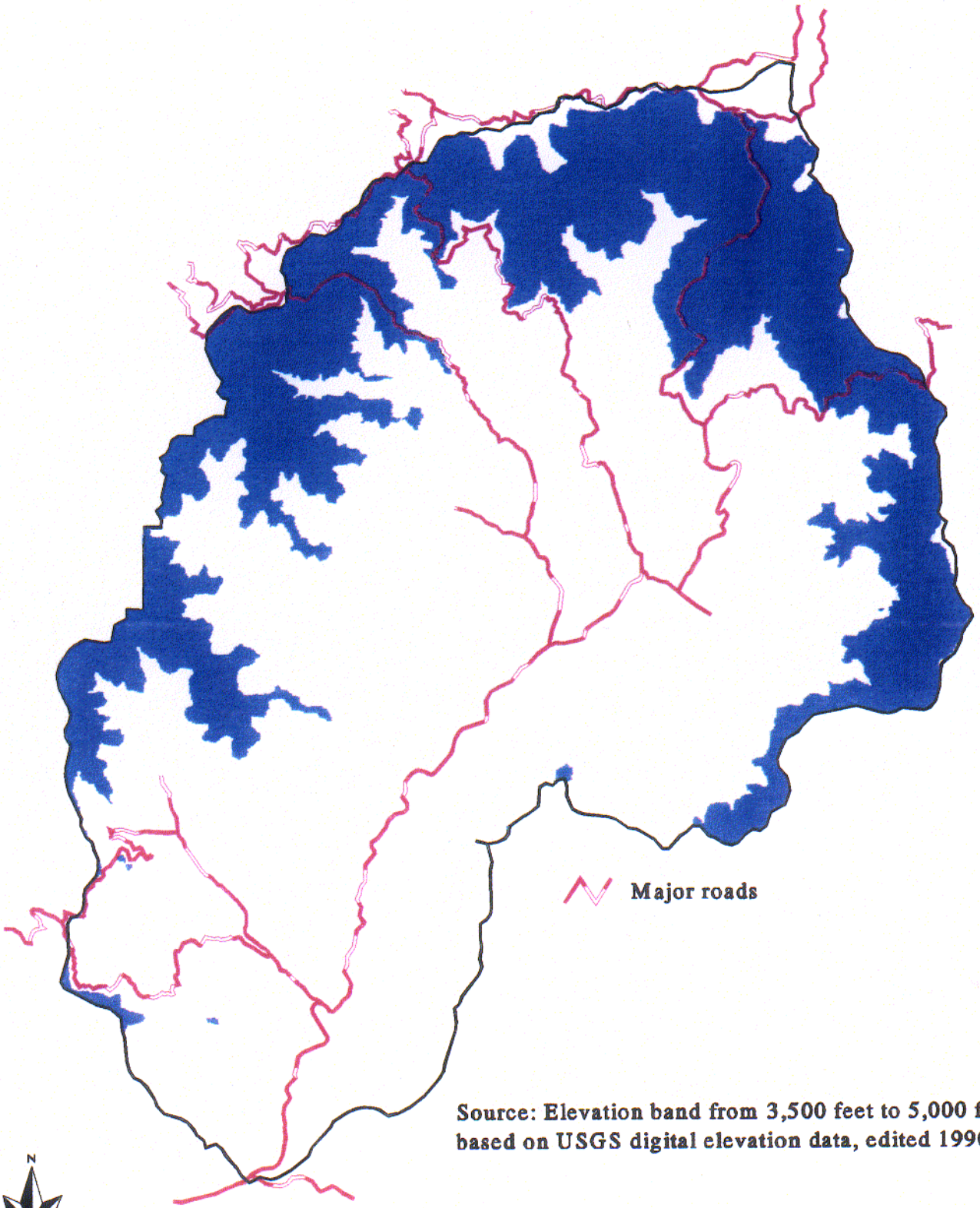
In recent years, low flows have been of concern to fisheries and others resources as the effects of a prolonged dry period were felt. Rainfall and runoff from area streams has been below normal for much of the past decade. Figure 5. shows the annual water yield for Elk Creek as a departure from normal which is about 156,300 acre-feet. Bars that extend below zero represent years when total runoff was below the average. Seven of the last ten years have been low runoff years.

Historic flows are generally the result of mid-winter rain-on-snow storm events. Wet snows that accumulate early in winter in the elevation zone of 3,500-to-5,000 feet often will melt during prolonged warm rain storms. The water from the rainfall combined with that stored in the snow can produce extreme runoff events. Floods on Elk Creek are caused primarily by heavy rains augmented by snowmelt runoff (ACOE, 1980). The record peak flow during the 1964 flood was this type of an event. There are 23,585 acres in the transient snow zone in this watershed that are susceptible to rain-on-snow events (See Map 14). This is 27.6 percent of the total watershed area.

MAP 14

Elk Creek Watershed

Transient Snow Zone Map

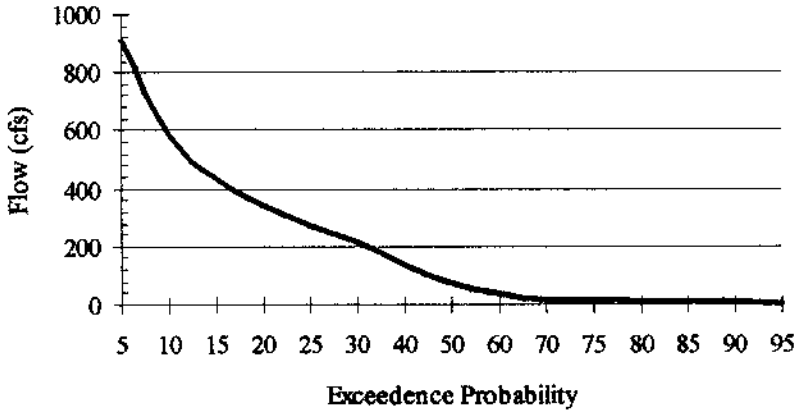


Source: Elevation band from 3,500 feet to 5,000 feet based on USGS digital elevation data, edited 1990

July 1996

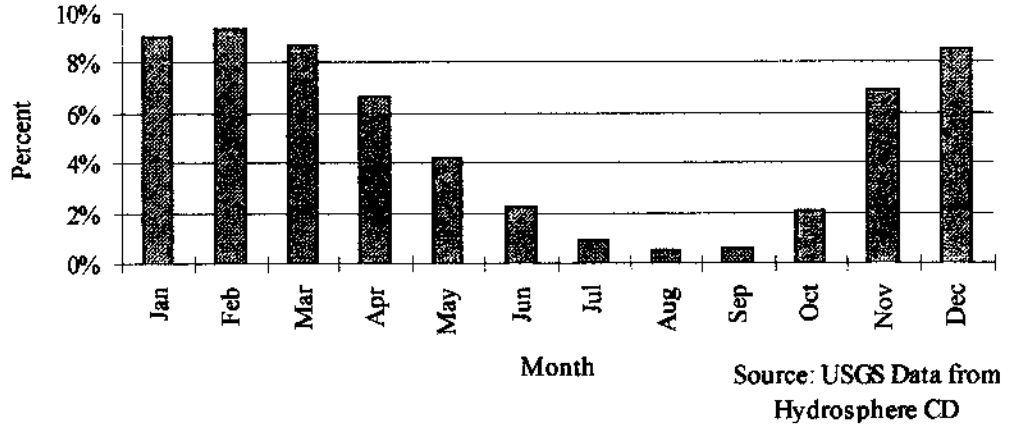
Peak flows in Elk Creek are rarely of long duration. This is typical of a rain-dominated watershed in southwestern Oregon. Figure 6. shows the duration of flows in terms of percent of time a given flow is equaled or exceeded. The discharge is less than 100 cfs about 55% of the time.

Figure 6. Flow-Duration Curve for Elk Creek, Near Trail.



There are approximately 1,010 miles of stream in the Elk Creek watershed (See Map 3). Of this total, about 187 miles are perennial and 822 miles are intermittent. Elk Creek makes up about 5% of the watershed above Grants Pass. It contributes flow in excess of that percentage for much of the year. In the summer, during low flow conditions, this percentage of flow in the Rogue River at Grants Pass is considerably less than its size would indicate. Figure 7. below, illustrates the importance of Elk Creek to flow in the Rogue throughout the year.

Figure 7. Elk Creek Mean Monthly Flow as a Percentage of the Mean Monthly Flow in the Rogue River at Grants Pass.



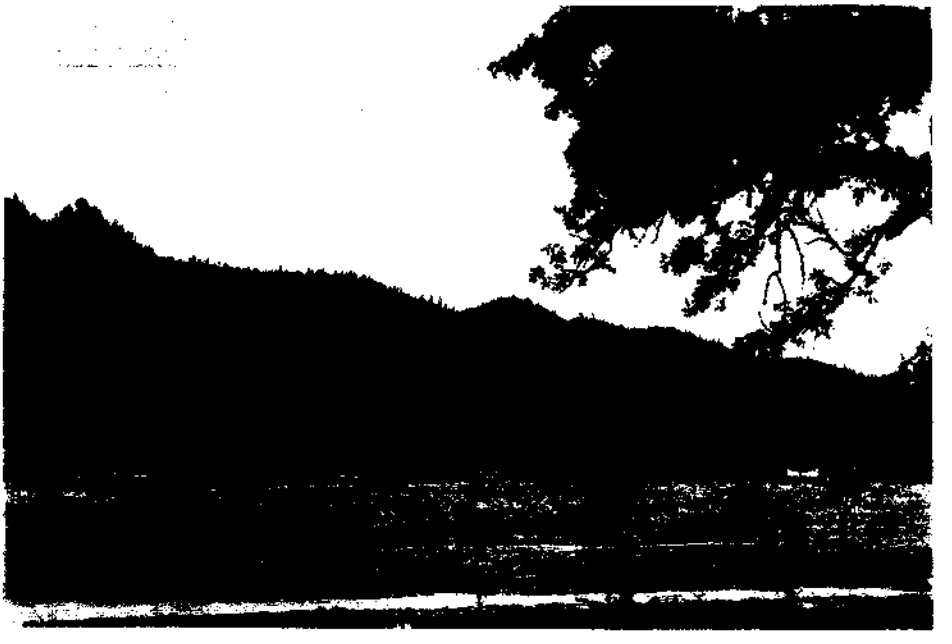
There are no natural ponds or lakes within the watershed. Near the mouth of the stream lies the U.S. Army Corps of Engineers partially completed Elk Creek Dam. This project was proposed as one of the three dams comprising the Rogue Basin Project. The two completed dams are Lost Creek on the main stem of the Rogue River and Applegate on the mainstem of the Applegate River. The primary purpose of the dams was for flood control, with additional benefits of recreation, irrigation, water quality improvements, and domestic water supply. At this time, the partially completed dam blocks fish migration to the upper portion of the watershed. It is not currently known what the final disposition of this structure will be.

The forested portion of the watershed (except for the Bitter Lick Roadless Area), has been extensively roaded. The vegetation is a patchwork of mature forests, clearcuts, partial cuts, and natural meadows in the upland portion of the watershed. The lower portion along Elk Creek is mainly farmland -- hay fields and pastures. Most of the land within the pool area of Elk Creek Reservoir was purchased by the Corps of Engineers and has lain vacant for about twenty years. It is also pasture land and hay fields, but has not been actively farmed for a while. The houses that once were within this area have been removed by the Corps.

The partially constructed Elk Creek dam has blocked fish passage into the Elk Creek watershed. Anadromous fish -- coho and steelhead -- cannot migrate past the dam. The Oregon Department of Fish and Wildlife (ODFW) has been operating a catch, transport and release program for the past several years where they trap returning fish at the dam and transport them (by truck) above it and release them into Elk Creek to continue their migration.

Many miles of roads lie within the watershed. Hydrologically, roads tend to increase the amount and decrease the timing of runoff during storm events. There are numerous stream crossings by roads which might hamper fish passage. Roads also tend to increase the amount of erosion and sedimentation into the stream systems.

There are also numerous water withdrawals for human uses in the watershed. Irrigation of pastures and hay fields are the primary uses of this water. This occurs during the summer growing season and exacerbates the problem with high stream temperatures in Elk Creek.



Typical pasture lands in lower reach of Elk Creek, near Elk Creek Road (Oregon Forest Highway 159)

E. STREAM CHANNEL CHARACTERISTICS

Streams in the Elk Creek watershed have formed under a number of different processes. Their morphology reflects these processes. Generally they can be classified morphologically into four different categories: canyon, alluviated canyons, slope-bound valleys, and alluvial valleys. Figure 8. shows the general relationships of these four categories.

1. Stream Segment Descriptions

a) Canyon stream segments

Processes and functions: these streams are generally confined to narrow canyons in the upper portions of the watershed. Width-to-depth ratios range from 1-to-2. Channel gradients are usually in excess of three percent. Functionally, they provide cool water to lower stream segments, transport sediment, trap and transport large wood, and provide the upper extent of habitat for steelhead and trout. Examples of this stream type are the upper reaches of Bitter Lick, Sugarpine, Elk, West Branch Elk, Alco and Flat Creeks.

Characteristics:

- Little accumulation of large woody material, steep side slopes. Important for delivery of sediment and wood.
- Small waterfalls, pocket pools associated with boulders, and step pools are frequent.
- Riffles and cascades important for macroinvertebrate production.
- Habitat for resident rainbow trout, cutthroat trout, and steelhead if accessible.

b) Alluviated canyon stream segments

These streams are generally located below the canyon streams. While still confined by canyon walls, there is somewhat more room for the channels to develop and they are wider and not as steep as the canyon streams. Deposition of large wood is important for channel maintenance. Examples of this stream type are: mid to lower reaches of Bitter Lick, Sugarpine, Elk, West Branch, Alco, and Flat Creeks.

Stream valleys are generally two to three times the bankfull stream width, stream gradients are moderate. These streams exhibit some meandering, moderate width-to-depth ratio, wood in complexes or on terraces, some side channel development.

Characteristics:

- More frequent connection of stream with riparian and hillslope vegetation than canyon streams..
- Terrace formations, vegetated with hardwoods provides food for aquatic insects, amphibian habitat.
- Lateral scour pools associated with meanders, riffles are important for macroinvertebrates.
- Key fish habitat for coho, steelhead and resident trout. Water temperatures usually cooler than in valley segments.
- Low-gradient segments are productive due to deposition of coarse wood and sediment. These areas are biologically rich for a variety of species.

c) Slope-bound and Alluvial Valley stream segments

These stream segments are lowest in the watershed. The channels are generally unconfined and have wide floodplains and terraces. These channels have been modified by humans more than any of the other types. Examples of this stream type are: Lower Elk Creek and the lower reaches of streams directly tributary to Elk Creek.

Characteristics:

- Stream valley is greater than three times the bankfull width of the stream. Low stream gradient with high width-to-depth ratio, meandering channel, extensive side channel development in natural conditions.
- Floodplains with high water tables, rich biological zones for wildlife, fish and waterfowl.
- Riffle-pool system with stream working across wide floodplain.
- Important fish habitat for all anadromous species, over-wintering habitat for coho salmon and steelhead juveniles. Large resident trout associated with complex riverine habitat.
- Side channels provide refuge from floods and freshets.
- Water withdrawals, low natural summer flows, and channel simplification combine to produce high summer stream temperatures.

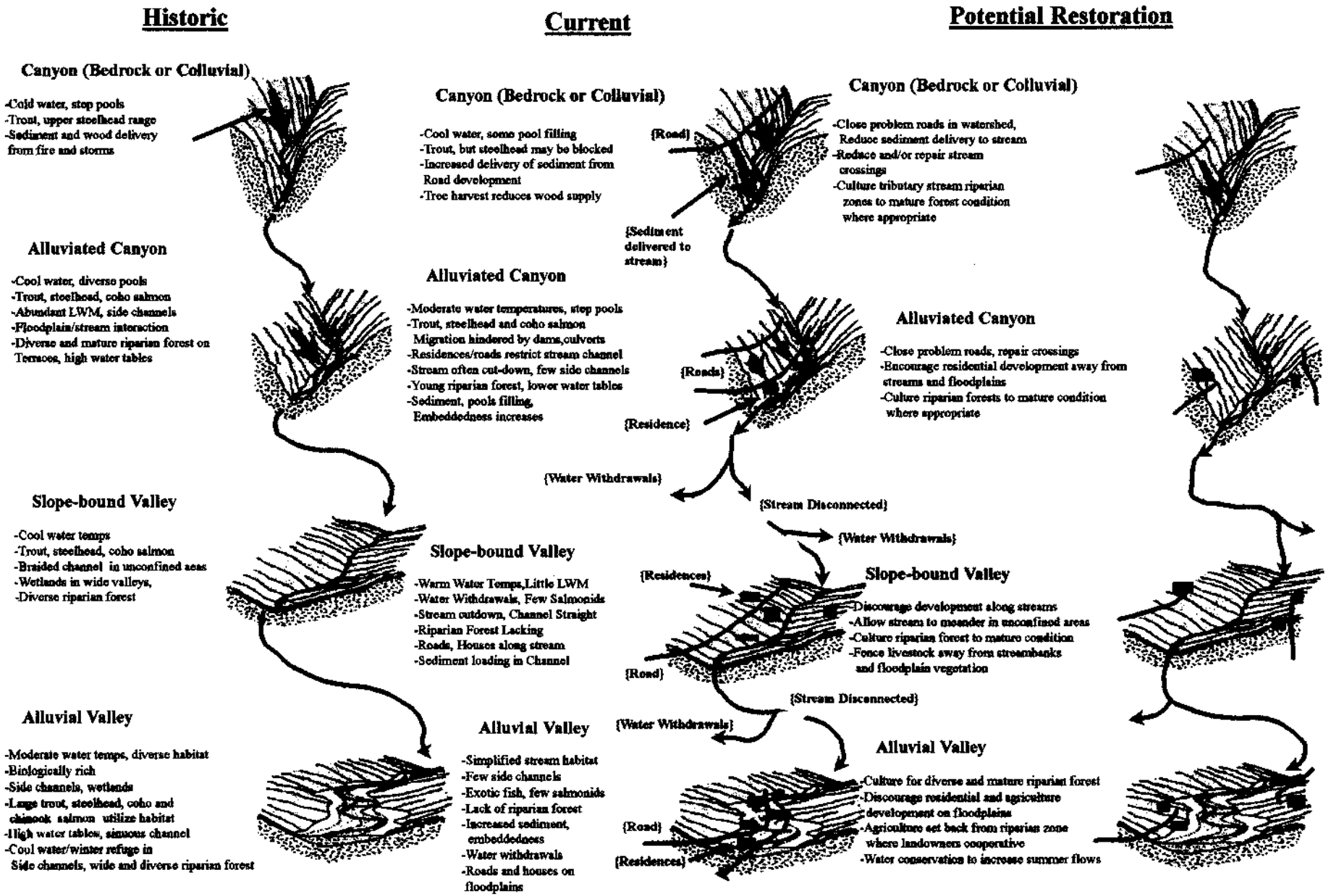


Figure 8. - Summary of Physical Processes and Human Influences on Aquatic & Riparian Ecosystems / Restoration Opportunities

F. WATER QUALITY

Water quality in the Elk Creek watershed varies spatially and temporally. During the winter months, streams generally are of good quality. Increases in turbidity levels in response to storm events and increased stream flow are common. However, these events are usually of short duration and are a part of the natural functioning of the watershed. During the summer flow period, conditions change and the quality of water in a number of the streams is not sufficient to meet Oregon Water Quality Standards or to support the designated beneficial uses as prescribed by the Clean Water Act (CWA). In particular, stream temperatures increase to detrimental levels for much of the summer.

The beneficial uses identified under the CWA for the Elk Creek watershed are fisheries, irrigation, domestic water supply, stock watering, and recreation. When water quality in a water body fails to meet the standards and does not support the designated beneficial uses, then it can be classified as "water quality limited" under the CWA.

Monitoring of water quality in streams is required before a stream can be termed water quality limited. To date, most of the water quality monitoring in this watershed has been of summer water temperatures on about ten streams. Five of these were found to fail to meet the summer temperature standard and were listed as water quality limited in July 1996 by the Oregon Department of Environmental Quality (DEQ). Streams that are not listed as water quality limited are as likely to be so due to a lack of data are they are due to meeting the standard. The DEQ has listed the following streams in the Elk Creek Watershed as water quality (summer temperature) limited:

- Bitter Lick from the mouth to headwaters. *Summer temperature.*
- Elk Creek from mouth to Bitter Lick Creek. *Summer temperature.*
- Hawk Creek from mouth to headwaters. *Summer temperature.*
- Sugarpine Creek from mouth to headwaters. *Summer temperature.*
- West Branch Elk Creek from mouth to headwaters. *Summer temperature.*

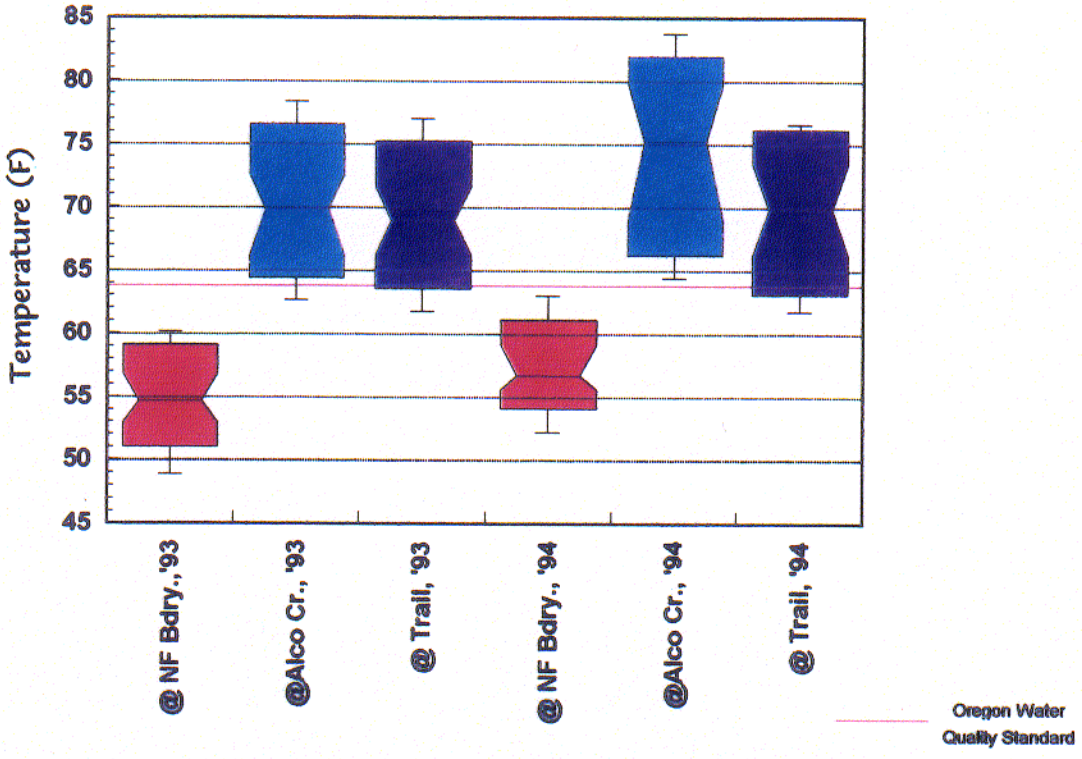
These streams are shown on Map 15. The final 303(d) listing includes total maximum daily loads (TMDL) for each pollutant that exceeds standards. For non-point sources of pollution, functional equivalents for the TMDL's will be established. A functional equivalent to the TMDL to bring about recovery could involve specific actions and timeliness for achieving water quality objectives. A likely functional equivalent for forest land in the Elk Creek Watershed would possibly be compliance with the Northwest Forest Plan or with the Oregon Forest Practices Act. Specific actions can be identified in the watershed analysis, in plans such as the Northwest Forest Plan, or in specific action plans.

Temperature is the parameter that most frequently fails to meet the state standards. Summer instream temperatures not exceeding a seven-day average maximum temperature of 64° F will be needed in order to bring temperatures back into compliance with the water quality standard. Temperature is one of the most sensitive parameters to management of the watershed. Removal of stream side vegetation during logging or agricultural operations exposes streams to the warming rays of the sun. Also, simplification of channels by filling in side channels, channel straightening, and irrigation withdrawals promote elevated stream temperatures.

The Northwest Forest Plan has designated all public lands adjacent to streams as Riparian Reserves. These reserves are to be managed to benefit aquatic resources and riparian values. On the public lands, there are approximately 24, 014 acres of Riparian Reserve. Of this, 40-50 percent have been altered by timber harvest, associated road construction, or other management activities. It is not known at this time what the specific effects of these activities on water quality have been.

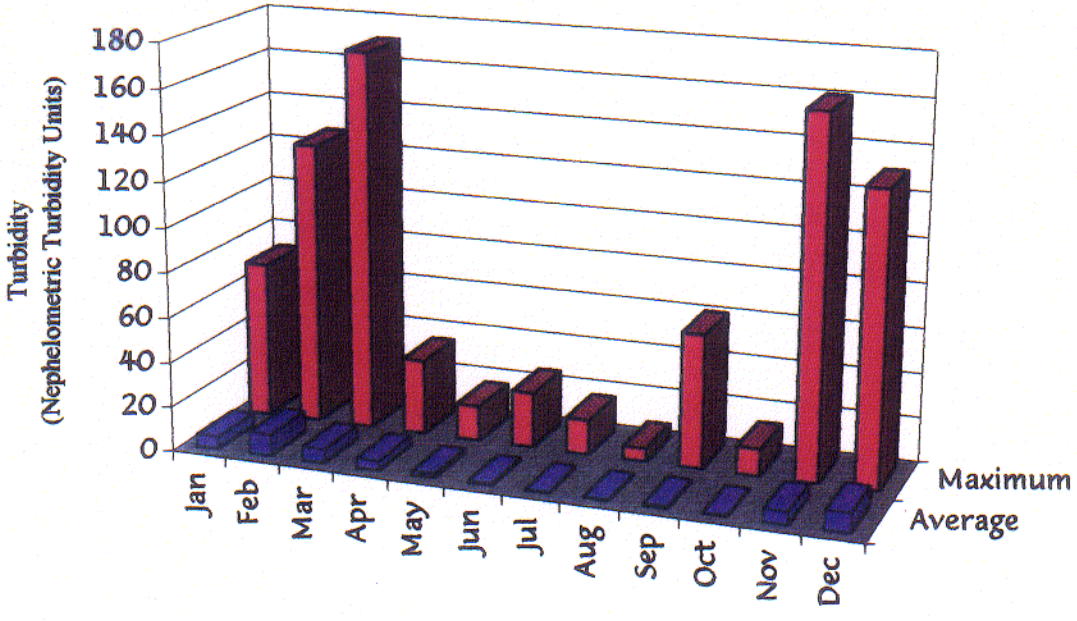
For the past several years, summer stream temperatures have been measured at ten stations in the Elk Creek Watershed. Figure 9. shows the summer temperatures at three stations on the main stem of Elk Creek for the 1993 and 1994 summers. The summer of 1993 was near normal in runoff and 1994 was a year of extreme low streamflow. Temperatures in 1994 are at or near record high levels reflecting the low water conditions. In each year, water leaving the National Forest was in compliance with the temperature standard throughout the summer. However, about ten miles downstream at the confluence with Alco Creek, the temperature rises to a point that it is rarely in compliance with the standard. This condition is also true at the mouth of the stream. Reasons for the increase in temperature are removal of stream side shade, modification of the channel, and irrigation withdrawals.

Figure 9. Maximum Temperature in Elk Creek.



While extensive logging, ranching and other land uses have affected stream temperatures, they have not had much effect on turbidity in the streams. The U.S. Geological Survey has been measuring turbidity at the Elk Creek near Trail gaging station for twenty years. During this period of time, there have been occasional peaks in turbidity to levels in excess of 150 turbidity units. However, the daily average by month is much less than these peak levels. Figure 10. shows the average daily and maximum turbidity measurements at the station near Trail.

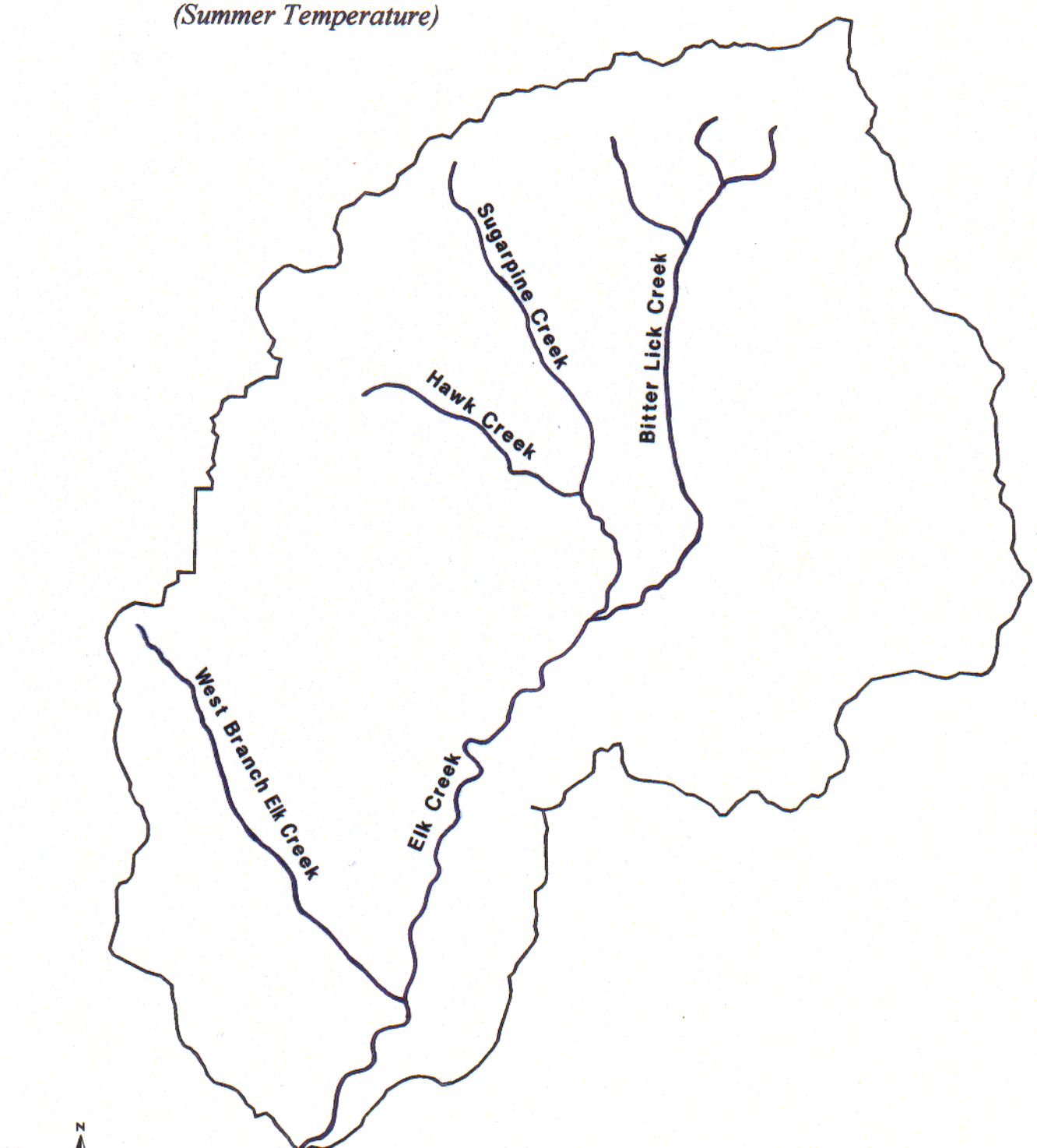
Figure 10. Turbidity in Elk Creek, near Trail.



Elk Creek Watershed

DEQ 303 (d) Listing: Water Quality Limited Streams

(Summer Temperature)



July 1996

G. VEGETATION

The Elk Creek Watershed contains a wide variety of plant communities, many with high species diversity, making it difficult to generalize the vegetation. Most of the southwest Oregon area has not reached climax status, as historically, disturbance has occurred frequently enough to maintain the vegetation in some stage of successional (changing) condition. Potential natural vegetation of the Elk Creek watershed is a reference point based on the late successional condition when the stands are considered to exhibit a high level of stability in both species composition and structure.

Map 16. is a vegetative condition map that displays the current condition of the Elk Creek watershed. The vegetative condition classes are listed in Table 4. and are derived from satellite imagery for all lands within the Elk Creek watershed. Imagery was determined to be the most cost effective way to obtain consistent vegetative data for the entire watershed, especially since over one-third is privately owned. Please see Appendix J for more information on the satellite imagery utilized for this Watershed Analysis. This imagery is useful for ecosystem analysis at the watershed scale and should not be used for specific project planning. In most cases, the Forest Service and the Bureau of Land Management have data on managed stands that is far more specific and accurate for project level planning and analysis.

Table 4. Vegetative Condition Classes for Elk Creek Watershed.

Vegetative Condition Class	Total Acres	% BLM	% FS	% PVT	% Other Agencies
Barren (non-forest)	902	8.1%	7.5%	74.6%	9.8%
Grass, forb (early successional)	1,384	20.0%	11.8%	66.6%	1.6%
Shrub (early successional)	5,394	28.4%	22.1%	48.8%	0.7%
Deciduous hardwoods (Oak woodland)	2,817	21.8%	9.1%	64.2%	4.9%
Evergreen hardwoods (Douglas-fir Series or early successional)	4,916	25.1%	11.1%	63.1%	0.6%
Conifer/hardwood (Douglas-fir or white fir Series)	24,885	25.9%	19.0%	54.0%	1.1%
Mixed conifer (Douglas-fir or white fir Series)	38,652	26.4%	42.6%	30.2%	0.8%
True fir (Shasta red fir or Mountain hemlock Series)	6,412	9.6%	80.4%	10.0%	0.0%

1. Series/Plant Associations

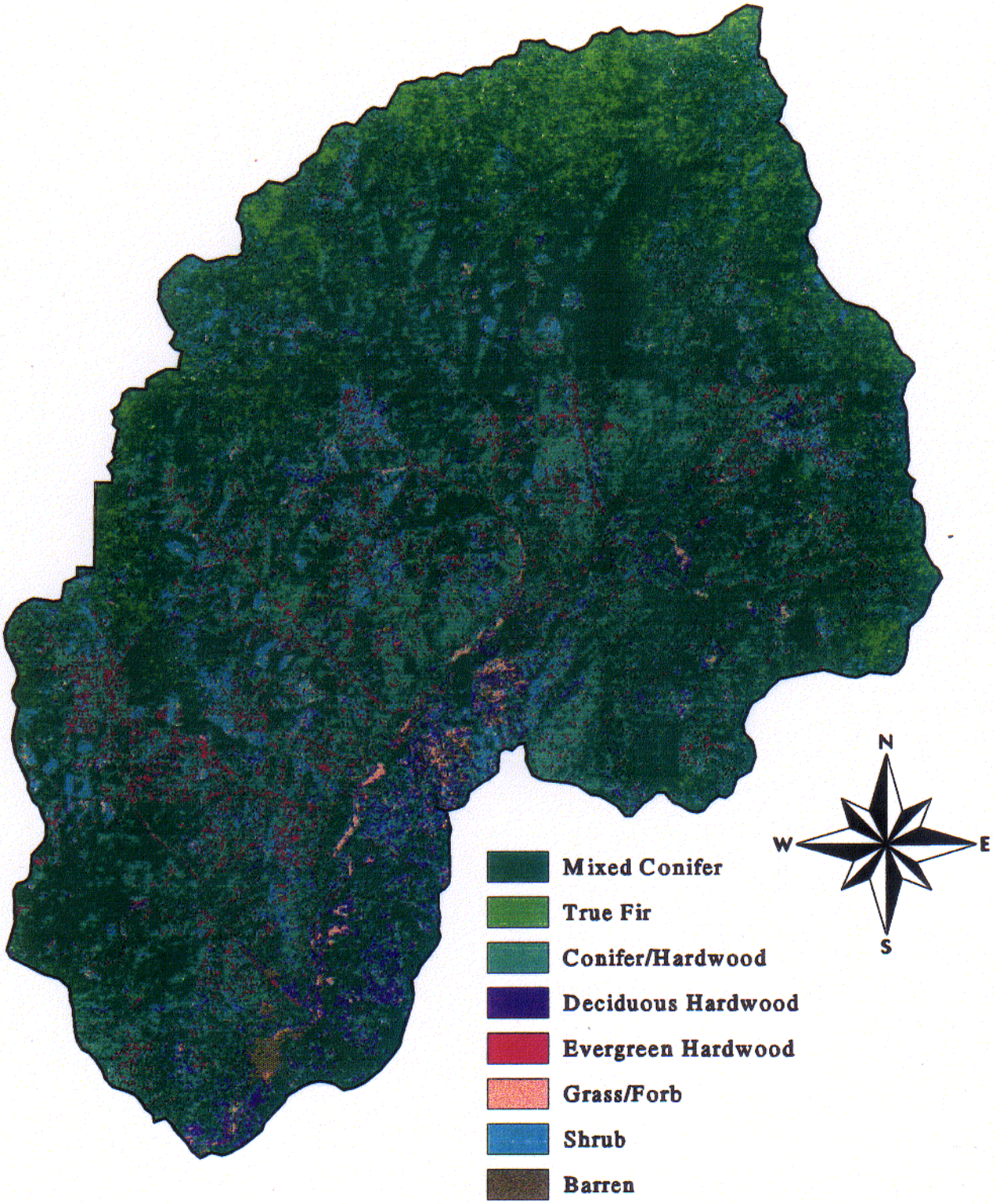
Plant Series is an aggregation of Plant Associations and is named for the climax or late successional dominant indicator plants. Series found in the Elk Creek watershed are influenced by precipitation, soil temperatures, soil depth, geology and soil type.

Six Plant Series have been identified in the Elk Creek watershed. The Series represented are: Shasta Red Fir, Mountain Hemlock, White Fir, Douglas-fir, and White Oak Series. Because differences are fine and definition was by elevation and aspect from satellite imagery, the Shasta Red Fir and Mountain Hemlock Series areas are mapped as True Fir High Elevation (See Map 17).

Due to the lack of detailed stand information across all acres of the watershed, only five Plant Series could be described by the satellite imagery used. The sixth Series, the Western Hemlock Series, is defined as riparian dependent at the lower and mid elevation range and, until field verified, will be assumed to be within many of the intact Riparian Reserves of the White Fir Series. See Appendix G for the formulas used to derive plant Series from the satellite imagery.

Elk Creek Watershed

Vegetative Condition Classes



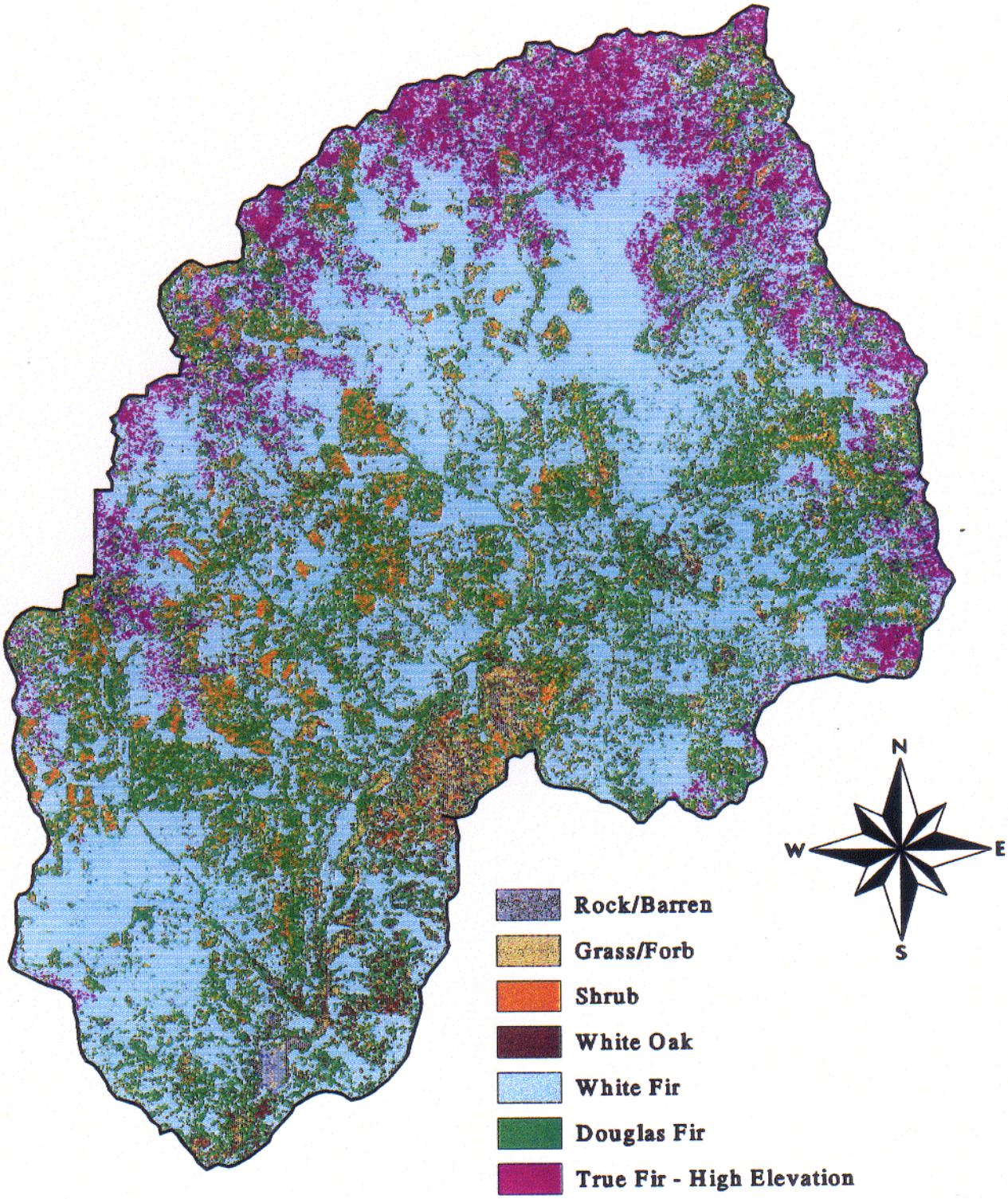
Source: Landsat TM satellite imagery from 1993

0 1 2 3 Miles

July 1996

Elk Creek Watershed

Plant Series



Source: Landsat TM satellite imagery taken 1993

0 1 2 3 Miles

July 1996

A summarization of the Series information is as follows:

a) True Fir High Elevation Series (ABMAS & TSME)

This area is a combination of the Shasta Red Fir (ABMAS) and the Mountain Hemlock (TSME) Series. The Shasta Red Fir Series typically occurs in cold sites with the vast majority of precipitation coming as snow. Shasta red fir has a low tolerance to drought. The Series occurs at the highest elevations within the watershed. Only the Mountain Hemlock Series will be found at higher elevations. The Mountain Hemlock Series is found in cold, moist environments found only in the highest elevations and head walls of the Elk Creek watershed. Advanced regeneration and natural regeneration will be the most reliable source of regeneration within five years in this Series.

Summary of characteristics:

- Long-stolen sedge can be a menace after soil disturbance and will often form a thick sod difficult to penetrate by any other plant species.
- Southern aspects in this Series will be very difficult to reforest, particularly on coarse textured soils due to the soil drying early in the growing season
- Forage for wildlife and livestock is low and availability is late in the season.
- Protection of advanced reproduction during harvest is essential.
- Fires are usually of low severity underburns with only rarely stand replacement fires occurring.
- Forage for wildlife and livestock is low and availability is late in the season.
- Reproduction with mechanical damage is very susceptible to rot.
- Reforestation of large openings will be difficult.
- Vegetation competition potential is high.
- Site preparation, particularly burning and machine methods, can seriously decrease site productivity.

b) White Fir Series (ABCO)

The White Fir Series is the most widespread, the most diverse, and one of the most productive. All of the watershed's major tree species are represented in the Series.

Summary of characteristics:

- Animal damage is the most serious threat to reproduction.
- Vegetation management is a major concern and vegetative competition should be kept in check where the desired condition for the area is conifer dominance.
- Stand density management is an important tool, especially in mixed species stands.
- Low intensity underburning is the natural condition in the drier, warmer end of the Series while a higher intensity, less frequent fire regime is common in the colder, wetter end of the Series.
- Wildlife habitat is very diverse by the mid-successional phase of stand development.

c) Douglas-fir Series (PSME)

The Douglas-fir Series occurs in the hottest, driest forest environments of the watershed. Soils tend to be shallower than with other Series. Much of the biomass production is in the shrub layer.

Summary of characteristics:

- Attention to vegetation management is necessary where timber volume production is the management objective.
- A moisture deficit can occur as early as late April.
- Frequent low intensity fire is responsible for eliminating large woody material on these sites, and decomposition rates are rapid where moisture levels are at least moderate.
- Fire has played a major role in shaping the composition and structure of most stands.

d) Western Hemlock Series (TSHE)

The Series can be found on a wide variety of mid-elevation sites but in the Elk Creek watershed the Series tends to occur in conjunction with riparian areas. Few vegetation concerns occur associated with this Series.

Summary of characteristics:

- If conifers are to dominate the site, site preparation will be necessary on most of these sites.

e) White Oak Series (QUGA)

This Series is found in association with shallow soils (9 inches average) over bedrock. The majority of these sites are not suitable for commercial timber production.

Summary of characteristics:

- Rainfall is lowest of any Series in the watershed; combined with shallow soils, the sites have significant water deficits early in the growing season.
- Tree growth is slow and conifers are scattered and rare in occurrence.
- Fire frequency is high with low intensity.
- Livestock and wildlife forage, herbage production is low and water sources usually are seeps occasionally found scattered on sites. Overgrazing indicated by the presence of hedgehog dogtail, a common grass.
- Shallow soils are sensitive to disturbance, erode easily and are damaged by activity when denuded, compacted, or displaced.
- Generally only ponderosa pine and white oak are tree species reaching maturity on these sites; understory will be dominated by white oak with scattered ponderosa pine, sugar pine or Douglas-fir.
- Plant Associations within these series give direction to resource manager actively seeking to promote ecosystem health and biodiversity. Information is needed about where natural processes of disturbance such as fire have been suppressed or eliminated by humans and where possibly conflicting needs are posed by animal habitat needs or human use demands. This information will give resource managers an understanding of the opportunities that exist to obtain late-successional vegetative conditions.

Plant associations for the Series are listed in Table 5. The complete association descriptions can be found in *Preliminary Plant Associations of the Southern Oregon Cascade Mountain Province* (Atzet and McCrimmon 1990). A summary of each association in this table can be found in Appendix G. Concerns and management direction and implications of each plant association are included.

Table 5. Plant Series and Associations in Elk Creek Watershed.

Shasta Red Fir Series **(ABMAS)**
Shasta red fir/thin-leaved huckleberry plant association

Mountain Hemlock Series **(TSME)**
mountain hemlock-Shasta red fir/thin-leaved huckleberry plant association

White Oak Series **(QUGA)**
Oregon white oak

Douglas-fir Series **(PSME)**
Douglas-fir/dwarf Oregongrape/swordfern plant association
Douglas-fir/salal/swordfern
Douglas-fir/poison oak/bracken fern
Douglas-fir/poison oak/Pacific hounds-tongue
Douglas-fir/Pacific rhododendron/twinflower (SW Oregon)

White Fir Series **(ABCO)**

white fir-Shasta red fir/prince's pine plant association
white fir/thin-leaved huckleberry/vanillaleaf plant association
white fir/California hazel-serviceberry plant association
white fir-incense cedar/dwarf Oregongrape plant association
white fir-western hemlock/vine maple plant association
white fir/vine maple/vanillaleaf plant association
white fir-Douglas-fir/tall Oregongrape plant association
white fir/dwarf Oregongrape-salal plant association
white fir-mountain hemlock/twinflower plant association
white fir/dwarf Oregongrape/threeleaf anemone plant association
white fir/western serviceberry/threeleaf anemone plant association
white fir/snow bramble/vanillaleaf plant association

Figure 11. Relative Potential for Vegetation Competition:

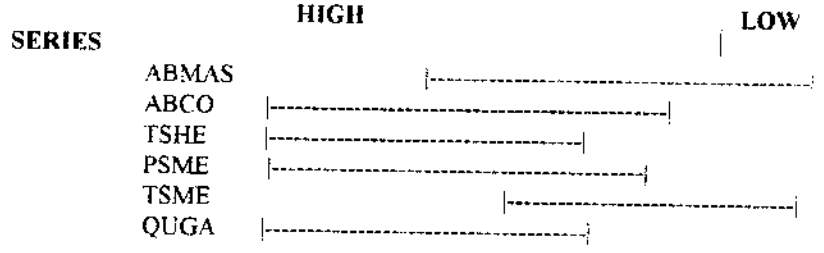
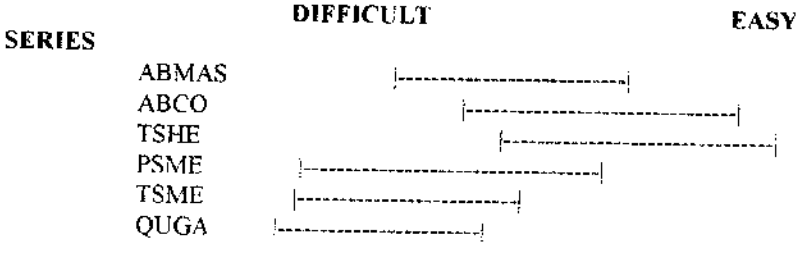


Figure 12. Relative Difficulty of Reforestation.



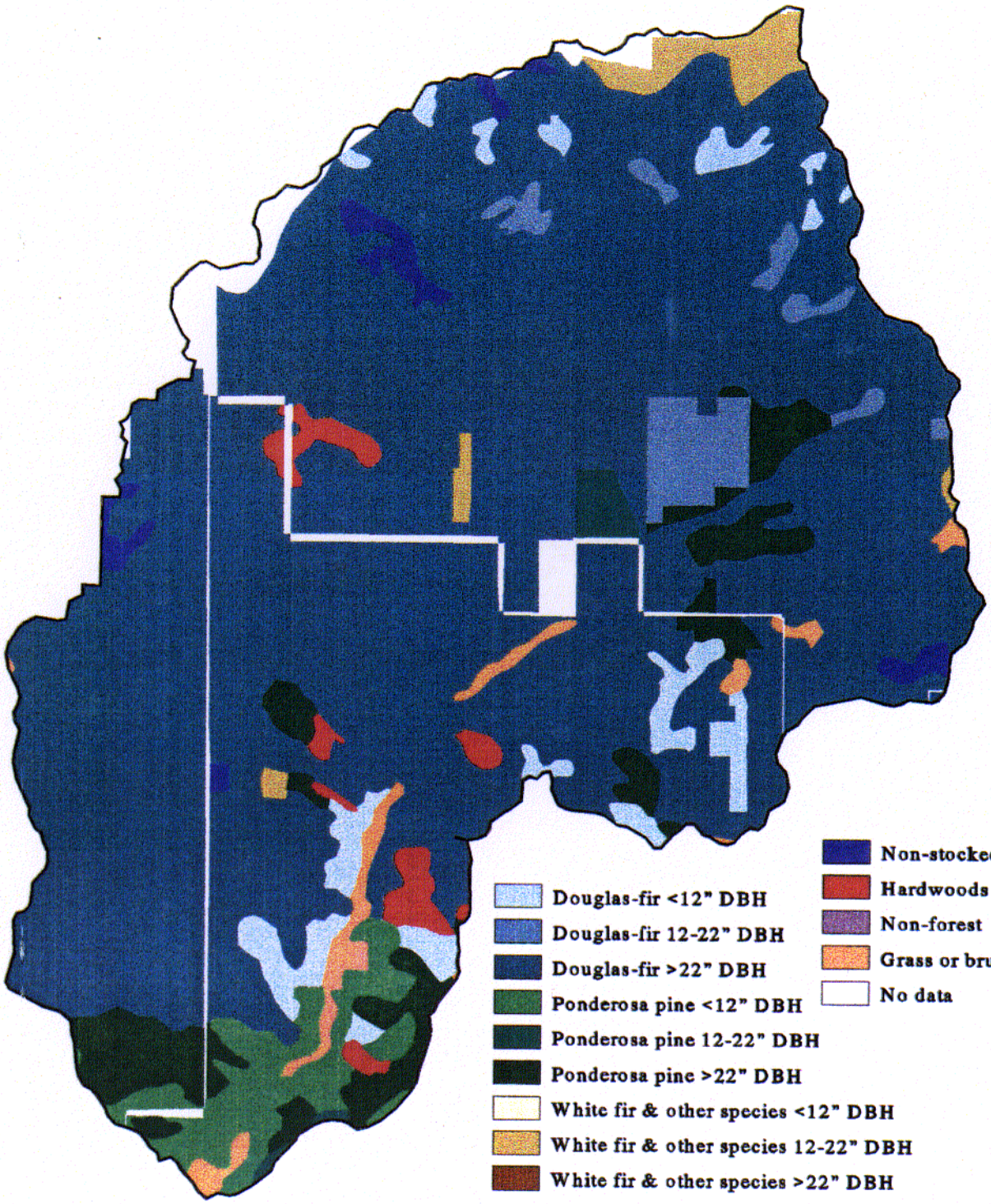
2. Landscape Patterns

Vegetation density (plants per acre) levels are generally much higher in the Elk Creek watershed now than in the past, especially in the conifer forests. Map 18. portrays the historical (1948-49) vegetation condition for the watershed as mapped by Jackson County for the purpose of a timber inventory. Map 18a. portrays the current vegetation condition, based on the 1993 satellite imagery. Vegetation types from both maps were similarly classified to display changes over this period of time. There are some data gaps within the historical vegetation map where no information is available.

Of particular interest is the acres that were dominated by large (22 inches dbh and greater) ponderosa pine stands. In 1948-49, 4,700 acres were contained in this vegetation type. As of 1993, there are no acres of this type remaining. In 1948-49, about 1,350 acres were characterized as being dominated by true firs. As of 1993, there were about 4,350 acres characterized as true fir dominated.

Elk Creek Watershed

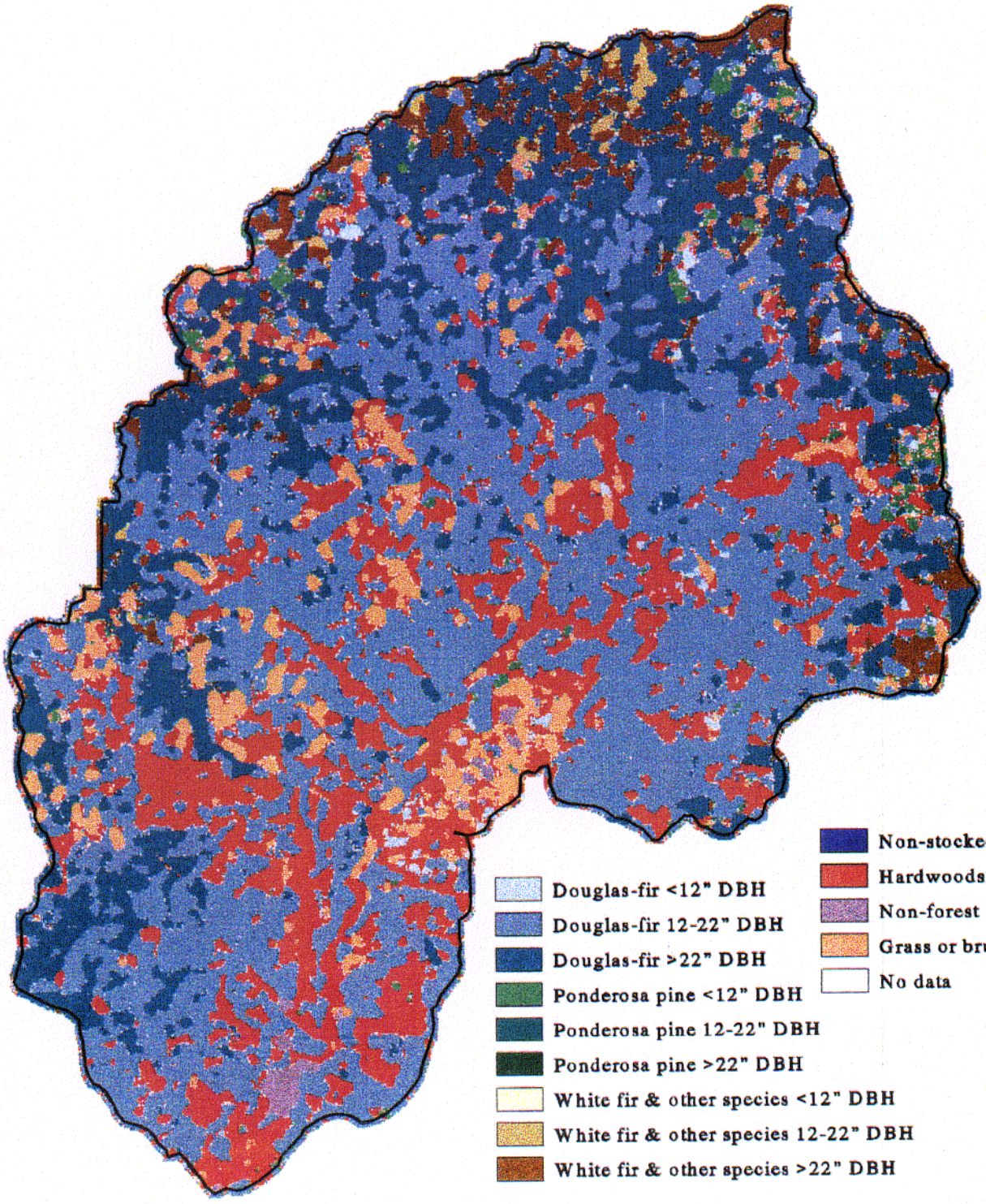
1948-49 Historical Vegetation Type Map



July 1996

Elk Creek Watershed

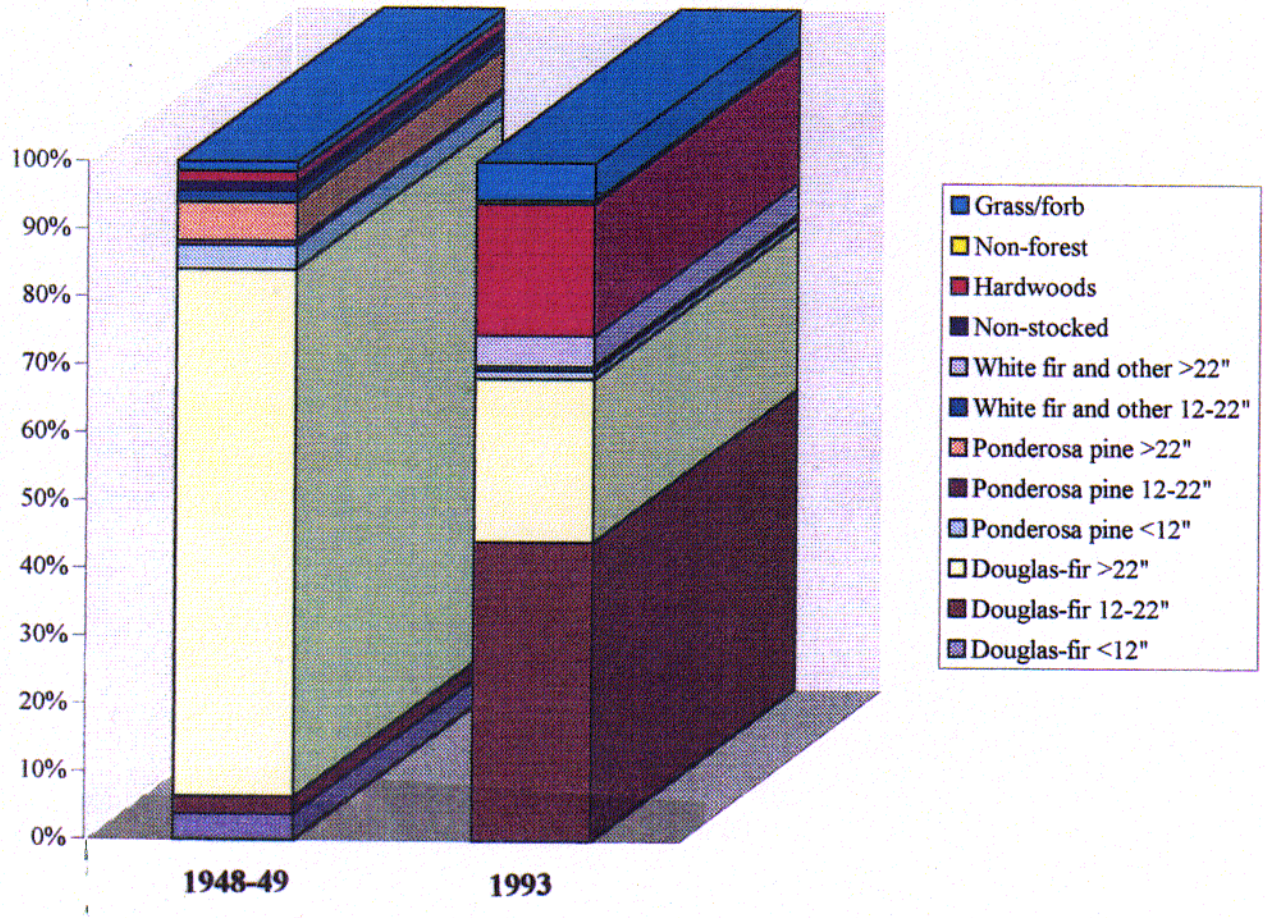
1993 Satellite Imagery Vegetation Type Map



July 1996

Due to fire exclusion, past selection harvest of dominant and large diameter early successional species such as ponderosa pine and sugar pine stands are converting to white fir, the climax species for the majority of the forested areas of this watershed. Douglas-fir is encroaching upon the oak woodlands and meadows at the lower elevations.

Figure 13. Comparison of Current and Historic Vegetation Types.

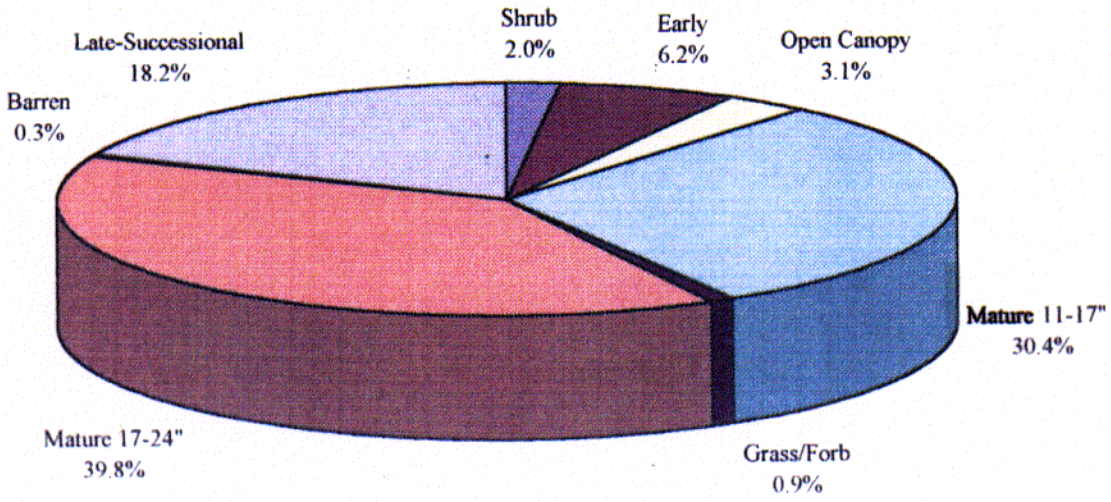


The Elk Creek watershed has a history of relatively high fire frequency. Both fire and drought resistance, or a species' capability to withstand either is important to maintaining a diversity in forest composition. On forested land ponderosa pine is the most resistant species to either fire events or periods of drought but are at the same time exhibiting the greatest sensitivity to fire suppression and stand density. As other species increase in the understory, ponderosa pine will have additional stress from vegetative competition and will reach a threshold of tolerance for resistance to drought much faster than in the past when fire events had been useful to clearing out growth of more shade tolerant trees around the pines.

Map 19. shows the pattern of successional stages for the Elk Creek Watershed, based on the 1993 satellite imagery. This classification approximates the methods and definitions used by the Northwest Forest Plan and the BLM and Forest Service Resource Management Plans. Table 6. displays the distribution of acres for the entire watershed.

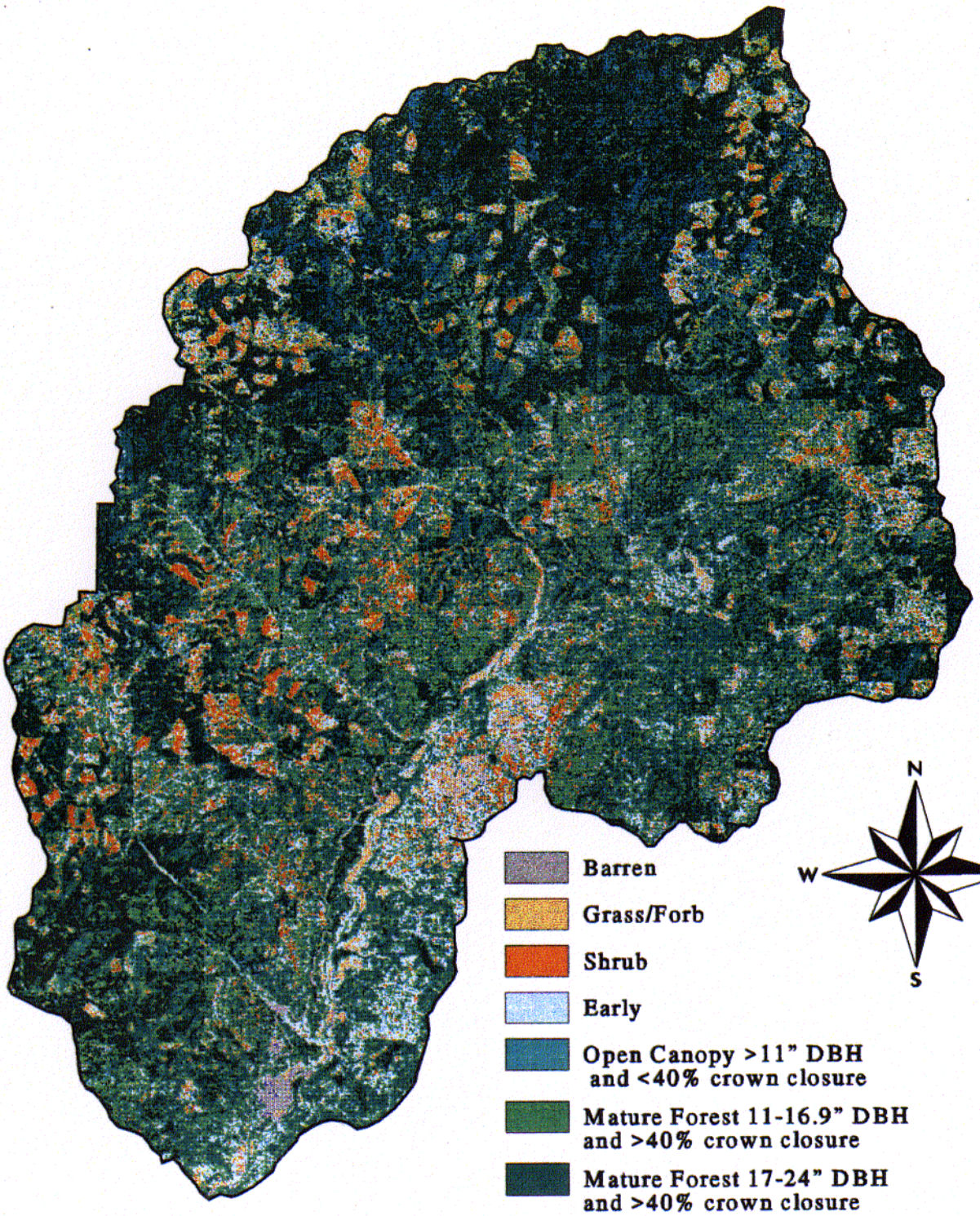
Table 6. Elk Creek Watershed by Successional Stages.

Successional Stage	Acres
Barren	297
Grass/Forb	740
Shrub	1,717
Early	5,305
Open Canopy (>11" Dbh,<40% crown closure)	2,628
Mature (11-17" Dbh, >40% crown closure)	25,992
Mature (17-24" Dbh, >40% crown closure)	33,125
Late- Successional (>24" Dbh, >40% crown closure)	15,558
	85,362



Elk Creek Watershed

Successional Stages



Source: Landsat TM satellite imagery taken 1993

July 1996

Table 7. displays the current vegetative condition classes that are located within riparian areas throughout the watershed.

Table 7. Vegetative Condition Classes Within Riparian Areas in the Elk Creek Watershed.

Vegetative Condition Class	Total Acres	Percent of Total Watershed	Acres within Riparian Area	Percent of Class Located within Riparian Area
Barren (non-forest)	902	1.1%	545	60%
Grass/Forb (early successional)	1,384	1.6%	953	69%
Shrub (early successional)	5,394	6.3%	3,473	64%
Deciduous Hardwood (oak woodlands)	2,817	3.3%	1,833	65%
Evergreen Hardwood (disturbed Douglas-fir series or early successional)	4,916	5.8%	3,343	68%
Conifer Hardwood (Douglas-fir and white fir series)	24,885	29.2%	14,339	58%
Mixed Conifer (white fir series)	38,652	45.3%	23,460	61%
True Fir (shasta red fir and mountain hemlock series)	6,412	7.4%	4,029	63%
Watershed Totals	**85,362**	**100**	**51,975**	**61%**

3. Disturbance Process

Fire is an important agent of disturbance. Forest fires have played a major role in creating the present-day landscape pattern by influencing species composition (favoring shade intolerant species such as sugar and ponderosa pines as well as Douglas-fir and, in the lower elevations, oak woodlands) and soil site productivity. See Map 20. for a display of known large fire occurrences.

Most plant species of the watershed have adaptations to cope with periodic wildfires. Pacific madrone sprouts vigorously from root crowns or the base of the trunk, even after being severely burned. Many hardwood seedlings or saplings develop root burls so they can sprout after fires. Other species develop thick bark to insulate against heat injury, such as ponderosa pine, sugar pine and mature Douglas-fir and Shasta red fir.

Windstorms and near ridge wind flows play a major role in shaping the Elk Creek landscape. High winds can uproot trees, snap tree branches, or break out main stems. Trees recruited for snags are susceptible to windthrow especially where located close to ridges or following hot site preparation fires which tend to weaken the trees in the bottom log of the tree where heat has damaged the wood.

Thinned forest stands are especially susceptible to wind damage because residual trees are no longer protected and supported by surrounding trees. But wind can act as a beneficial site disturbance by creating canopy gaps allowing a chance for shade-intolerant species to maintain or reestablish themselves in the forest stand composition. Root wads from uprooted trees provide shelter to forest animals. The overturned trees create a hummock on the forest floor and provide an opportunity for wind dispersed seeds to germinate on the disturbed soil.

The risk of beetle infestation is high (D. Goheen 1995), especially in stands with a southeast, or west aspect below elevations of 3,500 feet. Stocking level density of stands should be managed to reduce the potential for extreme levels of mortality and minimize tree mortality from increased insect populations in drought-stressed conifers. Without management for density control (possible through the use of many silvicultural tools, chief of which are thinning and the reintroduction of fire), the future of ponderosa and sugar pine is poor.

4. Plant Communities of Special Importance

Natural plant communities in this watershed continue to be threatened by harvest activities, conversion of riparian and valley bottoms to farmland, ranches, homesite and roading. Additional factors that have threatened natural plant communities include mining, water diversions, irrigation, logging, fire suppression, and the introduction of non-native plant species. Natural plant communities affected include oak woodlands, pine and oak savannas, and conifer forests. Past management practices in the upper portions of the watershed, particularly in the headwaters of Elk Creek, have disturbed groundwater flow patterns by compaction and soil displacement. This disturbance has modified certain sites and allowed incense cedar, a naturally occurring but relatively small component of the stand historically, to be favored on these sites. This is due to incense cedar's ability to adapt to a condition of very wet spring months and very dry summers, better than Shasta red fir, which incense cedar has replaced on these severely disturbed sites. Further activities that interrupt the flow of subsurface water could repeat these conditions. Restoration of these sites by mechanical means is impractical with natural healing and succession being the best treatment.

Low to middle elevation sites once dominated by oaks or ponderosa pine with mainly grasslands underneath, are threatened by invasion and dominance of non-native plant species. Factors contributing to this invasion are homesteading, dam construction, logging, road construction, recreation, livestock grazing, purposeful or unintentional introduction of non-native species, and the ability of these non-native species to spread aggressively after ground disturbance, especially where fire has not kept them in check. Reintroduction of fire in the watershed, particularly in the areas once dominated by oaks or ponderosa pine, may assist in maintaining these plant communities in the watershed, prevent the spread of non-native species, and reduce the densities and encroachment of white fir.

Wet area near Forest Road 6620 in the Sugarpine Creek subwatershed.

5. Plant Species of Concern

The list below displays the rare vascular plant species that are known to occur in the Elk Creek watershed. This listing includes Forest Service sensitive species, selected plants from Oregon Natural Heritage lists and plant species that are locally rare (may be more common elsewhere), but are important for their contribution to local biodiversity.

Table 8. Rare Plant Species of Concern - Elk Creek Watershed.

Scientific Name	Common Name
Cimicifuga elata *	tall bugbane
Cypripedium fasciculatum	clustered ladyslipper
Cypripedium montanum	mountain ladyslipper
Frasera umpquaensis (Swertia fastigiata)	green flowered gentian
Iliamna latibracteata	California globe mallow
Lewisia cotyledon var. cotyledon	lewisia
Mimulus pulsiferae	Pulsifer's monkey flower
Perideridia howellii	Howell's false-caraway
Rosa spithamea var. spithamea	ground rose
Sedum radiatum ssp. depauperatum	depauperatum stonecrop
Romanzoffia thompsonii	Thompson's romanzoffia

*high probability to exist in watershed area since it occurs along the Rogue Umpqua Divide. This has only recently been added to the list of plants probable to be located on the district. An adequate search has not been done in the area to ensure the presence or absence of the species.

a) Habitat

Many of the rare plant populations in the Elk Creek Watershed are rare for a number of reasons. Habitats are often unique, such as rock outcrops, scablands, wetlands, seeps, or moist meadows. Some species are found in forest openings or under dense forest canopy. Populations can be broadly distributed or clumped by many individuals, or can contain few individuals that are narrowly distributed. Without human intervention, many of these populations would be naturally rare due to evolutionary development. Neoendemic (new) species are those species that are genetically new and have not had time to expand to reach their full range of potential. Paleoendemic (old) species have reached their full range of potential and are on their way out or are retreating due to biological or climatic reasons.

Past habitat modification throughout the Elk Creek watershed may have contributed to the decrease or to the decline of certain species through changes in the habitat such as soil, moisture, light, vegetative competition, or changes in the plant communities successional stage.

b) ROD (Northwest Forest Plan) Survey and Manage Species

Vascular plants: There are two species of orchids that are present in the watershed; *Cypripedium fasciculatum* and *Cypripedium montatum*. These orchids are at high risk of extirpation primarily because of low population numbers, and response to habitat modification.

Allotropa virgata has not been located in the watershed but is most likely present. This plant is a vascular plant without chlorophyll, thus relying on mycorrhizal fungi for nutrition. Not enough is known about the distribution, abundance, and habitat requirements or this species to predict the risks to its viability in the watershed. This species is known to exist on the Prospect Ranger District along the Rogue River.

Bryophytes, lichens, and fungi: There are no known sites of Survey and Manage bryophytes, lichens, and fungi within the watershed although some are undoubtedly present It is reasonable to assume that special protection measures or management may be needed in the future to maintain the viability of some of the species within the watershed.

c) Non-Native Plant Species and Noxious Weeds

There have not been any official noxious weed surveys in the Elk Creek Watershed. A range analysis contract is awarded and will be completed in 1996. Information from this analysis will include noxious weeds. The most probable species are:

Tansy ragwort *(Senecio jacobaea)*	Contains several alkaloids which can cause irreversible liver damage. It can be toxic to cattle and horses.
Spotted knapweed (Centaurea maculosa)	Knapweeds readily establish themselves in disturbed soils. Their growth makes them competitive for soil moisture and nutrients.
Klamath weed (Hypericum perforatum)	This species rarely kills animals but causes white haired animals to loose weight and develop skin irritation when exposed to strong sunlight.
Sweet clover *(Mililotus officinales)*	Contains coumarin, an anticoagulant of the blood, often causing bloating in cattle.
Purple loosestrife *(Lythrum salicaria)*	This introduced species can take over streambanks or or shallow ponds. Infestations can become dense and impede water flow in canals and ditches.
Yellow starthistle *(Centaurea solstitialis)*	A winter annual or occasionally a biennial. Grows 1-6 feet in height, has a deep taproot and is poisonous to horses.

These are only a few of the more invasive species that can cause harm to native species and natural plant succession, aquatic systems, or cattle/horses.

Most of the natural meadow systems no longer support the species composition or structure that they had prior to human settlement, logging and grazing. They are dominated by "increaser" species (those that are unpalatable or otherwise do well under grazing pressure).

The non-native plant species can potentially displace native and rare plant species, alter the native animal habitat, and affect ecological processes in native plant and animal communities. Humans have introduced several species such as colonial bentgrass , medusa-head grass and Kentucky bluegrass. Intensive grazing habitat modifications have played a role in the increase of these invasive plant species.

In order to return the forest and meadows to a more natural and healthy form, grazing should be at a level that will help improve meadows, not just maintain current conditions. Allotment management should review noxious weed surveys and eradicate noxious and invasive invader species, and use native grass and plant stock whenever possible. Other uses within the Elk Creek Watershed should also be modified to reduce the spread of weeds. Logging equipment and off-road vehicles should be free of weeds, recreationists should be aware of weed problems and any ground disturbing activities should be carefully administered.

H. FIRE

Fire and fuels management are important components of all ecosystem analysis efforts in Southwest Oregon. Fire and fire suppression policies have had a major impact on shaping the current vegetation and associated species. Historically, fire has been one of the primary disturbance factors in this region. The role fire plays in developing and maintaining these ecosystems must be analyzed over extended periods of time, as goals and projects are developed. Desired future conditions that increase the probability of high intensity, stand replacement type fires need to be examined and the risk to resources weighed very carefully before implementation. It is important to remember that fire is a natural process that is neither good nor bad. Fire effects are perceived by their relationship to management goals on a site specific basis.

1. Fire Behavior and Potential

There are three major factors that influence fire behavior and potential: 1) Vegetation, 2) Topography, and 3) Climate. A brief discussion of all three follows.

Elk Creek is somewhat different in that it is a transition zone between interior valleys (lower elevations) and the western cascade types (higher elevations). The interior valley portions are characterized by the more flammable schlerophyll brush species such as madrones, manzanitas, and the drier ceanothus species. Conifer species tend toward fire resistant species such as ponderosa pine and Douglas-fir. On these sites the primary plant association series is Douglas-fir. The brush species also appear as larger patches on south slopes throughout the area. On north slopes and at the highest elevations the brush species shift to higher moisture regime plants such as dogwood, vine maple, and hazel. Douglas-fir and white fir are the dominate conifer species. The plant association series for these species is white fir; this series makes up the majority of the watershed. Minor series associated with the site are hemlock and Shasta red fir series. The latter two are found in small portions in the upper sections and are determined by aspect. The plant series determines the average fire return interval with the drier series having a shorter return interval. These species also have a much different effect on fire behavior than the interior valley types.

Topography plays a major role in fire behavior. The various drainages in the watershed are very steep with narrow bottoms and steep sidewalls. This type of topography is very conducive to large fires. The larger roadless areas in the upper reaches of the watershed (primarily on National Forest) also provide fire suppression challenges. These challenges are increased response time for initial attack, rugged terrain which minimizes options for suppression methods, and lack of access points for safe holding and fire line location points.

The climate and summertime weather pattern is dominated by the Pacific high pressure. The Pacific high moves from its southern winter time position and migrates into the northern Pacific during the summer months. This high pressure then forces storms and associated moisture north of the watershed. Annual precipitation ranges from 35-60 inches. Precipitation is rare in summer months with the majority occurring from October to late May - early June. It is not unusual to have periods of up to 90 days with no precipitation occurring in the summer. When precipitation does occur, it is often in the form of thunderstorms. These storms are triggered as warm tropical (moisture laden) air from the southern Pacific clashes with the colder northern dry Pacific flows, the amount of moisture associated with these events is often variable. These storms often pose ignition threats from the associated lightning. These storms pose a threat because of the high number of potential fire starts during any given event and their potential to exceed capabilities of initial attack forces, such as occurred during the fire events of 1987. In addition lightning fires often occur in remote areas often delaying initial attack. Because of this watersheds location, storms often occur to the south and western portion of the watershed first. This means that other agencies are committing available suppression resources prior to the storm event occurring in this area, leaving a potential shortage of initial attack resources.

Temperatures range from an average high of 75 degrees in June to 85 degrees in August. It is not uncommon for daily high temperatures to reach from the mid-90's to 100 + degrees. A potential for large stand replacement type fires exists during these extended periods of high temperatures and low humidities. At the head of the watershed, humidities and temperatures are often moderated by the Rogue-Umpqua Divide. Storms moving in from the north often just spill over the top of the divide, raising humidities and lowering temperatures. This also has an interesting effect farther into the drainage - as the colder moves over the divide it cools the surrounding area. However, as the cold air rides over the top of the warmer air, it compresses the airmass. As this airmass moves into the valley, there is actually a small drop in humidity from the compression action of the air movement in addition to the cooling effect. This means fire behavior may not be moderated as much as one would expect from the cooler air.

2. Historical Perspective

This area has had an active fire history. Charred stumps, logs and snag remnants are evident from the lower elevations all the way to the Rogue-Umpqua Divide. Fire history surveys and field validation were not accomplished for this analysis; the fire return intervals are estimated using a literature search and personnel observations. These fires would typically burn with a low to moderate intensity. Douglas-fir is the primary series in this watershed. In the Douglas-fir series the average return interval is in the 18-25 year range. The white fir series has a return interval of 35-40 years and burns at mid-range intensities. The Shasta red fir series has a return interval of 40 - 50 years and burns with moderate severity. The hemlock series burns at about 75 - 100 years; because of the longer time frames between fires, this series burns at the highest severity. It is important to remember that these severity levels are based on uninterrupted or unaltered fire frequencies. These stands do not fall into the realm of natural frequencies because of human fire suppression efforts. Interruption of the fire cycle has created an increasing potential for wildfires to burn with much greater severity today than in the past.

The most recent large fire (Burnt Peak) occurred in 1987; burning more than 3700 acres. Prior to that the watershed experienced one fire in 1971, and one fire in 1972, each which burned over 300 acres. In 1910 there was a 10,000+ acre fire which burned adjacent to and within the confines of the watershed. Also in 1910 a second fire of 5000+ acres burned entirely within the watershed. Map 20. portrays the Historical Large Fires and Map 21. shows overall fire occurrence in this watershed.

Lightning has historically been a primary ignition source. Although it is assumed that anthropogenic burning was an important ignition source, we have no way to quantify this source of fires. By examining lightning occurrence maps for the last 10 years it is evident that lightning has the potential to provide starts throughout the watershed at all elevations. Low to moderate intensity fires are significant. The large scale events are more dramatic; however, it is the smaller scale events that truly shape vegetation and fuel profiles. These fires provide the minor reductions in fuel profiles that reduce the potential for large scale catastrophic events. It is important to recognize that fires of all intensities often burn in mosaic patterns, with various intensity levels and associated effects.

3. Current Conditions

A significantly different set of vegetative conditions exists today from those of the past; these changed conditions also result in a changed fire regime. In the past fire was described as:

-Frequent,
-Low intensity,
-Primary fuel being the litter layer at ground level, and
-Fires often spread over periods of weeks or months.

Fire behavior has been altered by increased fuel buildup resulting primarily from fire suppression.

Current fires can best be described as:

-Infrequent,
-Insignificant or extreme during severe burning conditions,
-Primary fuel is dense vegetation often resulting in crown type fires, and
-Often have extended duration and are not easily extinguished.

As vegetation (biomass) increases on the site it is safe to assume that the potential for stand replacement type fires is also increasing. The multi-layered canopies that now exists in some stands may eventually provide the greatest potential for these high intensity fires. As the potential for crown fire increases, more radical fire behavior can be expected, such as increased spotting from prolific firebrand production. This makes control efforts difficult and expensive. These types of fires also present extreme safety hazards to suppression crews

4. Fuel models

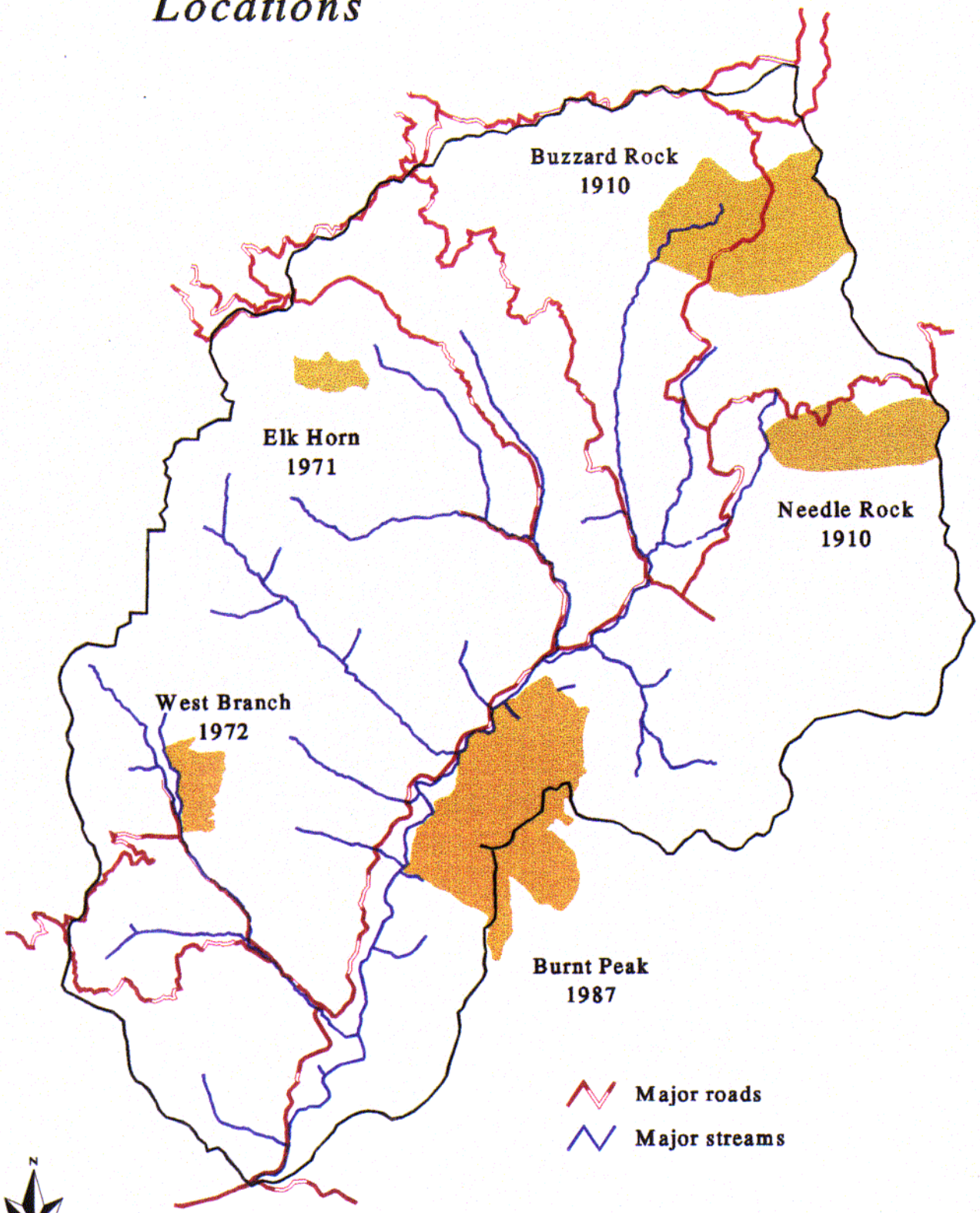
Different successional stages and vegetation types equate to different fuel models. These fuel models are used to assess fire behavior once a fire occurs. Detailed information on the fuel models and their description can be found in publication*GTR-INT-122 Aids to Determining Fuel Models For Estimating Fire Behavior.*

Fire has different effects and consequences on the different seral stages. The earlier stages are more susceptible to fire. These stands are often at risk because of the fuel types that they represent.

MAP 20

Elk Creek Watershed

Historic Large-Fire Locations

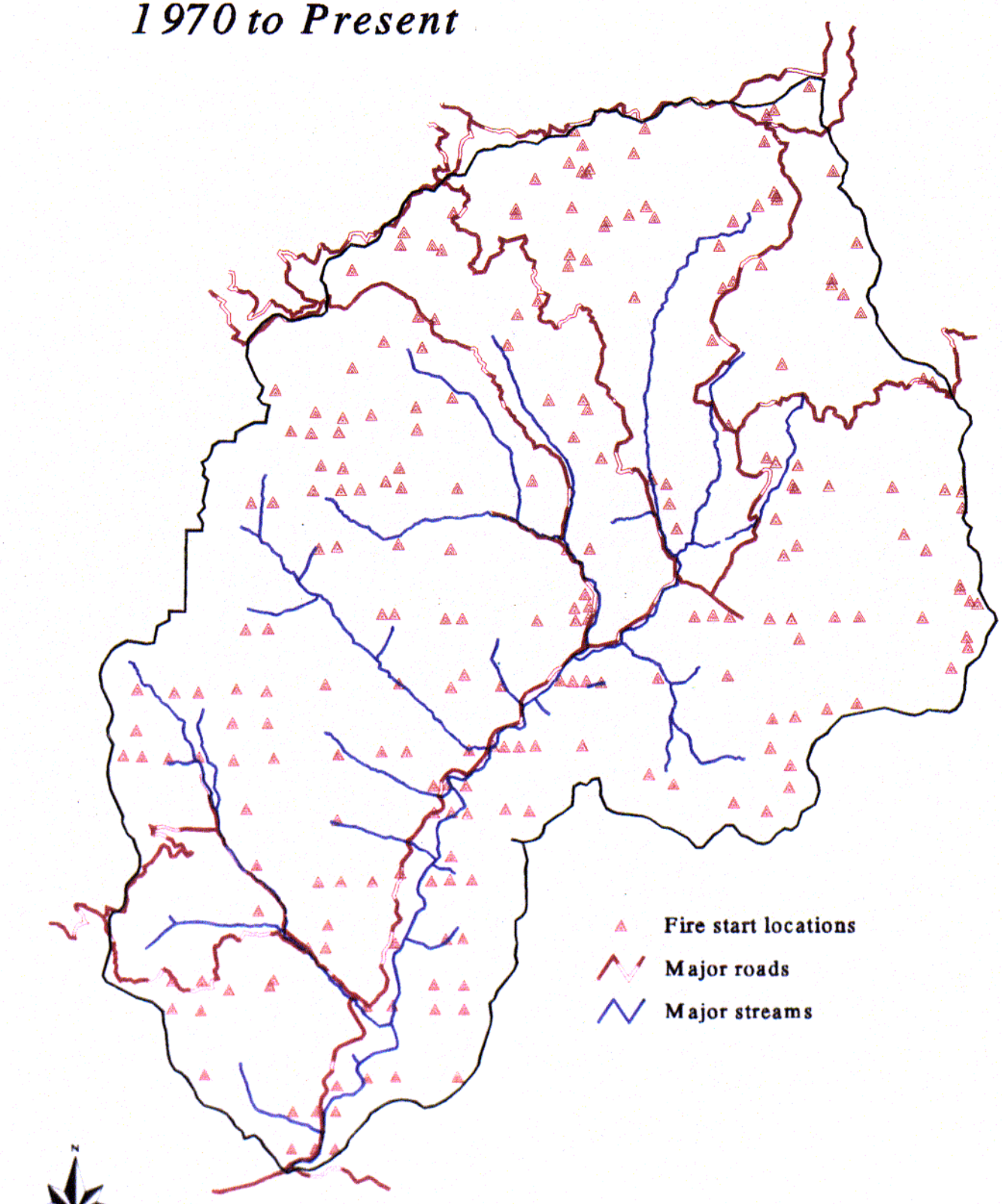


July 1996

MAP 21

Elk Creek Watershed

Fire Occurrence 1970 to Present



July 1996

Information on fuel models is presented in this Chapter as a component of the Core Topics and current condition, and as a basis for the Issues and Key Questions that are discussed in Chapter III. The questions in Chapter III are related to fire risk and the effect and feasibility of reintroducing fire into this ecosystem.

a) Associated Fuel Models - Managed Stands

Plantations where conifers have not assumed dominance will fall into one of two fuel models, with the most likely being a fuel model 5. In this fuel model, young brush and the associated litter layer and grasses are the primary carriers of fire. At worst case, flame lengths of 4 feet could be expected from a wild fire occurring in this fuel type.

Closed canopy conifer plantations rate as a fuel model 6. Fires carry through the shrub layer, the foliage is more flammable than a fuel model 5. This model requires a moderate wind to maintain fire in the canopy. Flame lengths would be in the 6-foot range. Under drought conditions conifer stands with a closed canopy could conceivably rate closer to a fuel model 4. A fuel model 4 is the most flammable of the brush series, with fire burning primarily in the canopy. Under drought conditions flame lengths could approach 19 feet in length.

Precommercially thinned stands rate as one of two models, depending on the age and stand diameter when thinned. Stands thinned at less than 3 inches in diameter will likely rate as a fuel model 11. This model will have loadings of less than 11.5 tons per acre in the 3-inch size class. This model is not likely to experience erratic fire behavior during a wildfire event nor is any long term site damage probable. Flame lengths will be in the 4-foot range. Fires will have high rates of spread.

Stands that are thinned at a later age and have fuel loadings in excess of 11.5 tons per acre in 3 inch and larger fuels will likely rate as a fuel model 12. This model will experience erratic fire behavior and flame lengths in the 8-foot range as well as high rates of spread. Because of the heavier loadings in the larger size class the potential exists for long term site damage. The heavier fuels take longer to burn out; this in turn will cause greater soil heating and subsequent damage to the soil.

b) Natural stands

Older brush fields with a high ratio of dead to live or a high percentage of schlerophyll species rate as a fuel model 6. Fires carry through the shrub layer; foliage is more flammable than a fuel model 5. This model requires a moderate wind to maintain fire in the canopy. Flame lengths will be in the 6-foot range.

Closed canopy timber stands will primarily fall into one of two fuel models. Smaller diameter stands will likely fall into a fuel model 8. In this model, fire moves through the litter layer. There is little material that is three inches in diameter or larger. Only under extremely severe burning conditions does this model pose a fire hazard. Flame length will generally be 1 foot in length or less. The second model is a fuel model 10. This model is representative of larger diameter timber stands. Fuel model 10 has higher fuel loadings in the larger material. The three inch and larger material will exceed 12 tons per acre. This model is indicative of some stands that may have insect or disease problems; and/or **stands that suffered windthrow and storm damage such as that occurring in the winter of 1996.** In this model, occasional trees may torch. Spotting may pose control problems. This model can also sustain crown fires through reproduction pockets. Flame lengths may exceed 4.8 feet.

Cool air mass moving into the Elk Creek Watershed over the Rogue-Umpqua Divide

I. AQUATIC SPECIES AND HABITAT

1. Fisheries

A variety of anadromous, and resident fish occur within the Elk Creek watershed. Anadromous salmonid fish species that use Elk Creek and its tributaries for spawning and/or rearing are fall and spring chinook salmon, coho salmon, winter and summer steelhead trout:

Common Name	Scientific Name
Chinook salmon	*Oncorhybchus tshawytscha*
Coho salmon	*Oncorhybchus kisutch*
Steelhead trout	*Oncorhybchus mykiss*
Cutthroat trout	*Oncorhybchus clarki*
Pacific lamprey	*Lampertra tridentata*
Umpqua squawfish*	*Ptychocheilus umpquae*
Klamath smallscale sucker	*Catostomus rimiculus*
Reticulate sculpin	*Cottus perplexus*
Redshine shiner	*Richardsonius balteatus*
Speckled dace*	*Rhinicthys osculus*

* This species has not been documented in this watershed, but has been introduced into the Rogue River system. If found, this would be an extension of the range of this species.

a) Spring Chinook Salmon

Adult spring chinook salmon enter the Rogue River from March through June. These fish typically are bound for the upper Rogue River and its tributaries and hold in areas between Gold Ray Dam - River Mile (RM) 126 and Cole Rivers Hatchery (RM 157). Spawning takes place from September through mid-November (ODFW 1994). It has been estimated that <50 spring chinook salmon spawn in the Elk Creek watershed each year (ODFW unofficial 1994). The Oregon Department of Fish and Wildlife's 1993-1995 trap and transport data shows that an average of 25 chinook returned to Elk Creek during those years, with approximately 12% of the population composed of hatchery fish. No distinction was made between spring and fall chinook.

Eggs incubate in the gravel through the winter and juveniles emerge from January through May with the majority of fry emerging from mid-April through mid-May. Juvenile spring chinook rear in the mainstem Rogue River, migrate downstream and enter the ocean in August and September. Once in the ocean, the smolts head south to rear off the Northern California/ Southern Oregon coast (National Marine Fisheries Service - NMFS 1994), and return to spawn in 2 to 6 years with the average age of most returning adults being 4 years (ODFW 1994).

b) Fall Chinook Salmon

Fall chinook salmon enter the Rogue River from July through October, with the run peaking from mid-August through mid-September. Spawning takes place from October through late January, and peaks in the mainstem Rogue River in November. Approximately 10% of the population spawns above Gold Ray Dam, with spawning densities highest in the Middle Rogue River (ODFW 1994). It is estimated that <200 fall chinook spawn in the Elk Creek watershed each year (ODFW 1994).

Eggs incubate in the gravel from mid-October through mid-March. Fry emerge from the gravel and rear for about 4 months in fresh water, then migrate downstream to the ocean between mid-August through mid-September. Most Rogue River fall chinook migrate south and rear off the Northern California/ Southern Oregon coast (NMFS 1994) for 2 to 6 years before returning to spawn with the majority of fish returning to spawn after 4 years (ODFW 1994).

c) Coho Salmon

Adult coho enter the Rogue River beginning in September and move upstream to hold in the mainstem until winter rains allow them to move into tributaries to spawn in December and January (ODFW 1994). During large run years, spawning may commue into March. Coho above Gold Ray Dam are almost entirely hatchery stock except for remnant runs in Big Butte, Little Butte and Elk Creeks (BLM and USFS 1992). It has been estimated that up to 1,560 coho

return to spawn in the Elk Creek watershed (US Army Corp of Engineers - USACE 1980). The Oregon Department of Fish and Wildlife's 1993-1995 trap and transport data shows that an average of 187 coho returned to Elk Creek during these years, with approximately 15% of the population composed of hatchery fish.

Fry emerge during April and most rear for one year in fresh water, with a small percentage rearing for two years in fresh water (ODFW 1994). Young coho over-winter in large, deep pools with complex woody cover, backwaters, alcoves, and side channels, during high winter flow months. Juveniles headed for the sea generally migrate to the lower river from mid-May through July. Most Rogue River coho salmon migrate south and rear off the Northern California/ Southern Oregon coast (NMFS 1994) for two years before returning to spawn.

d) Summer Steelhead Trout

Summer steelhead enter the Rogue River from May through October with the early portion of the run making up the smallest portion. The early portion of the run also tend to spawn the highest in the system (ODFW 1994). Steelhead spawn primarily in tributary streams like Elk Creek and its tributaries, although they may use the mainstem Rogue River when access to their natal tributary is blocked by a barrier or low winter flow levels. It has been estimated that approximately 1,000 summer steelhead spawned in the Elk Creek watershed (USACE 1980). The Oregon Department of Fish and Wildlife's 1993-1995 trap and transport data shows that an average of 166 steelhead returned to Elk Creek during those years, with approximately 3% of the population composed of hatchery fish. No distinction was made between summer and winter steelhead.

Spawning takes place from December through March with the peak occurring in mid-January. Cross spawning may take place between summer and winter steelhead in the Rogue River due to the overlap of spawning time and area. Summer steelhead like winter steelhead are capable of multiple spawning during their lifetime, however, mortality is high, and usually 90% or more die after their first spawning migration (Everest 1973).

Summer steelhead emerge from the gravel in April and May, then migrate to the mainstem in May and June when their natal waters become too warm or dry up. Smolts migrate from April through June with a peak in early May. Most summer steelhead smolt in freshwater at age 2, but can smolt from ages 1 through 4 (Everest 1973).

Most summer steelhead are believed to rear in the ocean off the Northern California/ Southern Oregon coast (NMFS 1994) for 2 years, though time in the ocean can vary from 1 to 3 years. A large portion (approximately 97%) of summer steelhead in the Rogue River make a false spawning migration known as the "half-pounder" run (Everest 1973). Fish which exhibit this life history pattern enter the river 2 to 4 months after migrating to the ocean, remain in fresh water over the winter, and return to the ocean the following spring. The size of these fish is generally <406 mm (16 in.) in length (Everest 1973).

e) Winter Steelhead Trout

Winter steelhead enter the Rogue River from November through March with peak movements of fish over Gold Ray Dam in March (ODFW 1994). Winter steelhead spawn primarily in tributary streams like Elk Creek and its tributaries, although they may use the mainstem Rogue River when access to their natal tributary is blocked by a barrier or low winter flow levels. It has been estimated that approximately 2,000 winter steelhead spawned in the Elk Creek watershed (USACE 1980).

Steelhead fry emerge from early April through August with the peak being sometime between late May and early June. Because of reduced water flows during the summer months, many steelhead fry emerge and barely have time to migrate to larger tributaries before their natal streams dry up. Most winter steelhead rear for two years in fresh water before migrating to the sea (ODFW 1994).

Most winter steelhead are believed to rear in the ocean off the Northern California/ Southern Oregon coast (NMFS 1994) for 2 years, though time in the ocean can vary from 1 to 3 years. Some repeat spawners are found, but mortality is high, and usually 90% or more die after their first spawning migration. About 30% of the wild winter steelhead in the Rogue River make a false spawning migration (ODFW 1994).

2. <u>Distribution</u>

Spring and fall chinook salmon spawn in the lower reaches of Elk Creek when autumn flows increase enough to allow upstream migration. This represents approximately 2.1 miles of chinook habitat in the watershed, See Map 22.

These fish utilize the low gradient portions of the mainstem, and juveniles generally migrate out of the watershed soon after emerging from the gravel. Coho and winter and summer steelhead penetrate deep into the smaller tributaries with steelhead being able to access higher gradient areas that are unattainable to coho. Both generally spawn in lower gradient or flat areas of high gradient streams. Coho generally rear for one year in fresh water before migrating to the ocean, while steelhead rear from between one and four years, with two years being the most common for Rogue River steelhead (ODFW 1994, Everest 1973). Autumn water flows of any given year will largely dictate the extent of chinook, coho and steelhead spawning distribution in Elk Creek

Both coho and steelhead adults and juveniles, historically and currently have an extensive distribution throughout the Elk Creek watershed and can be found in nearly all the major tributaries. There is approximately 8.7 miles of coho habitat and 12.2 miles of steelhead habitat within the Elk Creek Watershed. It is interesting to note that, at least in 1995, no coho juveniles were found in either Flat or Bitter Lick Creeks. Reasons for this are not completely known but may be a function of low adult coho escapement into the Elk Creek Watershed. Indications are that coho should be spawning in these streams, especially when compared with adjacent watersheds (pers. comm. Tom Satterthwait, ODFW 1996). Limited spot-checks conducted by ODFW in the spring of 1996 have produced coho juveniles in Flat Creek and Bitter Lick Creek. Historically, coho were documented to be utilizing Bitter Lick Creek, and during electrofishing surveys conducted by ODFW in August, 1981 coho juveniles were found in Bitter Lick Creek. It is expected that distribution of coho in Flat and Bitter Lick Creeks will be extensive once adult escapement increases in the watershed.

There is limited information about the full distribution of resident salmonid species within this watershed. Cutthroat and rainbow trout have a wide distribution throughout the Rogue River basin. Within the watershed, cutthroat and rainbow trout have been found throughout all the major tributaries and in numerous small tributaries which are inaccessible to anadromous fish use. Project level verification of fish presence in perennial and intermittent streams, not identified as fish-bearing but potentially fish-bearing, should be completed and used to update the current data source.

Although Klamath small-scale suckers, red-side shiners, reticulate sculpins and Pacific lamprey are present within the watershed, the full extent of these species within the watershed is not completely known. It is likely that red-side shiners would be limited to the mainstem of Elk Creek, while Klamath small-scale suckers may be found throughout the mainstem and possibly some of the larger tributaries like West Branch Elk Creek, Flat Creek, Sugarpine Creek and Bitter Lick Creek. Pacific lamprey are likely to use the entire mainstem and the larger tributaries as well. Reticulate sculpins would be expected to have a fairly wide distribution in the Elk Creek watershed.

The full extent of the interactions of these fish with salmonids, and their relationship to the entire ecosystem are not fully understood. Some of these species compete for the same basic life sustaining resources (e.g. food, space) with salmonids and in some cases may outcompete them if microhabitat conditions are to the disadvantage of salmonids. Red-sided shiners and Klamath small-scale suckers can be in competition with juvenile salmonids for these resources. In addition, red-side shiners are more tolerant of degraded water quality situations (e.g. elevated temperatures) than salmonids. In a situation which has simplified aquatic habitats, which could create an overly competitive environment for salmonid species, red-side shiners could displace salmonids from their preferred habitat.

3. Passage Barriers

The primary barriers for adult and juvenile fish in the watershed are culverts, diversion dams, and Elk Creek Dam. Within the Elk Creek Watershed there are numerous stream crossings with culverts, located at fish-bearing streams occurring within this watershed. Four diversion dams were noted during stream surveys with heights ranging between 0.3 m and 1.25 m. Diversion structures were made of either concrete, wood, or boulders. Elk Creek Dam is a partially completed structure approximately 20 m in height, located near the mouth of Elk Creek.

The seasonal effects of all these structures range from delayed to complete obstruction of upstream migration for either adult or juvenile fish. Removal and/or modification of these would be considered a priority for restoration of aquatic habitat connectivity, to provide for complete undelayed and unobstructed migrations of all adult and juvenile fish species.

In addition to human created barriers to fish migration, there are also barriers which occur naturally, such as beaver dams and falls. Although beaver dams may present seasonal barriers, they generally do not result in complete obstruction of fish passage and function as important winter-rearing habitat for coho salmon. In addition to serving as coho refuge during the winter, beaver dams also maintain base water flows during the summer months.

While most falls above twelve feet in vertical distance are generally considered barriers to anadromous fish migration, they also act as isolation mechanisms for resident fish populations and other aquatic species. This prevents competition by species from below the falls and provides species above with greater access to available aquatic resources (e.g. habitat and food). With this isolation, and the advantages it may provide for resident fish populations and other aquatic species, some genetic variation may occur, given enough time. Both falls and beaver dams are naturally occurring barriers which play a role in overall watershed processes and should not be modified from their original form.

4. **Hatcheries**

The Cole Rivers and Butte Falls hatcheries are the primary fish propagation facilities in the Rogue basin. Cole Rivers hatchery began operation in 1975 and was built to mitigate for the loss of anadromous salmonid habitat above Lost Creek Dam. Hatchery released fish have been identified as contributing to the decline of anadromous salmonids through competition with wild fish, genetic introgression, residualism, disease, and creating a mixed stock fishery (FEMAT 1993). Conversely, hatchery released fish also make up an important component of sport and commercial fisheries. Although hatcheries are an important variable affecting the health of wild salmonid production and recreational and commercial fisheries, an in depth review of the positive and negative impacts to fisheries and fishery resources from these hatcheries is not provided in this analysis.

5. **Aquatic Invertebrates**

There have been no recorded surveys for aquatic mollusks in the Elk Creek Watershed. Current information shows no known sites of sensitive species of aquatic mollusks within this watershed. The watershed, however, is within the range of the Highcap lanx (*Lanx alta*), a State of Oregon designated Species of Concern.

Aquatic Benthic Macroinvertebrates samples were taken at three sites and analyzed by Aquatic Biology Associates (ABA) using a modification of Plafkin et al.'s (EPA 1989) Rapid Bioassessment Protocol. Overall, watershed and instream conditions at these sites vary, and the benthic community tend to reflect this. The limited number of sample sites, however, does not allow for definite conclusions on the condition of the benthic community throughout the Elk Creek watershed. Additional information is contained in Appendix K.

6. **Stream Temperature and Aquatic Resources**

The Federal Water Pollution Control Administration in 1967 called temperature "a catalyst, a depressant, an activator, a restrictor, a stimulator, a controller, a killer, one of the most important and most influential water quality characteristics to life in water" (U.S. EPA 1986). Current EPA criteria for protection of freshwater aquatic resources as related to temperature is based on "the important sensitive species" present during the time of concern. This is based on two extreme upper temperature limits, with one based on a weekly maximum average temperature, which changes with season, reproductive stage, maintenance of species diversity, or prevention of nuisance growths of organisms, and the other being a short-term exposure (i.e. minutes) (U.S. EPA 1986). The calculated values for maximum weekly average temperatures for growth and short-term maximum for survival of both juvenile and adult coho salmon are 64° F and 75° F. For rainbow trout these values are 66° F and 75° F respectively (U.S. EPA 1986 Table 11). A summary of reported values for maximum weekly average temperature for spawning and short-term maximum for embryo survival during the spawning season for coho salmon are 50° F and 55° F. For rainbow trout these values are 48° F and 55° F (U.S. EPA 1986, Table 12.)

Water temperatures were collected at sites in the Elk Creek Watershed from June 15, 1994 to June 26, 1994. Analysis of the temperature data used seven-day moving averages of daily maximum temperatures as the values for comparison with established Oregon Department of Environmental Quality (ODEQ) temperature criteria and subsequent determination of temperature sensitive reaches within the watershed. For the purpose of this analysis, it was assumed that coho salmon juveniles (fingerlings) were the most sensitive organism and life stage in this watershed during the extreme high temperature period. Therefore the EPA calculated 64° F seven-day average maximum temperature for growth and rearing of coho salmon juveniles was used as the value for determination of temperature sensitive areas within the watershed. This coincides with currently established ODEQ criteria.

Results of stream temperature analysis show that stream reaches along the entire length of the mainstem of Elk Creek to Bitter Lick Creek, the lower reaches of West Branch Elk Creek, Sugarpine Creek, Hawk Creek and Bitter Lick Creek exceed the temperature criterion. It is suspected there are additional streams which exceed the temperature criterion (Flat Creek and Dodes Creek), however this has not been verified. Additionally, due to the limited number of sampling sites, the extent of thermally impacted areas throughout the watershed has not been fully determined or documented.

7. **Non-Point Source Sedimentation**

Suspended fine sediment and deposition of fine sediment can acutely affect the survival of salmonids during; (1) intragravel incubation of eggs and embryos; (2) as fingerlings; and (3) as over-wintering juveniles (Chapman and MacLeod 1987). Increased proportions of fine sediment in substrates has been associated with reduced intragravel survival of embryonic cutthroat trout (Irving and Bjornn 1984) and steelhead trout (Tappel and Bjornn 1983). Aquatic benthic Macroinvertebrates can also be impacted in many of the same ways as fish which can result in a species shift in the benthic community. Impacts to fish which may result from this benthic community shift are a reduction in the quality and quantity of food supply.

The flow regime in the Elk Creek Watershed is largely dominated by rain, resulting in high flow periods during winter and low flow periods during summer. This consequently results in turbidity levels which are strongly linked to flow levels. One of the most commonly used measures of assessing the clarity or the optical qualities of water is the Jackson Turbidity Unit (JTU). As a general rule, prolonged periods of 50 JTU water alters fish behavior (USACE 1980). Average daily turbidity levels in Elk Creek from 1973-1978 ranged from 0-25 JTU's with seasonal variations in this range. In the summer average daily turbidity levels ranged from 0-10 JTU's, while average daily turbidity levels in the winter ranged from 0-25 JTU's. Hourly turbidity values in the winter can vary widely within a few hour period and turbidity levels have been recorded at $\geq$ 1000 JTU's (USACE 1980).

Generally, adverse impacts to fish and aquatic resources from turbidity in the Elk Creek watershed is not seen as a major limiting factor for these species. There are certainly season adverse conditions which exist in the watershed, however these are not felt to be of a magnitude or duration to have caused wide-spread damage to fish populations. Because of limited information on background turbidity levels, and a limited sampling area, it is difficult to determine if turbidity levels are currently within a range of natural variation in the watershed. Although turbidity is not currently viewed as a major adverse impact to fish populations, efforts should be made to prevent anthropogenic inputs of sediment to the streams which would cause any unnecessary increases in turbidity levels.

8. **Stream Sediment Potential from Roads**

It is often difficult and time consuming to quantify non-point source sediment delivered to the stream as a result of land management activities. Although the amount of sediment being delivered to stream channels from Federal roads is currently unknown, it is known what types of roads are the greatest contributors and have the greatest risk of delivering sediment to streams.

There are three major road types within this watershed. Bituminous surface type (BST) roads (paved or black topped roads) generally have the least risk of generating sediment from surface erosion, and stream crossing fill covered by this surface are the least likely to fail. Rocked roads generally have a low to moderately high risk of generating sediment from surface erosion, and stream crossing fill has a low to moderately high risk of failing and being delivered to the stream. Natural surfaced (dirt) roads have a moderately high to high risk of generating sediment from surface erosion, and stream crossing fill has a moderately high to high risk of failing and being delivered to the stream. Of the 404 miles of road within riparian areas in the Watershed, approximately 170 miles of road are located within Federal Riparian Reserve. For roads located within riparian areas, those with natural surfaces would be considered to have moderately high to a high risk of delivering sediment to streams and would be considered priority areas for consideration for decommissioning, closure or upgrade.

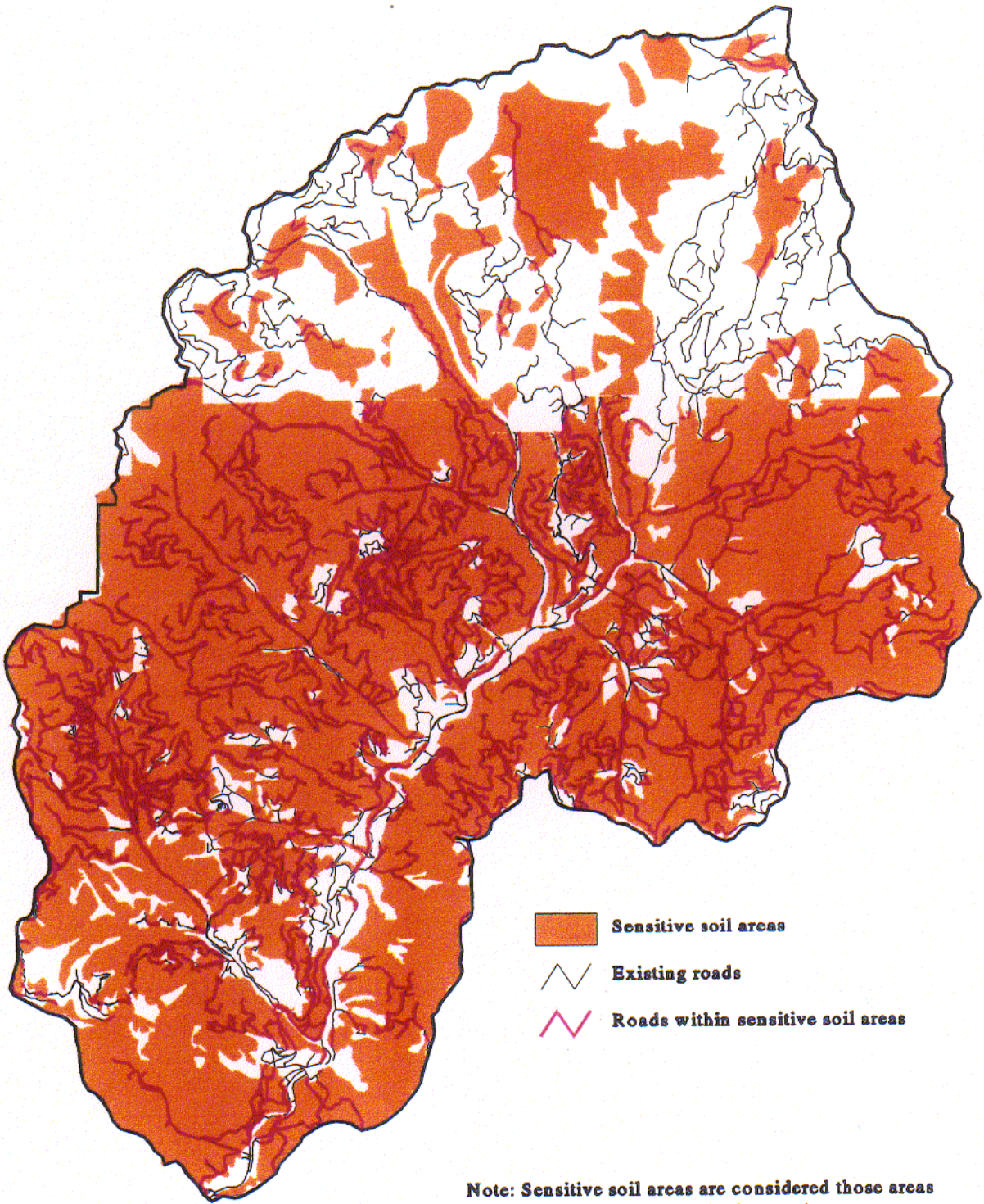
For this analysis, the miles of road used include all roads, open or closed. Skid roads utilized for timber harvest, private timber company access or skid roads, driveways to private residences, non-inventoried federal roads, power line right-of-way access roads, and mining area access roads were included in the analysis.

Of this 404 miles of road within the riparian areas, approximately 70% are located on areas with a high erosion potential. Of the 170 miles located within Federal Riparian Reserves, an estimated 74% are located within high erosion potential. Map 23. shows sensitive soils and roads.

Elk Creek Watershed

Sensitive Soils and Roads

Source: RRNF Soil Resource Inventory, 1977 and Jackson County Soil Survey, 1993



Note: Sensitive soil areas are considered those areas that are rated as a "high risk" for erosion.

July 1996

J. TERRESTRIAL SPECIES AND HABITAT

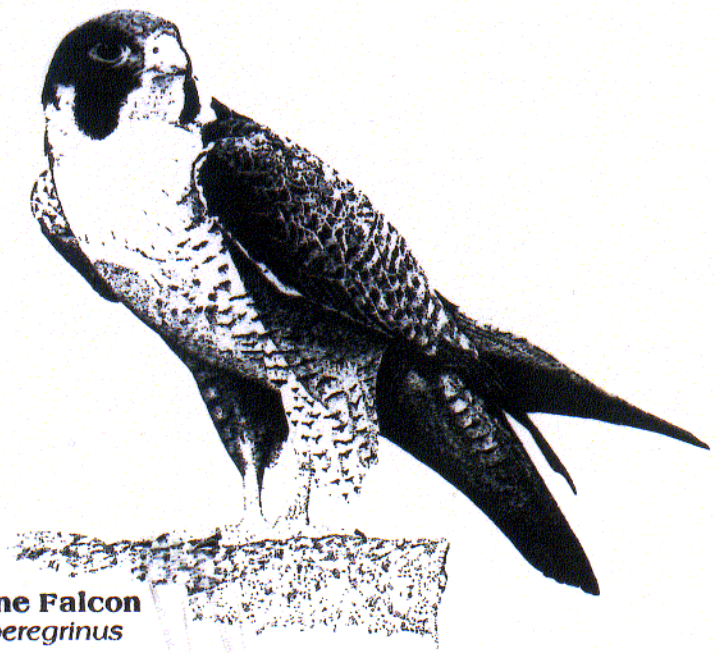
Terrestrial wildlife habitats, like the vegetation of southwest Oregon, are extremely diverse. Habitat types vary greatly from the Elk Creek valley floor to the upper reaches on the Rogue-Umpqua Divide. Terrain, climatic factors and vegetation all combine to create a wealth of wildlife habitats. The majority of the Elk Creek Watershed is dominated by forests of conifers in various stages of stand development, with a significant hardwood component. Habitats found on the valley floor include grasslands, oak brushlands, pine forest and riparian. The uplands habitats, though dominated by coniferous forest, include barren areas, meadows, riparian areas, alder thickets and a variety of other unique areas. Historically, many of these habitats were created and maintained by disturbance events, particularly fire. Each plant community provides conditions that fulfill certain wildlife species habitat.

The Elk Creek Watershed contains a diverse array of wildlife. Habitats of concern for the Elk Creek Watershed include late-seral coniferous forest and riparian habitats. The main driving force for management in the Elk Creek Watershed is maintenance and enhancement of older seral stage habitat. As previously noted, there are two designated Northwest Forest Plan allocations associated with late-seral objectives, within the watershed: Late-Successional Reserve (LSR) #RO 224 (BLM south half) and #RO 222 (USFS north half).

A list of species found in southwest Oregon that are in various sensitive categories is shown in the accompanying table. Table 13. also indicates presence or absence of the species in the watershed, quality of habitat available, and what level of survey has been done. An accompanying section (contained in Appendix L) briefly describes the habitat requirements for each of the special status species.

Table 9. Special Status Terrestrial Species Occurrence: Elk Creek Watershed.

U.S. FISH & WILDLIFE T&E SPECIES (Codes listed at end of table)					
SPECIES	STATUS	RANGE (Y/N)	P/A	HABITAT QUALITY	LEVEL OF SURVEY
Peregrine falcon	FE, SE, 1	Y	P	High	Thorough
Bald eagle	FT, ST, 1	Y	P	Medium	Limited
Northern spotted owl	FT, ST, 1	Y	P	High	Thorough



Peregrine Falcon
Falco peregrinus

Table 9. Special Status Terrestrial Species Occurrence: Elk Creek Watershed.

U.S. FISH & WILDLIFE SPECIES of CONCERN (SoC)					
SPECIES	STATUS	RANGE (Y/N)	P/A	HABITAT QUALITY	LEVEL OF SURVEY
Spotted frog	C-, SC , BS, 1	N	A	Low	Limited
Cascade frog	SoC, SV, 3	Y	U	Medium	Limited
Foothill yellow legged frog	SoC, SV, 3	Y	Y	High	Limited
No. red legged frog	SoC, SU, 3, R	Y	P	Low	Limited
Tailed frog	SoC, SV, 3	Y	U	Medium	None
Northwestern pond turtle	SoC, SC, 2, R	Y	P	Medium	Limited
Little willow flycatcher	SoC, 1	U	U	Low	None
Northern goshawk	SoC, SC, 3	Y	P	High	Incidental
Tricolored blackbird	SoC, SP, 2	N	A	Low	None
Western burrowing owl	SoC, SC, 3	N	A	Low	None
Fringed myotis	SoC, SV, BS, SM, 3	Y	U	High	Limited
Long eared myotis	SoC, SU, SM, 3	Y	P	High	Limited
Long legged myotis	SoC, SU, SM, 3	Y	P	Medium	Limited
Townsend's big eared bat	SoC, SC, 2, R	Y	U	Medium	Limited
Yuma myotis	SoC, SU, 3	Y	S	Medium	Limited
Pacific fisher	SoC, SC, 2	Y	P	High	Limited
California wolverine	SoC, ST, 2, R	Y	S	Medium	Limited
Burnell's false water penny beetle	SoC, 4	UNK	U	Medium	None
Denning's agapetus caddisfly	SoC, 3	UNK	U	Medium	None
Green springs Mt. faurlan caddisfly	SoC, 3	UNK	U	Medium	None
Schuh's homoplectran caddisfly	SoC, 3	UNK	U	Medium	None
Siskiyou caddisfly	SoC, 3	UNK	U	Medium	None
Siskiyou chloealtis grasshopper	SoC, 3	UNK	S	Medium	None
Mardon skipper butterfly	SoC, 2	UNK	U	Low	None
Franklin's bumblebee	SoC, 4	N	U	Low	None

Table 9. Special Status Terrestrial Species Occurrence: Elk Creek Watershed.

OTHER (ODFW AND BLM) SPECIAL STATUS SPECIES					
SPECIES	STATUS	RANGE	P/A	HABITAT QUALITY	LEVEL OF SURVEY
Clouded salamander	SU, BS, 3	Y	S	High	Limited
Western toad	SV, 3	Y	Y	Medium	None
California mt. kingsnake	SP, AS, 3	N	S	Low	None
Common kingsnake	SP,AS, 3	Y	S	Low	None
Sharptail snake	SV, AS, 4	N	U	Low	None
Black backed woodpecker	SC, AS, 3	N	U	Low	None
Flammulated owl	SC, AS, 4	Y	S	Low	None
Grasshopper sparrow	SV, 3	N	A	Low	None
Great gray owl	SV, AS, SM, 4	Y	S	Medium	Limited
Greater sandhill crane	SV, 4, R	N	A	Low	Incidental
Lewis' woodpecker	SC, AS, 3	Y	S	Low	None
Northern pygmy owl	SU, 4	Y	P	High	Incidental
Northern saw whet owl	AS	Y	P	High	Incidental
Oregon vesper sparrow	SC, 3	N	A	Low	None
Pileated woodpecker	SV, AS, 4	Y	P	High	Incidental
Pygmy nuthatch	SV, 4	Y	S	Medium	None
Red-necked grebe	SC, 2	N	A	Low	Incidental
Three-toed woodpecker	SC, AS, 4	Y	U	Medium	None
Western bluebird	SV, AS, 4	Y	S	Medium	None
White headed woodpecker	SC, 3	Y	U	Low	None
Red tree vole	BS, SM	Y	S	High	None
Western gray squirrel	SU, 3	Y	P	High	Incidental
Pacific pallid bat	SV, AS, SM, 3	Y	S	High	Limited
Silver haired bat	SU, SM, 3	Y	Y	Medium	Limited
American marten	SV, AS, 3	Y	S	Medium	None
Ringtail	SU, 3	Y	S	Medium	None
White footed vole	SC, SU, 3, R	Y	U	Medium	None

STATUS CODES FOR TABLE:

FE - USFW Endangered - in danger of extinction throughout a significant portion of its range
FT - USFW Threatened - likely to become endangered species within the foreseeable future
SoC - USFW Species of Concern (formerly Federal Candidate 1, 2, 3) -under consideration for listing, but additional information is needed to support a proposal to list under the Endangered Species Act
C→ - Federal candidate which is likely to become an SoC when new USFW review is completed
PE - Proposed endangered by National Marine Fisheries Service (NMFS)
PT - Proposed threatened by NMFS

SE - State Endangered - in danger of extinction in the state of Oregon
ST - State Threatened - listed as likely to become endangered by the state of Oregon
SC - State Critical - listing is pending, or appropriate, if immediate conservation action not taken
SV - State Vulnerable - listing not imminent, and can be avoided through continued or expanded use of adequate protective measures and monitoring
SP - State Peripheral or naturally rare - populations at the edge of their geographic range, or historically low numbers due to limiting factors
SU - State Unknown - status unclear, insufficient information to document decline or vulnerability

SM - Survey & Manage - Northwest Forest Plan ROD directs protection of known sites and/or survey for new sites
BS - Bureau Sensitive (BLM) - eligible for addition to Federal Notice of Review, and known in advance of official publication. Generally these species are restricted in range and have natural or human caused threats to their survival.
AS - Assessment Species (BLM) - not presently eligible for official federal or state status, but of concern which may at a minimum need protection or mitigation in BLM activities.

R - Region 6 Regional Foresters sensitive species list for Rogue River NF.

1 - Oregon Natural Heritage Rank, critically imperiled throughout its range
2 - Oregon Natural Heritage Rank, imperiled throughout its range
3 - Oregon Natural Heritage Rank, not rare, threatened throughout its range
4 - Oregon Natural Heritage Rank, not rare, apparently secure throughout its range

P/A Presence Absence:

P - Present
S - Suspected
U - Uncertain
A - Absent
T - Possibly transitory

Habitat Quality:

H - High
M - Medium
L - Low
A - Absent

For the following discussion, the levels of past wildlife surveys, monitoring and general knowledge can best be described by breaking the watershed into three geographic areas:

- The northern third - National Forest block: the Bitter Lick country.
- The SW third - BLM checkerboard management pattern: West Branch Elk, Flat Creek, Sugarpine, including Corps of Engineers.
- The SE third - Private timberlands and other private ownerships.

1. **Northern Spotted Owl**

Historic: One of the first Northern Spotted Owl sites discovered in SW Oregon was the Middle Creek site (in this watershed) identified by Eric Forsman in 1973. General surveys in the SW third in 1984 & 85 revealed nesting pairs in stands that had undergone previous shelterwood harvest treatments. The first radiotelemetry study of spotted owls in Elk Creek occurred in 1985 as part of Kathy Nickell's Masters Thesis study.

Oregon State University (OSU - Frank Wagner) began the more intensive Miller Mountain study of five owl sites in 1986 continuing through 1989, with demographic data collection spreading into the northern third by 1988. Additional density studies outside the watershed were added in 1990, and coverage of the entire watershed continued through the 1995 field season, making this one of the most intensively surveyed areas for owls in the range of the species. Between OSU, USFS, BLM, and Boise Cascade crews, the Elk Creek area was surveyed six times a year for six years to color band as many pairs and singles as possible, and to monitor their reproductive performance and population turnover through time.

Most of the watershed was designated as a Habitat Conservation Area (HCA) to feature management for spotted owl habitat by the Interagency Scientific Committee (ISC) report in 1990. The species was listed as Threatened on June 26 1990. Court injunctions halted fiscal year 1991 timber sales. Those injunctions were lifted July 1995. The draft Spotted Owl Recovery Plan of May 1992 provided for the watershed to become a Designated Conservation Area (DCA). US Fish & Wildlife designated most of the area as Critical Habitat Unit (CHU) # OR-34. As a result of all these rulings, there has been relatively little habitat alteration on Federal lands in the watershed since 1990.

Current Situation: Fifty four historic owl sites have been identified within the watershed boundary on all ownerships. The Table in Appendix L lists the last four years' status of these sites. Over the past decade, many of the historic sites have "winked out", with birds no longer detected. At others, surviving birds from two sites join to form one site. Tracking these changes over time has been made possible by color banding. Timber harvest on intermingled private lands has been ongoing. The number of active sites on non-federal lands is now believed to be two, down from a high of four. All ownerships had been surveyed as part of the OSU density study area.

The latest annual status report by OSU for the owl study area shows a decline in numbers of owls of 8% for the past six years (1990 through 95), with the caveat that the sample size is relatively small, and that this data cannot be extrapolated to other areas. The decline is thought to be due to the loss and fragmentation of suitable owl habitat. Crude density for the Elk Creek Density Study Area is 26 pairs within 67,000 acres (within the Elk Creek Watershed). Of the 54 historic sites, 7 have been inactive for the most recent 4 years, and another 7 sites have been inactive for the past two years. Twenty five sites have produced young in at least one of the past four years, with a total of 51 young produced.

The draft Spotted Owl Recovery Plan made several assumptions about owl numbers for the next several decades, namely that ongoing harvest on private lands would continue to whittle away at available suitable owl habitat, owl numbers would decline in the short term. But as old clearcuts and shelterwoods on Federal lands grew back in, overall late-successional habitat would increase, reducing fragmentation, and owl numbers would start to slowly rebound. The goal of a Late-Successional Reserve is to maintain a cluster of at least 20 viable owl pairs. LSRs are scattered across the species range with an approximate 12 mile spacing between each LSR.

With more block ownership and less historic harvesting, the northern third of the watershed (Bitter Lick) seems to be providing a source for production of young owls. The SW third (BLM checkerboard) has a declining number of owls, with sporadic production of young that is probably a population sink. There are few nesting owls in the remaining private east third of the watershed, but ample dispersal habitat remains.

Habitat: The land base has been typed into several categories of habitat suitability for spotted owls, based on a system devised by researcher Kevin McKelvey. Habitat *one* is potential nesting habitat. Habitat *two* is foraging/roosting habitat but not nesting - usually a little younger or more open stands. Habitats one and two are generally lumped to be termed "suitable owl habitat". Dispersal habitat provides cover for juvenile/yearling owls that may be moving across the landscape, usually having 40% canopy closure, or scattered clumps of conifers or hardwoods.

Designation of these habitat types is somewhat subjective, most was done from air photos and timber stand inventories, with an estimated accuracy of plus or minus 10%. For suitable habitat, there are 10,510 acres of BLM administered lands, 13,320 ac. of National Forest, and 3,970 ac. of other ownerships (private, State, Corps), for a total of 32% of the watershed currently considered as suitable habitat. For dispersal habitat, there are 2,960 ac. of BLM, 6,100 ac. of National Forest, and 7,500 ac. of other ownerships, for a total of 20% of the watershed.

2. <u>Big Game</u>

The watershed is within ODFWs Dixon management unit. Deer numbers are 15% below the management objectives. Buck ratios have been sliding down, but went up a bit last year. Trend information for deer is incomplete. ODFW has one herd composition driving survey route up Elk Creek. The elk population is 18% below management objectives. Bull ratios are at 8 per 100 cows, down from previous years 10 per 100 cows. Elk are doing better east of the watershed. ODFW has one helicopter survey route for elk in the watershed. There are radio-tagged black tailed deer in the watershed as part of an ongoing SW Oregon deer study.

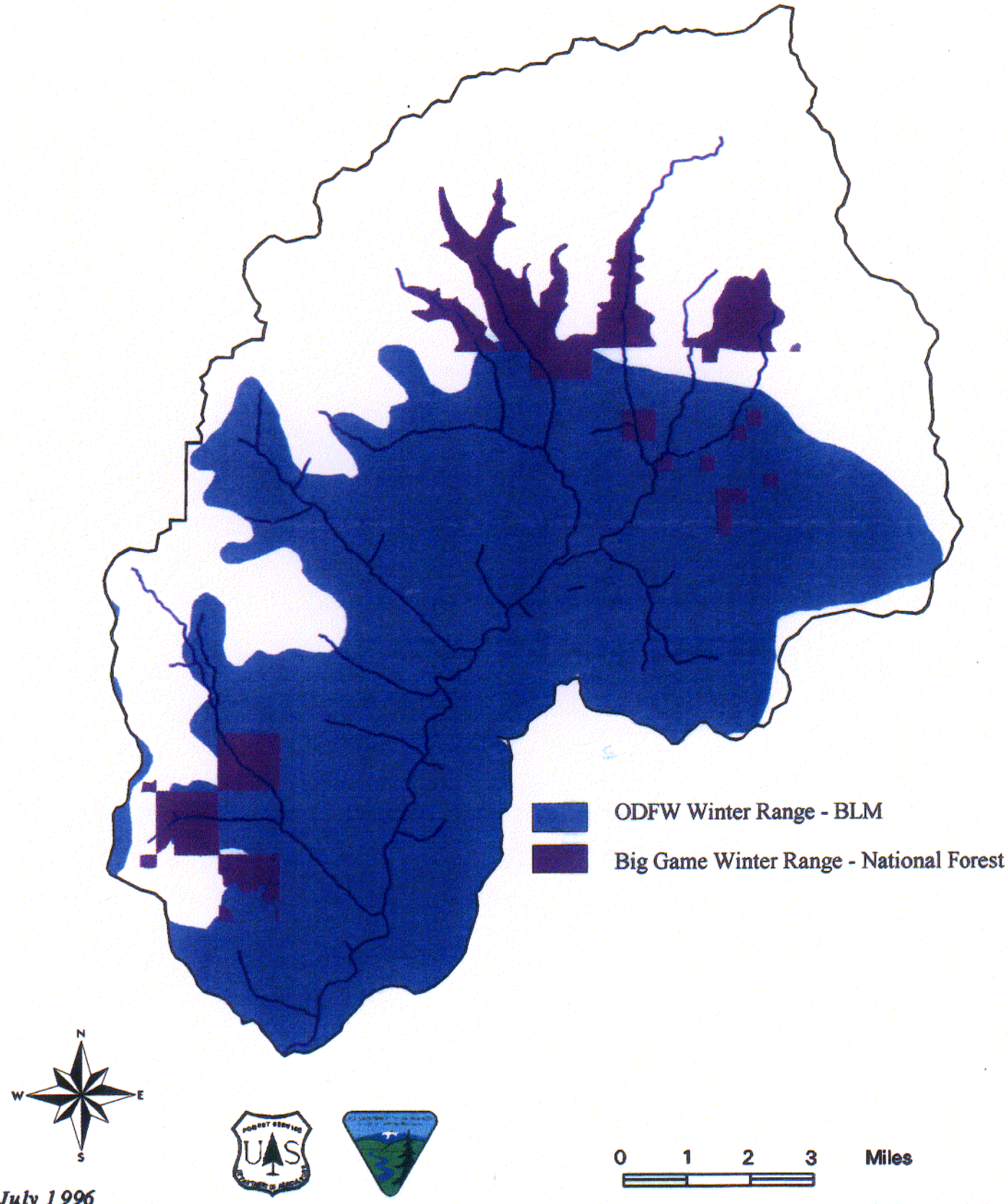
ODFWs recommendation to maintain or improve big game habitat is to reduce the density of open road miles. Look for habitat improvement projects such as prescribed burns on south aspect hillsides. Water is not a limiting factor. If the dam were ever completed, an important segment of winter range would be flooded. Poaching pressure is low to moderate. The area between Elk Creek and Lost Creek (Tatouche/Burnt Peak) is within the Jackson Access and Cooperative Travel Management Area (JACTMA), a cooperative road closure (ODFW, Boise Cascade, BLM, USFS, private landowners) from September through May to benefit big game, as well as to reduce road maintenance costs, minimize trash dumping, reduce siltation into streams, etc. The objective of the plan is to foster cooperation for hunter access with private landowners. Authorization by the state Game Commission for the JACTMA plan to continue is contingent upon annual review, so boundaries of closure areas, and dates of closures could change. This plan was recently re-authorized.

When winter range was designated, USFS and BLM used different criteria, so maps of winter range don't line up across management boundaries. Currently 46,000 acres (53 % of the watershed) on the SW third of the watershed (BLM checkerboard) is classified as big game winter range, mostly in the dam pool and the hills between Elk Creek and Lost Creek. USFS (northern third) has designated elk winter range but not deer winter range (too high an elevation). Map 24. shows the current designation of big game winter range.

If most of the federal lands were allowed to mature to a late-successional condition, there would be a significant decrease in foraging habitat for deer and elk. Timber harvest openings would continue to be created on private industrial lands, although Boise Cascade has indicated they will be doing more partial cutting (vs clearcutting) in the future. Percent of the land base in foraging habitat has been decreasing in the past five years due to the injunction on harvest of Federal timber. On the deer winter range, animals feed in the lowlands near Elk Creek at dusk, then move to higher elevation by day to hide.

Elk Creek Watershed

Big Game Winter Range



July 1996

3. Other Game and Nongame Species

ODFW feels the cougar population is above capacity. Bear density is increasing above management objectives. Fur trapping in the area is minor. There is a fair population of game birds (quail & grouse), with one survey route in the basin. Turkey populations are increasing.

There is one Partners-in-Flight Neotropical Migratory Bird Survey route that has been run for two years in the NE private portion of the watershed, coordinated by Boise Cascade. A second route was initiated in 1995 by BLM in the Buck Rock-Alco Creek vicinity. There has been no mist netting for bats. One wolf inventory or "howling" route was run for two years, with no responses. There have been a few reports of goshawks, but no surveys completed. There have been no reports or surveys for great gray owls. Opportunistic surveys for amphibians have been going on throughout the watershed for the past two years.

4. Special Habitats

Oak pine woodlands are disappearing in SW Oregon, cut for firewood, converted to pasture, or taken over by encroaching conifers. This habitat is found along the east side of Elk Creek, and scattered through flatter portions of the watershed. Controlled burns help maintain this habitat type.

There are no known caves within the watershed, although there are four identified large overhangs (pseudo caves) that provide potential bat roost habitat. The Al Sarena mine is the only active mining area.

There are no identified wetland areas in the watershed, other than swampy seeps and side channels associated with the creeks. There are several water development or " pump chances" on the Federal lands. These sites provide habitat opportunities for bats and amphibians.

There is no known inventory of overall snag densities or amounts of downed woody material for the Elk Creek Watershed.

Oak pine woodland in the lower elevation of the Elk Creek Watershed

K. HISTORIC HUMAN LAND USE

1. Native American Use

Map 25. represents the pattern and occurrence of historical land use, including: settlement, major mining, ranching, and travel routes. It includes Native American, early Federal, and private use. Compared to most other watersheds in southwestern Oregon of similar size, the archaeological character of the Elk Creek Watershed is relatively well known. During the 1970s and 1980s, most of the public lands within the Elk Creek Watershed were intensively surveyed for archaeological sites by the Forest Service and Bureau of Land Management. In addition, the U.S. Army Corps of Engineers sponsored archaeological excavations within the Elk Creek Dam project area, located within the Watershed Boundary. In brief, excavations found evidence of several small winter villages (which included several house-pits and other residential features used by these first human beings in the area) located primarily on the broad, alluvial terraces on the west side of Elk Creek. A number of smaller "task-specific" sites (e.g., where chipped-stone tools were made) were also found by surveys; however only very small, sparse, shallow scatters of lithic debitage were located outside the low-elevation valley-lands. Dating of sites suggests intensive use as far back as 2,500 years ago, with lighter use assumed as long ago as 10,000 years ago.

From small villages or base-camps in the valley, native people would have radiated out in groups to hunt elk, deer, and other game, often using dogs to drive small herds of animals into brush enclosures. Acorns, hazelnuts, chinkapin nuts, sugar pine nuts, camas and broadoa bulbs, yampa roots, serviceberries, and huckleberries formed the most important vegetable portions of the native diet. Little evidence of fishing was found by the Corps of Engineers' excavations.

As illustrated on the map, once people ascended out of the valley floor and adjacent foothills, most of their travel followed the major ridges leading toward the Rogue-Umpqua Divide. Large meadows and other opening along the Rogue-Umpqua Divide, which provided comparatively easy travel routes to adjacent watersheds, contain the largest upland sites.

Approximately 1,000 years before the arrival of Euro-Americans, the major groups occupying or seasonally using the Elk Creek Watershed would have been the Upland Takelma (or "Latgawa") and the Southern Molalla. The Cow Creek Indians (a Takleman-speaking group) would have entered the uppermost portions of the Watershed from the Umpqua drainage to the north. The Butler Butte vicinity in particular was an important seasonal-use area for the Cow Creeks.

Although not well understood at this time, one of the greatest influences of these native inhabitants was their extensive use of fire. Native people used fire to drive game and to enhance the browse vegetation the animals fed on. Anthropogenic fire also served to create, maintain, or restore favorite plant-gathering areas, such as oak groves and meadows. It has been speculated that the former open, "park-like" character of the oak and pine stands in the Elk Creek Valley owed much to deliberate burning by native Americans.

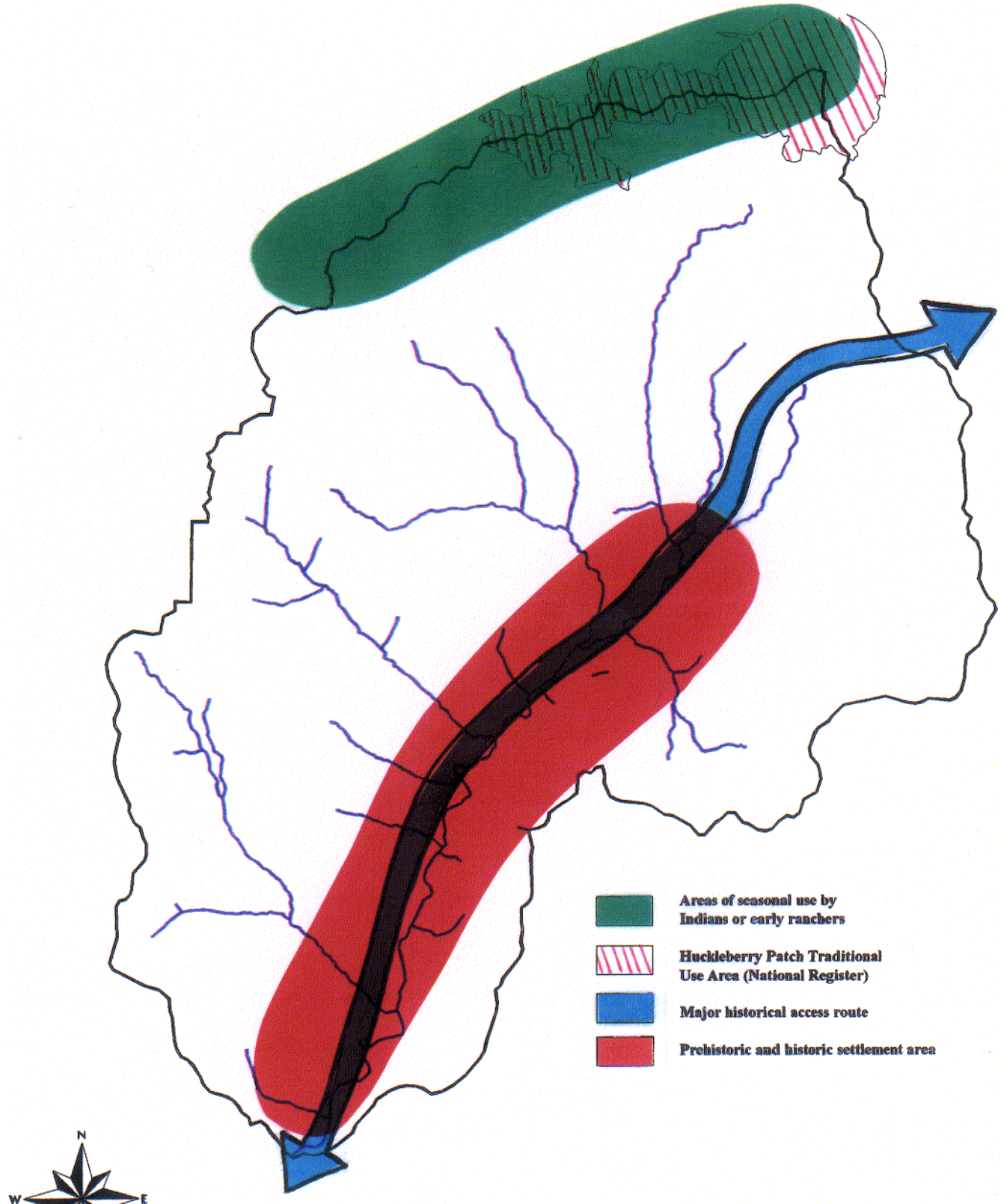
2. Euro-American Use

Euro-American use dates from 1827, when fur trappers of the Hudson's Bay Company's "Snake Country Brigade" traveled through the Rogue River Valley. During the 1830s-40s, later trappers captured beaver from the lower reaches of Elk Creek and its tributaries, which resulted in a substantial decrease in beaver populations, hence changing beaver-caused streamflow characteristics. With the discovery of gold in the nearby Siskiyou Mountains, early Euro-American agriculture settlement sprang up in the Rogue Valley. A few Rogue Valley settlers roamed the Upper Rogue during the 1850s, looking over the country and searching for good transportation routes over the Cascade Range. During the 1850s-60s, with the main Rogue Valley "settling up," the Elk Creek Watershed became a favored "hunting ground" for residents of Jackson County. Deer and elk were apparently abundant. Although there is no direct evidence, place names such as "Abbott Prairie," "Elkhorn Peak," and "Bitter Lick Creek" are thought to be associated with this era. The attractive qualities of the Elk Creek area, although "just off the beaten track" (i.e., the Rogue Valley's main wagon road over the Cascades to eastern Oregon), became known at this time.

Farming families began to homestead the lower Elk Creek valley in the 1870s and early 1880s. Gold was discovered in Elk Creek in 1897, by Peter and Mark Applegate. The Pearl Mining Co. was incorporated in 1898, but the first ore was not shipped until 1909. The total production from the "Buzzard Mine" between 1909-1918 was nearly $24,000.00, chiefly in gold, with minor amounts of silver and lead.

Elk Creek Watershed

Historic Land Use



July 1996

By 1900, a second influx of settlers occurred in the upper portion of the valley. As most of the land in the upper valley was marginal for agricultural use, many of these short term settlers sold their property to the Big Bend Milling Company, which later became the Elk Lumber Company. By 1900, settlement led to the development of a wagon road the entire length of the valley, from the Rogue River to Bitter Lick Creek.

Elk Creek valley settlers customarily burned the foothills and upland range areas on a regular basis to improve browse for game animals and to maintain grasslands for livestock. By 1905, elk populations had been dramatically decreased. Grazing began to affect high-country meadows and the majority of the large sugar pines had been harvested to make shakes. In the late 1890s through the early 1900s, small capacity irrigation ditches proliferated. As a result of water diversions and unscreened ditch intakes, salmon populations began to dwindle. Out of concern, H.D. Hume (the "Salmon King of the Northwest," who operated a major cannery at the mouth of the Rogue River), hired local resident J. H. Pankey to build a fish hatchery at the confluence of Elk Creek and the Rogue River in 1897.

3. Federal Land Management

The upper portions of the Elk Creek watershed were proclaimed as a Forest Reserve in 1893, but Forest Service management did not begin until 1906. In 1916, much of the remaining former Oregon - and -California (O-and-C) Railroad land grant was "re-vested" to the Federal government with the Bureau of Land Management getting control in 1946. During the early 1900s, federal land management was custodial and protective in its intent and effect. Forest structure was allowed to develop, fires were extinguished where and when they could be reached in time, and human-caused fires were discouraged. The period between 1905 and the early 1930s witnessed increased and more diverse uses of the watershed, including mining, hydroelectric power distribution and road building. The California-Oregon Power Company (COPCO) completed its main inter-tie power-line from the Prospect powerhouse to the Roseburg area in the early 1920s. Although a few sheep may have been driven to the Elk Creek range during the late nineteenth century, cattle were the major commercial stock in the upper portion of the Watershed. With high beef prices during World War I, cattle utilization increased, especially along the Rogue-Umpqua Divide. In 1940, the majority of the land ownership in Elk Creek Watershed was under Federal control. Out of the privately owned lands, about 15,000 acres were held by the Elk Creek Lumber Company, about 3,000 by the Stanley Dwindell Company, with the remainder being divided among small ownerships. (LaLande, 1996)

L. RECENT HISTORIC AND CURRENT HUMAN USES

1. Commercial Use: Timber/Roads

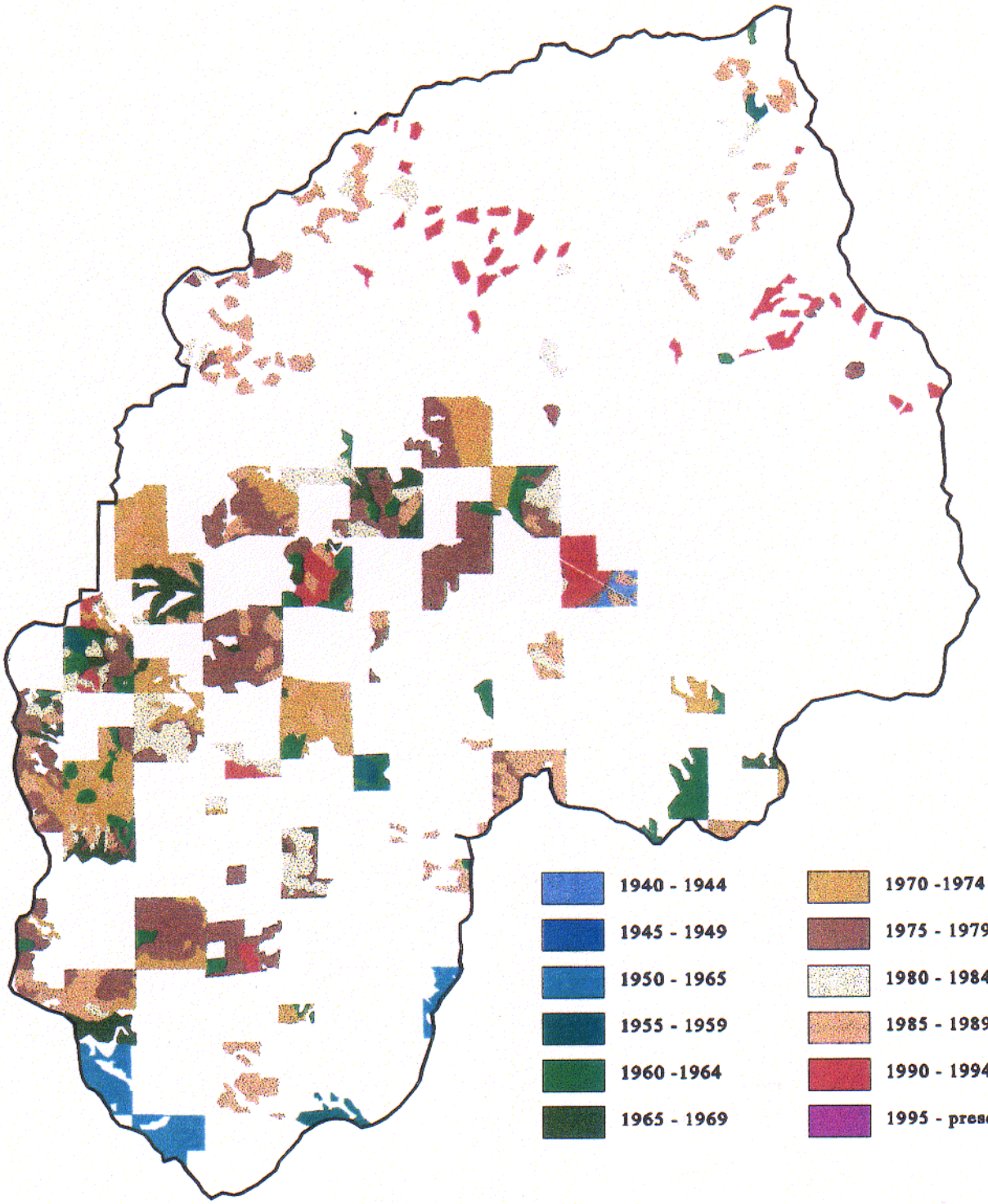
World War II spurred the opening of the Elk Creek Watershed to timber harvest. Map 26. shows the areas of harvest on Federal timber lands. The McGraw-Collins Lumber Company began cutting private timber land in the lower portion of the Watershed during the early 1940s, hauling logs by truck to mills in the Rogue Valley. In the late 1940s-50s, the Bureau of Land Management and the Elk Lumber Company began to road and harvest their lands, as part of a region-wide push to enter mixed-conifer stands in southwest Oregon. Much of the logging was done with crawler tractors that followed the ridge-crest spines of the Watershed. Haul roads accessed Elk Lumber Company lands along Button Creek and Brush Creek in the early 1960s. In 1965, Boise-Cascade Corporation purchased Elk Lumber Company's timberland, as well as its large mill (built in 1947) in the Rogue Valley. During the late 1960s and 1970s, roads were constructed on Bureau of Land Management lands throughout the headwaters of West Branch Creek (on the west side of Alco Rock Ridge), Morine Creek, and Flat Creek.

Timber harvesting in the higher elevations on public lands did not get underway (aside from several isolated units along the Civilian Conservation Corps (CCC) road to Huckleberry Lake near Abbott Prairie) until the 1960s. The 1962 Columbus Day windstorm, which blew over millions of board feet of timber in the upper Rogue Basin, spurred the construction of new roads into formerly remote areas. By the 1970s, many of these roads had been built along Bitter Lick Creek, Sugar Pine Creek, over Goodview Point to Neal Camp Burn, and elsewhere. By 1980, a relatively dense system of roads wound throughout public lands. These roads were primarily of an aggregate surface type. Out of the 142 miles of roads within the Watershed, 5.16 miles are paved with asphalt, 27.53 miles are native (un-surfaced), and 109.05 are aggregate (See Map 23). Between this "new" road system and the "old" CCC-generated road network to the east of Swanson Creek, lay a remnant unroaded drainage designated as the "Bitter Lick Roadless Area" on National Forest land.

MAP 26

Elk Creek Watershed

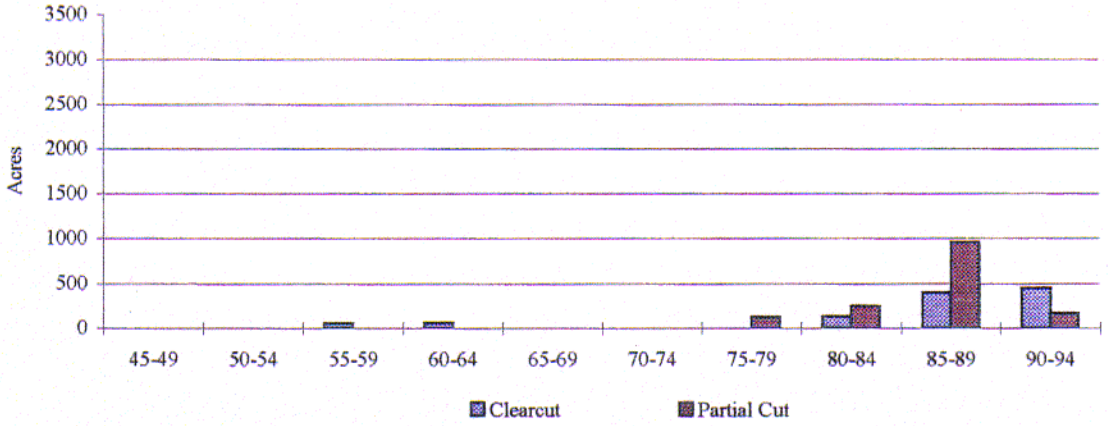
Historic Federal Timber Harvest Areas



July 1996

Between 1981-1991, the height of intensive timber management occurred on Forest Service administered land (which currently totals 28,797 acres) within the Elk Creek Watershed.

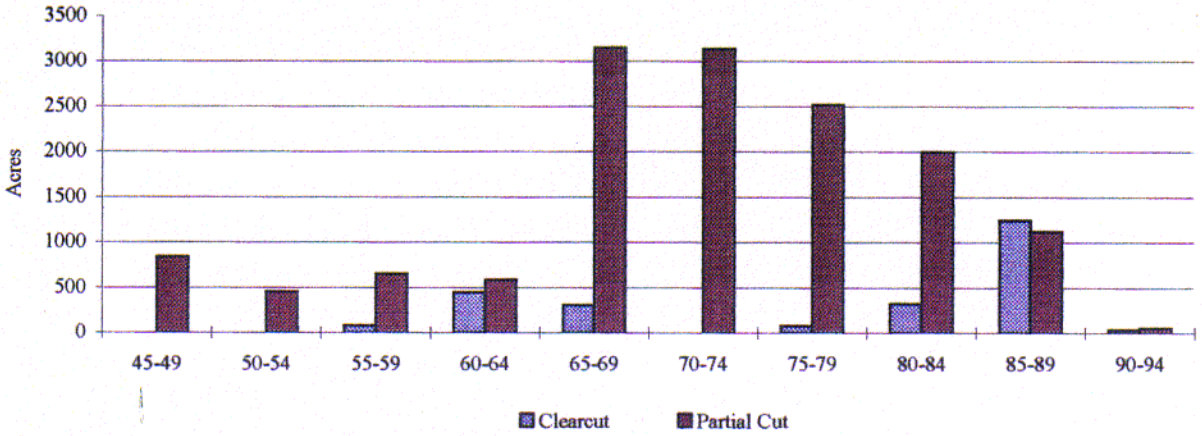
Figure 14. Forest Service Timber Harvest Activities.



Clearcut Acres (even-age management)
Partial Cut Acres (uneven-age management = sanitation, salvage, some thinning treatments)

In comparison, timber management increased earlier (in the mid 1960s-1989) on the 20,978 acres of Bureau of Land Management administered land.

Figure 15. Bureau of Land Management Timber Harvest Activities.



Clearcut Acres (even-age management)
Partial Cut Acres (uneven-age management = sanitation, salvage, some thinning treatments)

Since 1991, there has been a dramatic downturn in timber harvest levels and new road construction within Elk Creek Watershed. This was a result of a 1991 court-ordered halt of federal timber harvest within the range of the northern spotted owl and because of new management direction as outlined in the Northwest Forest Plan (1994). Prior to the Pacific Northwest Forest Plan, approximately 85% of the federally administered land was in allocations in which the production of timber volume was allowed, scheduled and in some cases, was the primary goal. These land allocations emphasized full or partial yield timber management within the capability of the land management requirements of other resources. Applied silvicultural treatments on lands classified as "suitable" for timber production created a landscape predominated by a mosaic of even-aged managed timber stands, although even and uneven aged management were accepted systems under these strategies. Even-aged management was commonly applied in coniferous forests on both Federal and private timberlands.

Before the early 1970's, tractor logging was the main method for extracting timber. By the mid 1970's, Federal standards were developed to minimize soil erosion and compaction resulting from logging, causing a shift in yarding methods. Cable systems began the dominate yarding method on steeper ground (35+%). Minor amounts of helicopter yarding have also occurred on both private and Federal timberlands. Presently, only about 10% of National Forest lands within the Elk Creek Watershed is in allocations that emphasizes, or even allows regulated timber production, reflecting a dramatic decrease in the timber program land base. Lands managed by the Bureau of Land Management are totally allocated to LSR, which has no scheduled or "Probable Sale Quantity" expectations. Please see Map 5. in Chapter I for current Federal Land Allocations.

Figure 16. Medford District - Bureau of Land Management Timber Program.

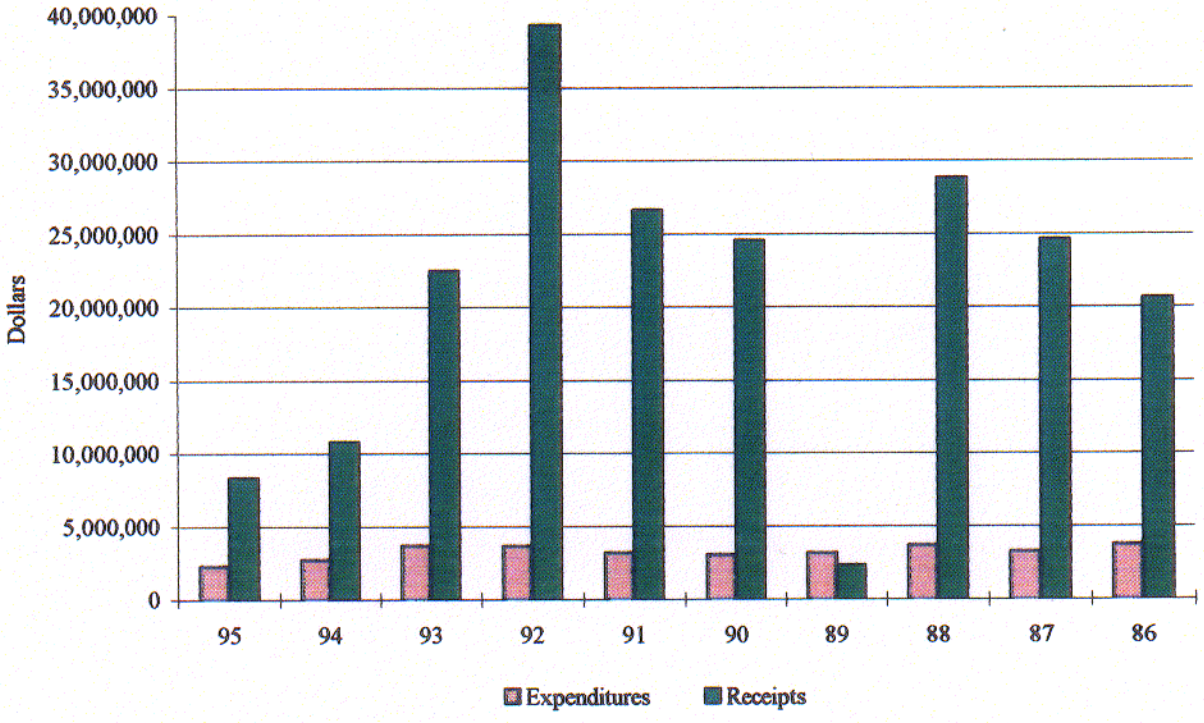
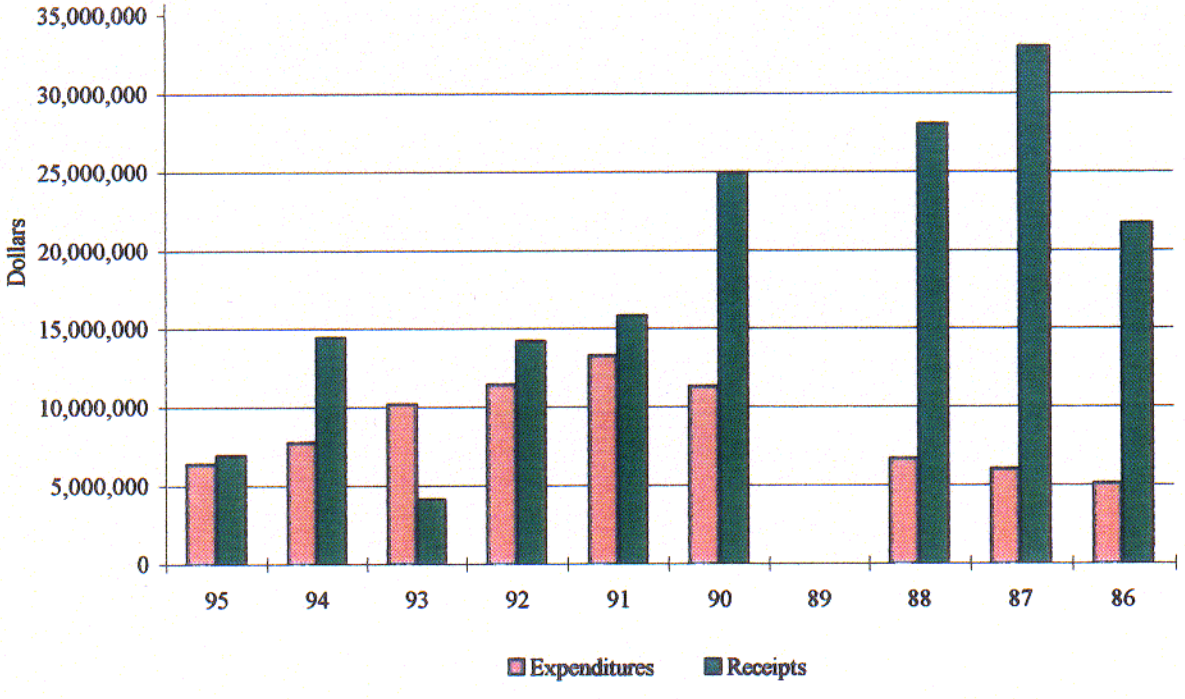


Figure 17. Rogue River National Forest Timber Program.



2. Special Forest Products

Pacific Yew Wood - One-third of the high-quality yew wood on the Prospect Ranger District is located within the Elk Creek Watershed. Yew was extracted from 1991 to 1994, for medical research related to the production of Taxol. The majority of yew wood was harvested from K-Rock, Kettle Rock, Nine, and Seventy-nine Timber Sale areas on Forest Service administered land. Theft of yew wood is common.

Firewood - In the mid 1980's, the Forest Service sold two large commercial firewood cutting sales along Abbott Prairie and Gray Rock (Forest Service road 6640) Roads for a total of 875 cords. On average, utilization on a annual basis is an estimated 75 cords on Forest Service administered land. Theft related to firewood removal is moderate to high.

Christmas Trees - An estimated 50 Christmas tree cutting permits are sold on an annual basis, primarily to local users/residents from Forest Service administered land. Access to true firs is difficult during the month of December because of snow.

Cedar Rails - The quality of wood production for cedar rails within the watershed is high. An average of three permits for 100-200 rails has been sold by the Forest Service annually (totaling 500 rails) since 1989.

Fossils/Unique Rock types - The Elk Creek Watershed is deemed one of the best locations on the Rogue River National Forest to gather/collect fossils and unique, interesting rock types.

Sugar Pine Shake Bolts - Sugar pine shake bolts produced from the Elk Creek Watershed were used for the restoration of the Crater Lake National Park Lodge. The Forest Service has sold an average of one permit every other year for an estimated 10 cords of shake bolts.

Morels/Matsutakes - The Forest Service has sold an average five permits per year to local collectors for morels. No recorded permits exist for the collection of matsutakes, however utilization is suspected.

Other - Madrone burls are often extracted from lands within this watershed. It is also highly likely that illegal marijuana ("Cannabis") is cultured in this watershed.

3. Privately-Owned Timberlands

On Boise Cascade land, timber harvesting began to decrease in the 1980's, as the Company began dispersing harvest activities over newly acquired timberlands in Josephine and Jackson Counties. Currently, only a small portion of Boise Cascade ownership in the Elk Creek Watershed is entered, in any one year. The majority of Boise Cascade roads are native-surface and were designed for seasonal (summer) use. Currently, most Boise Cascade lands and roads are open to the public for recreation, hunting and fishing.

Historically, harvest prescriptions on Boise Cascade lands in the early 1970's consisted of salvage and selective harvesting. In the late 1970's and early 1980's, clearcuts were the main silvicultural prescription. In the mid and late 1980's, prescriptions were directed at removing the overstory tree layer. In the 1990's, prescriptions shifted to selective harvests applied in various size classes or by thinning from below to maintain structural diversity. The majority of the Boise Cascade ownership within the Elk Creek Watershed had been operated on by 1990. Current forest stand structure over most of the Company's ownership exists in multiple size, uneven-aged trees with a canopy closure of over 40%.

Medite typically harvests some portion of their land annually. The Company's present timber harvest program is lower than previous harvest levels. Medite presently has an active tree planting and stand-tending program, which includes precommercial thinning and other vegetation control treatments. Generally, the Medite road system is not open to public access, however road barriers and gates have not been constructed by the Company. Some of Medite's roads are behind Bureau of Land Management gates. Approximately 10% of the Medite road system is surfaced with rock, with the remaining 90% being un-surfaced.

4. Livestock Grazing

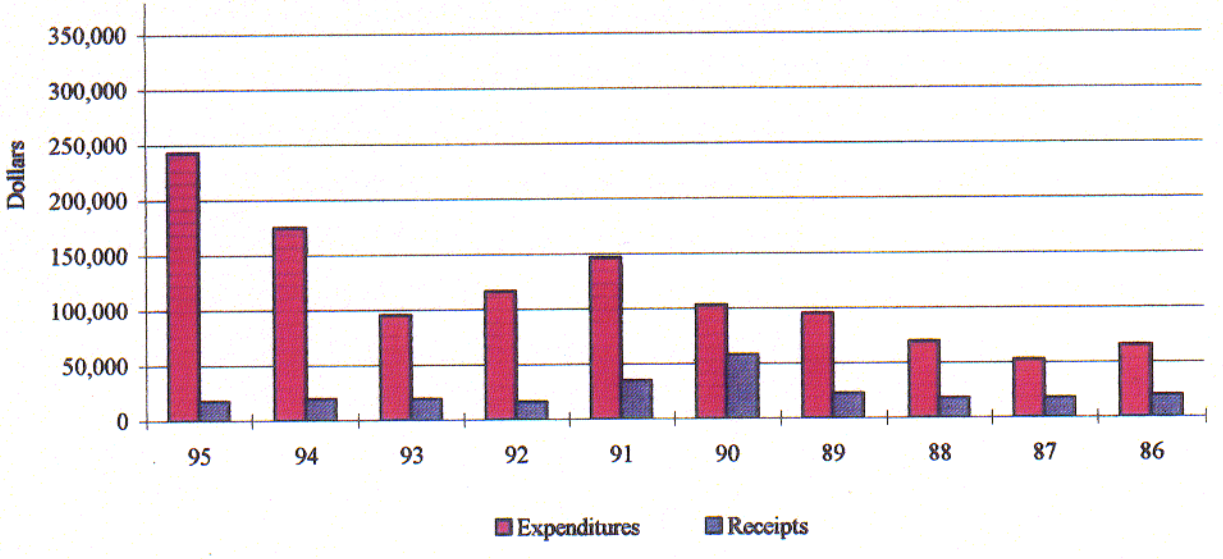
Since 1974, Boise Cascade has a lease agreement on 22,380 acres of land for grazing purposes with the Bureau of Land Management and Forest Service within the Elk Creek Watershed. Historically, these Federal Agencies had taken the lead in overseeing the livestock grazing program. However, in 1996, Boise Cascade began to take a more pro-active role in the grazing program. The Company began increasing monitoring efforts to determine how current grazing practices are affecting vegetation, water quality, fisheries and wildlife habitat. Currently, lower intensity, shorter duration grazing strategies within riparian areas are being tested and evaluated to determine vegetative responsiveness, especially critical to streambank stabilization.

Historically, Forest Service management objectives for the Whaleback, Butler Butte, and Buckrock Cattle & Horse Allotments (partially located with the Elk Creek Watershed) were maximum production and proper utilization of the forage resource on a sustained yield basis in correlation with multiple-use objectives. The Whaleback, Butler Butte and Woodruff Meadows (not located within the Elk Creek Watershed) Allotments originally formed a portion of the Elk Creek Allotment. The tabulated history of the Elk Creek Allotment started in 1907, with 130 head of cattle (see Appendix M for historic use information). In 1948, the Elk Creek Allotment was divided into several allotments. In 1984, the Butler Butte Allotment boundary was expanded to include all National Forest west of the allotment to allow for an increase in cattle utilization in previously harvested timber units and because cattle historically migrated to this area in the spring and late fall when moving from Bureau of Land Management to National Forest land. Historic Range Allotment Management Plans from the early 1950's to the late 1970's document management challenges related to lack of water developments resulting in underutilization, conifer encroachment into meadows, liver fluke infesting water sources, introduction of larkspur, wet areas occupied by water hemlock (which is poisonous to livestock), cattle trails blocked by windfall trees, the need for additional corrals, and a variety of administrative problems related to livestock permittee noncompliance. As of 1996, one operator is grazing 62 animals in Butler Butte Allotment between early June and late October. Two operators are grazing 60 cattle within the Whaleback Allotment between early July until late October.

Several of the livestock operators utilize both Bureau of Land Management and Forest Service administered lands. Four allotments administered by the Bureau of Land Management, including Lost Creek, Clear Creek, Sugarloaf and Flat Creek Allotment; all (except for Flat Creek) are only partially located with the Elk Creek Watershed. Map 27. displays the allotments located within the Elk Creek Watershed. In early spring and summer, 343 cattle are turned out in the lower elevation Bureau of Land Management lands, then as summer progresses, the majority of animals are moved to the higher elevations on National Forest land. One hundred and thirty-five cattle remain on Bureau of Land Management Land until mid-to-late October.

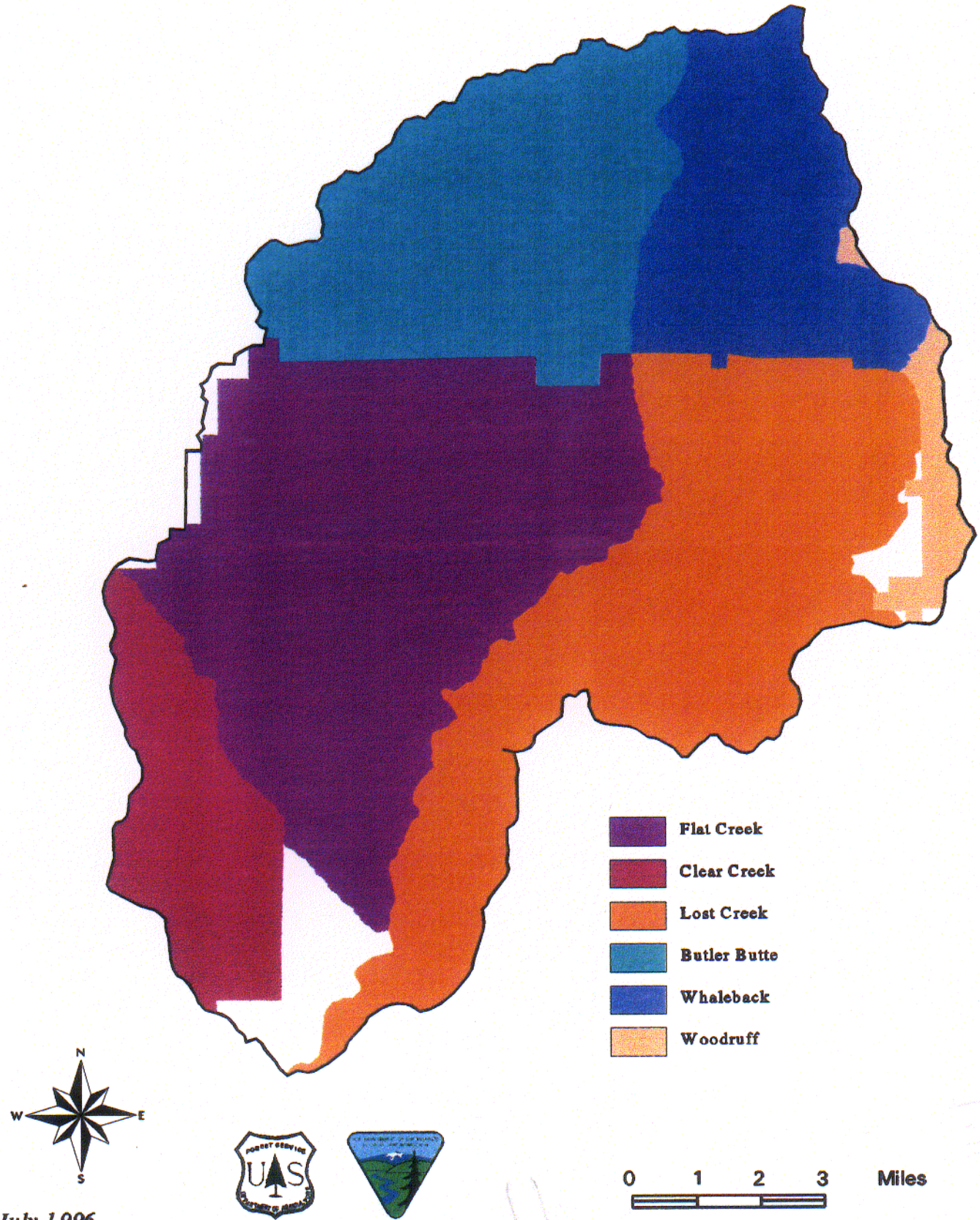
The majority of Federal lands within the Elk Creek Watershed are not primary rangeland. Rather, most of the land is used as transitory range, meaning forested areas with grazing opportunities. Past clearcutting (and associated activities such as landing and road construction) create short term foraging opportunities for livestock, elk and deer.

Figure 18. Medford Bureau of Land Management Grazing Program.



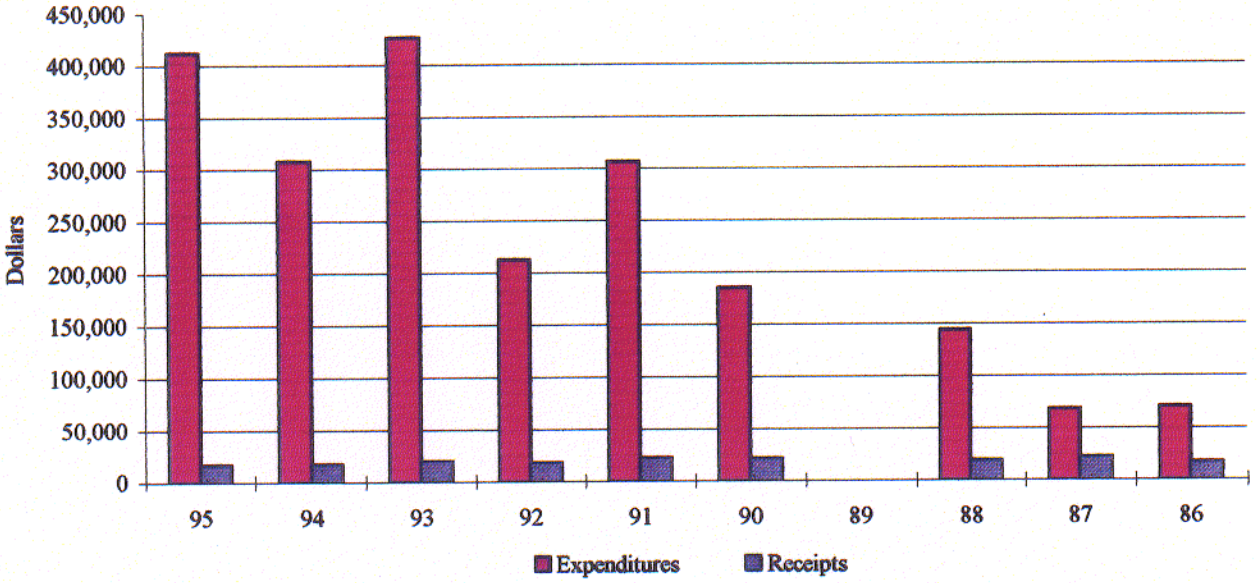
Elk Creek Watershed

Range Allotment Areas



July 1996

Figure 19. Rogue River National Forest Grazing Program.



In the mid 1980's, existing livestock control fences were removed to facilitate access for earth moving equipment associated with the initial construction of the Elk Creek Dam, thus allowing livestock access to Elk Creek. Presently, access to Elk Creek still exists. Due to the gentle terrain, water availability and moderate amounts of forage, livestock tend to settle along Elk Creek during the summer, well after proper utilization levels have been reached.

Noxious weeds such as yellow starthistle are out-competing more desirable forage grass and forbs species, especially along Elk Creek.

5. Fire Suppression/Facilities

Forest Service - There are two staffed lookouts that overlook the Elk Creek Watershed: White Point (State) and Halls Point (Forest Service). Rustler Lookout does not have a direct view into the Watershed, but a large fire could be detected from that location. Multiple "pumper shows" are scattered throughout Forest Service land within the Elk Creek Watershed. Primary fire engine coverage is by the Lost Creek Engine (State) and the Prospect Ranger District Engine (Forest Service). Back-up engines are located at Butte Falls (both State and Forest Service) and at Dodge Bridge (State).

Bureau of Land Management - Multiple "pumper shows" are also scattered throughout. Fire suppression is accomplished via a contract agreement by the Oregon Department of State Forestry for lands administered by the Bureau of Land Management, Army Corps of Engineers, Boise Cascade, Medite Timber Companies, as well as private landowners (residential).

6. Elk Creek Reservoir/Dam

The Elk Creek Reservoir was proposed as a multiple-purpose Rogue Basin flood-control project near river mile 3 on Elk Creek. The project was authorized by the Flood Control Act of 1962, as an Army Corp of Engineers project. The project as proposed for authorization would have been a rock and gravel embankment type dam about 2,670 feet long at the crest, and about 235 feet high above the streambed. The reservoir was designed to have a total storage capacity of 101,000 acre-feet at maximum pool elevation 1760 feet above mean sea level. Of this storage 95,000 acre-feet would have been usable for flood control, irrigation, fishery enhancement, water supply, and recreation.

Construction of the Elk Creek Dam began in the mid-1980's. Many properties in the lower Elk Creek valley were condemned and purchased. The land was cleared of houses and other buildings, and several miles of highway were built above the pool-level within the reservoir project area. With the massive earth and rock fill structure taking shape in 1988, environmental organizations (concerned about the dam's potential effect on the Rogue's salmon population) succeeded in halting further work by obtaining a Federal court injunction order. The disposition of the existing features associated with this project are currently being studied; final disposition is unknown at this time.

7. Recreational Use

The Elk Creek Watershed is not used intensively for recreational purposes, outside of deer hunting. Dispersed activities such as camping, hiking, horseback riding, fishing and hunting are projected at 1.3% increase per year in the number of participants on public lands (RPA, 1995). In the State of Oregon, dispersed activity participation is ranked in the following order: sightseeing (1), camping (4), fishing (6), hiking (7), hunting (9), mountain biking (16), and horseback riding (17), according to the State Comprehensive Outdoor Recreation Plan (Dec. 1, 1994).

There are two recorded dispersed campsites (Big Bear and Gravel Pit Campsites) and several non-monitored sites that are used during hunting season on public land. Approximately 10 miles of maintained trails exist within the Watershed. The Bitterlick Trail is categorized as "Most Difficult" because of steep grades and difficult stream crossings. The trailhead is on Boise Cascade land for 0.5 miles before entering National Forest. The trail is classified for motorized and hiker use. The Sugarpine Trail is categorized as "Easiest." It is available to hikers, horseback riders and mountain bikers.

Several special dispersed features exist within the Elk Creek Watershed including: Needle Rocks (unique geologic feature), Goodview Point (unique geologic feature), John's Camp (historic cattlemans camp) and Al Sarena Mine (a privately owned mine).

Bitter Lick trailhead on Forest Road 6620

ELK CREEK WATERSHED ANALYSIS

Rogue River Basin
Upper Rogue Subbasin

Butte Falls Resource Area - Medford BLM
Prospect Ranger District - Rogue River NF

SUMMARY

A rudimentary understanding of watershed scale processes and interactions is essential to assist Federal land managers in making ecologically sound management decisions. The Elk Creek Watershed Analysis report provides a description and evaluation of historic and current key disturbance agents and resources including: discussions of late-successional wildlife habitat, fisheries and aquatic habitat, hydrologic processes such as stream flows and climatic precipitation patterns, human uses, as well as vegetative conditions. Inter-relationships of how landform, elevation and natural and human caused influences have affected vegetative conditions, habitats, species viability and trends were assessed. The report also outlines options for future management and restoration activities on Federally administered lands within this watershed. This watershed analysis addressed all lands (public and private) within the analysis area.

The Elk Creek Watershed Analysis was conducted by a Federal Interagency Team working cooperatively. The team consisted of Forest Service (FS) and Bureau of Land Management (BLM) resource specialists, as well as resource skills from other groups and individuals. This team followed guidance contained in the Federal Guide for Watershed Analysis, Version 2.2, dated August 1995.

Characterization of the Watershed

The Elk Creek Watershed is located primarily within Jackson County. The remaining northern portion falls within Douglas County, Oregon. The approximate upper third of the Elk Creek Watershed is National Forest lands managed by the USDA Forest Service in a mostly contiguous block (T.31S.,R01W., and R.02E). Another approximate third is lands managed by the USDI Bureau of Land Management (T.32&33S., R1W., R1W., R1 & 2E) in a predominately "checkerboard" pattern. The south eastern approximate third is owned by timber companies and private individuals. Isolated, individual sections or portions of are managed by the U. S. Army Corps of Engineers and the State of Oregon.

Elk Creek is an 85,362 acre watershed in southwestern Oregon. It is tributary to the Rogue River at river mile 151.9. Elk Creek heads in the High Cascades physiographic province and flows through the Western Cascades Sub-province of the Cascade Geologic Province to its confluence with the Rogue River near Trail. Watershed elevations range from 1475 feet to 5500 feet. There are numerous tributaries to the Elk Creek, including the West Branch of Elk Creek (Lower Elk), Flat Creek (Elk Flat), Sugarpine Creek, Bitter Lick Creek, Upper Elk, and Button Creek (Elk Button).

The Elk Creek Watershed is designated under the Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan). The ROD describes management direction by land allocations, habitats and provides standards and guidelines to meet outlined objectives. The Elk Creek Watershed was defined as a "Tier 1", Key Watershed, which means this area is to be managed in such a way as to provide a refuge for maintaining and recovering habitat for at-risk stocks of anadromous fisheries.

Approximately 48,614 acres of Federal lands are designated as Late-Successional Reserve (LSR), intended to serve as habitat for Late-Successional related species. Two designated LSRs largely coincide with the boundary of the Elk Creek Watershed: LSR #RO 224 (BLM south half) and #RO 222 (FS north half). There are approximately 24,013 acres of Federal Riparian Reserves in the Elk Creek Watershed, intended to provide protection for aquatic systems and to provide dispersal habitat for late-successional species. The Matrix area encompasses approximately 2,074 acres on National Forest lands, which is where regulated timber harvest strategies can be applied. As merged with the Northwest Forest Plan, the Rogue River Land and Resource Management Plan further refines the Matrix to include Management Areas (MA) identified as Matrix 1 and 2 (MA 20 & 21) and Big Game Winter Range (MA 14).

The climate and summertime weather pattern is dominated by the Pacific high pressure. This high pressure then forces storms and associated moisture north of the watershed. Annual precipitation ranges from 35-60 inches. Precipitation is rare in summer months with the majority occurring from October to late May - early June. It is not unusual to have periods of up to 90 days with no precipitation occurring in the summer. When precipitation does occur, it is often in the form of thunderstorms. These storms are triggered as warm tropical (moisture laden) air from the southern Pacific clashes with the colder northern dry Pacific flows; the amount of moisture associated with these events is variable.

The streamflow regime of the Rogue River and tributaries is similar to its precipitation pattern. Runoff generally lags behind precipitation by about a month. Low flows normally prevail from July through September or October, the period of low precipitation. Demand for water for irrigation, stock watering and domestic use exceeds the amount of water available in the summer and often causes flows to be lower at downstream locations than higher up in the watershed. There are no natural ponds or lakes within the watershed.

The high flow period begins about mid-November and lasts generally through April. Stream flows during the months of May and June are augmented by melting snowpack. The historic extreme high flows have been produced by wet snows that accumulate early in winter in the elevation zone of 3,500 to 5,000 feet which tend to melt during prolonged warm rain storms. The water from the rainfall combined with that stored in the snow can produce extreme runoff or flood events.

Monitoring of water quality in streams is required before a stream can be termed water quality limited. To date, water quality monitoring efforts in the watershed have been data collection of summer temperatures on ten streams. Half of those monitored failed to meet the summer temperature standard and were therefore listed as water quality limited in July 1996 by the Oregon Department of Environmental Quality (DEQ). The DEQ has listed the following streams as water quality (temperature) limited: Bitter Lick from the mouth to headwaters, Elk Creek from mouth to Bitter Lick Creek, Hawk Creek from mouth to headwaters, Sugarpine Creek from mouth to headwaters, and West Branch Elk Creek from mouth to headwaters.

Near the mouth of Elk Creek lies the U.S. Army Corps of Engineers partially completed Elk Creek Dam. This project was proposed as one of the three dams comprising the Rogue Basin Project. The two completed dams are Lost Creek on the main stem of the Rogue River and Applegate on the mainstem of the Applegate River. The primary purpose of the dams was for flood control, with additional benefits of recreation, irrigation, water quality improvements, and domestic water supply. As of August 1996, the partially completed dam is blocking fish migration to the upper portion of the watershed. It is not currently known what the final disposition of Elk Creek Project will be.

The current vegetative condition of the Elk Creek watershed was derived from satellite imagery to provide consistent vegetative data for all land ownerships within the entire watershed. This imagery was used in this analysis to describe successional stages within the watershed. Approximately 18.2% can be described as late-successional (>24"Dbh, >40% crown closure), 39.8% as mature (17-24"Dbh, >40% crown closure), and 30.4% was classified as mature (11-17"Dbh, >40% crown closure). Approximately 3.1% is in open canopy (>11"Dbh,<40% crown closure), 6.2% is in an early stage, 2% is in a shrub stage, 0.9% is in a grass/forb stage and 0.3% is barren.

The vegetation is a patchwork of mature forests, clearcuts, partial cuts, and natural meadows in the upland portion of the watershed. The lower portion along Elk Creek is mainly farmland -- hay fields and pastures. Most of the land within the pool area of Elk Creek Reservoir was purchased by the Corps of Engineers and has lain vacant for about twenty years. The houses that once were within this area have been removed.

Forest fires have played a major role in creating the present-day landscape pattern by influencing vegetation type, age distribution and species composition. Historical fire return intervals range from 15 years at lower elevations to 35 years at the upper elevations. The more frequent the fire return interval was, the less intense the fire. Historically, multi-canopied stands were less common than is found today.

Timber harvesting and road construction in the higher elevations on public lands did not get underway (aside from several isolated units along the Civilian Conservation Corps (CCC) road to Huckleberry Lake near Abbott Prairie) until the 1960s. The 1962 Columbus Day windstorm, which blew over millions of board feet of timber in the upper Rogue Basin, spurred the construction of new roads into formerly remote areas. By the 1970s, many of these roads had been built along Bitter Lick Creek, Sugar Pine Creek, over Goodview Point to Neal Camp Burn, and elsewhere. By 1980, a relatively dense system of roads would throughout public lands. These roads were primarily of an aggregate surface type. Out of the 142 miles of roads within the Watershed, 5.16 miles are paved with asphalt, 27.53 miles are native (unsurfaced), and 109.05 are aggregate (See Map 23). Between this "new" road system and the "old" CCC-generated road network to the east of Swanson Creek, lies a remnant unroaded drainage designated as the "Bitter Lick Roadless Area" on National Forest land.

Since 1991, there has been a dramatic downturn in timber harvest levels and new road construction within Elk Creek Watershed. This was a result of a 1991 court-ordered halt of federal timber harvest within the range of the northern spotted owl and because of new management direction as outlined in the Northwest Forest Plan (1994). Prior to the Pacific Northwest Forest Plan, approximately 85% of the federally administered land was in allocations in which production of timber volume was allowed, scheduled and in some cases, was the primary goal. These land allocations emphasized full or partial yield timber management within the capability of the land management requirements of other resources.

The majority of Federal lands within the Elk Creek Watershed are not primary rangeland. Rather, most of the land is used as transitory range, meaning forested areas with grazing opportunities. Past clearcutting (and associated activities such as landing and road construction) creates short term foraging opportunities for livestock, elk and deer. Several of the livestock operators utilize both Bureau of Land Management and Forest Service administered lands. Four allotments administered by the Bureau of Land Management, including Lost Creek, Clear Creek, Sugarloaf and Flat Creek Allotment (except for Flat Creek) are only partially located with the Elk Creek Watershed.

A variety of anadromous and resident fish occur within the Elk Creek Watershed. Anadromous salmonid fish species that use Elk Creek and its tributaries for spawning and/or rearing are fall and spring chinook salmon, coho salmon, and winter and summer steelhead trout. Currently, Elk Creek supports a small percentage of returning adult anadromous salmonids in the Upper Rogue River. This is seen in the very low proportion of the runs which have returned to Elk Creek during those years especially coho and steelhead. Historically, however, it is estimated that returns to Elk Creek made up a much higher percentage. Historic estimates may not be highly accurate, however, they do provide some perspective as to the degree of change which has occurred in the number of returning anadromous salmonids to the Elk Creek watershed. Chinook escapement appears to approximate historic levels.

Management Recommendations for Public Lands

These recommendations are primarily applicable to any subsequent analysis within the Elk Creek Watershed. These could include the next version of Watershed Analysis, either on the watershed or subwatershed scale, the next version of Late-Successional Reserve Assessment (watershed or Reserve specific) and/or any further analysis done for specific projects. In many ways, these recommendations would assist in filling data gaps uncovered during this process.

- Future landscape assessment and/or project analysis should include field verification of stream classes, location and morphology, their order of importance related to need and restoration opportunities within the watershed, and their status related to providing for beneficial uses.
- Subsequent planning and analysis should continue to validate reforestation access needs, public access needs and access needs for fire management.
- Comprehensive (cumulative effects) analysis to evaluate the hydrologic condition of the watershed should be done at the subwatershed scale.
- Data that evaluates owl demographics should continue to be collected.
- Data should be collected to determine and prescribe the amount and distribution of large coarse woody debris and snag densities.
- When closing Maintenance Level 1 roads, review on a case-by-case basis the need for and effects of removing existing culverts.
- Update all Allotment Management Plans to assess the implications of the Northwest Forest Plan on the grazing program.
- Survey stream reaches every ten years or after 25 year flood events to determine changes and trends in aquatic habitat.
- Forest Service administered sections 1 & 11, and portions of sections 3, 13 & 15 in the Morine Creek area, (T.33S., R.1W., Jackson County), are recommended for re-allocation to LSR, where National Forest Land is contiguous with the LSR designation on BLM administered land. This may require an analysis and decision under NEPA.
- Complete Watershed Improvement Needs (WIN) inventory work to identify restoration needs related to existing roads.
- Resolve mapping discrepancies between Forest Service and Bureau of Land Management associated with big game winter range habitat.
- Work toward integrating Forest Service and Bureau of Land Management geographic information databases.

The following is a summary by Issue topic and the Findings for the Elk Creek Watershed, the implications of these findings, the underlying objective(s), and statements or listings of recommended management actions.

Anadromous Fish Habitat - Hydrology

Findings: Human activities and artifacts, such as the presence of roadways within floodplains, have tended to create straightened channels which provide little resistance to water movement. The cumulative effects associated with past human activities have resulted in a limited amount of high quality, well-distributed salmonid habitat and is likely to have reduced overall survival rates of cutthroat and steelhead trout. The result has been an overall increase in the velocity and quantity of water flows during and shortly after storm events, which periodically have dislodged debris jams, caused

channels to down-cut and become confined (some streams can no longer reach the original floodplain even during flood events), increased the quantity, size and distance suspended particles are being transported, and increased the severity of streambank erosion and associated amounts of soil deposition.

In addition, alterations and removal of riparian vegetation, particularly the harvest of overstory conifer trees, as well as activities associated with road building, grazing and rural development have caused a reduction in the amount and distribution of streamside shade and large woody debris, reduced bank stability, and modified the morphology of many channels. The way in which water is being captured, stored and released has been altered as a result of cumulative past human activities, primarily related to road building, timber harvesting, ranching and rural development. The result has been an increase in stream temperatures, occasional peaks in turbidity above natural rates, and increased rates and quantities of runoff and soil transport during and shortly after storm events, applicable to areas where runoff cannot infiltrate and becomes concentrated, primarily associated with impermeable road surfaces.

Recommendations: Restore anadromous fish habitat to increase survival rates by improving the abundance and quality of spawning gravels, deep pool habitat, side channels, overwintering habitat (channel structures and log jams which can shelter fish), while maintaining water temperatures and quality that can sustain multiple fish species within the Elk Creek Watershed. The following specific recommendations would allow progress toward these objectives:

- encourage the development of late-successional riparian vegetation which would be typical and expected within the Elk Creek Watershed, especially where overhanging cover and root structure is lacking or where streambanks are eroding,
- reduce surface erosion and channeling of runoff within floodplains by reducing or eliminating known, identified sediment sources,
- encourage water conservation to increase summer base flows,
- provide shelter/cover for juvenile salmonids in pools by creating debris structures, and protect fingerlings from traveling into water diversion channels by placing screens at diversion sites,
- slow down high water flow rates where feasible by placing large logs within channels, by creating side channels, and encouraging beaver colonization,
- restore slope-bound and alluvial valley stream segments to include low stream gradients with a high width-to-depth ratio and meandering side channels where feasible,
- encourage cooperative/voluntary participation of landowners, groups and agencies when planning and implementing watershed restoration projects within the floodplain of Elk Creek,
- protect known beaver habitat,
- remove obstructions to allow for fish migration for multiple fish species and life stages throughout the entire mainstem of Elk Creek by eliminating passage problems at all known human-created passage barriers,
- implement stream-specific recommendations for fisheries contained in the Aquatic Ecosystem Report, Appendix K,
- import and place large wood in stream channels where amounts are considered deficit, taking into consideration landform, stream gradient, and floodplain width,
- encourage the development of conifer dominated late-successional Riparian Reserves, especially in West Branch Elk Creek (BLM),
- enhance or develop side channels/riparian areas, especially along West Branch Elk Creek, Sugarpine Creek, Flat Creek, Bitter Lick Creek and on the mainstem of Elk Creek, where feasible, and
- Allow for the recovery of hydrologic conditions by maintaining Riparian Reserve widths as recommended by the Northwest Forest Plan. Conduct specific analysis that determines conditions to attain Aquatic Conservation Strategy objectives and coordinate with private land owners to encourage restoration on non-Federal lands.

Fire Risk - Reintroduction of Fire

Findings: The majority of the watershed is considered to be of moderate to high fire hazard (based on vegetative and climatic conditions, related to topography). Records of human and natural fire starts, which averages 14.5 starts per year, combined with known evidence of fire such as charred stumps, logs and snags, suggest that fire events will occur. However, when, where, at what intensity and to what extent is difficult to predict. The implementation of the Northwest Forest Plan will generally result in further increases in vegetative densities, increased amounts of ground fuels (depending on future management activities), and most likely, slower access for fire suppression vehicles caused by reduced road maintenance and road decommissioning.

The safe reintroduction of fire within the Elk Creek Watershed would be complicated by the exclusion of fire in most of the watershed which has resulted in large, continuous areas being characterized by moderate to heavy down fuels and densely growing, multi-layered vegetation, (increasing the difficulty and cost of containing controlled burns), the "checker board" ownership pattern in the southern half of the watershed, the presence of steep, rugged terrain which tends to preheat and dry vegetation and increases risk of escape. Increased implementation costs pose logistical challenges for providing safe holding/fire line sites, limited vehicle access (Bitter Lick Roadless Area), various vegetative types, some of which are highly flammable, limited funding and personnel, and restrictions placed on controlled burning associated with the Rogue River Smoke Management Plan, Oregon Smoke Management regulations and the Clean Air Act for air quality.

Recommendations: Protect values and resources associated with Late-Successional Reserves, the Tier 1 Key Watershed, public and private facilities and human life by:

- introducing controlled fire where fire risk and hazards are moderate to high and where protection of resources is most critical,
- applying fire in such a way as to maintain duff and litter by burning at a low to moderate intensity in a mosaic type pattern, which may include several repeated treatments. Recommend initiating fire hazard reduction activities in Fuel Models 8 & 10 (closed-canopy white fir and white oak), and
- by applying commercial thinning, precommercial thinning and pruning as methods to separate tree crowns and continuous fuels, along with treating slash (3 inches diameter plus). Slash treatments should occur soon after thinning activities are completed.

Late-Successional Conditions

Findings: The watershed is composed of 18.2 % late-successional forests, with 14,079 acres being located on public lands. Most late-successional forests tend to be located in irregularly-shaped patches scattered throughout the mid to upper elevations. Of the late-successional vegetation type on public lands, approximately 90% lies within the Late-Successional Reserve allocation.

An estimated 27,800 acres, or 32% is currently providing suitable habitat for the northern spotted owl on Federally administered lands. While it is not known what type of vegetative patterns and composition should exist in the designated Late-Successional Reserves to ensure the viability of 20 owl pairs (one of the goals of the LSR), it is recommended that the short-term objective (10 years) should be to maximize the extent of late-successional habitat. Although fifty-four historic owl sites were identified within the watershed in the last decade, populations have declined. The decline is thought to be due to the loss and fragmentation of suitable owl habitat.

Recommendations: Increase the amount and size of late-successional forest patches and vegetative conditions by:

- managing stands to develop multi-aged and multi-layered characteristics through thinning and uneven-aged management,
- maintaining oak woodlands,
- maintaining ponderosa and sugar pine components where historical or present occurrence is evident; apply density management around existing (large) ponderosa and sugar pines (BLM and FS) to maintain those components,
- experimenting with various silvicultural treatments in representative types to see how vegetation responds,
- on BLM lands; brushing and precommercial thinning stands in early-successional conditions to accelerate the development of late-successional characteristics (fire recommends accomplishing as early as possible to reduce fuels buildup). Of note are the Flat Creek, W.Branch Elk Creek, Timber Creek and the Burnt Peak Fire Area, and
- on FS administered land, considering opportunities for density management in "off-site" pine stands. Lack of species diversity, especially for sugar pine, may be a concern and an opportunity in the upper portions of the watershed.

Public Access

Findings: Federally appropriated road maintenance dollars and funding generated by commercial timber revenues have decreased drastically since the early 1980's, resulting in an inability to maintain Federally-administered roadways to current management standards. The result has been Maintenance Level 1 roads, which would normally be barricaded after activity use is completed, are accessible to vehicle traffic, some roadway signs have deteriorated, the need to seasonally close roads without the funding or people required to enforce restrictions, unregulated off-road vehicle use, sediment production related to rapid runoff and channeling of water along roadways, and the presence of hazard trees in proximity to roads that can threaten human safety for forest users.

Road densities by sub-watershed range from 2.24 to 7.29 miles per square mile. An estimated 57% of the watershed contains greater than 6 miles per square mile. The result of moderate to high road densities has been increased water discharge rates, peak flow quantities, and turbidity, straightening of stream channels, reduction in the number of side channels and increased deposition, and increased disturbance and poaching of black tail deer and elk.

Recommendations: Reduce the number of road miles accessible to vehicle use and associated maintenance costs on Federally-administered Maintenance Levels 1 and 2 roads by:

- decommissioning Maintenance Level 1 roads not needed for timber stand improvement, fire suppression access, or commercial activities (eventually ALL Level 1 roads should be considered for decommissioning within designated LSRs).
- applying and enforcing seasonal use restrictions,
- reducing maintenance level objectives or standards, where appropriate,
- designing future projects (such as timber sales) so that they permit or generate funding to accomplish or assist with road closing, constructing barricades and road decommissioning.

Reduce road-related soil transport, particularly within or in proximity to stream channels and floodplains by:

- repairing fillslopes, travelways, cutslopes, ditches and culverts where down-cutting, surface rutting, puddling, and other signs of erosion is occurring,
- limiting vehicular traffic during periods of wet weather on unsurfaced roadways, and
- relocating the Bitter Lick and Sugarpine Trailheads.

The Watershed Analysis Report (Table 14) contains specific recommendations for roads on National Forest Lands. The process for assigning Road Management Objectives has not been completed as of July 1996 for Bureau of Land Management administered roads. Future road review processes should consider opportunities to reduce road densities, especially when located on sidehills, lowland areas, or in big game winter range. In addition, the following criteria should be considered when determining future road decommissioning opportunities and priorities roads less than 0.5 miles in length, roads that include multiple stream channel crossings, roads in proximity to Riparian Reserves and stream channels, natural surfaced roads (versus surfaced), and roads located on geologically unstable terrain, or where constructed on soils with a high potential for erosion.

Grazing

Findings: Livestock grazing is not a major human enterprise within the Elk Creek Watershed and some of those who have permits with the Federal government, do so as a secondary source of income. The current costs and revenues associated with the grazing program for the Federal government are expected to continue into the future. Major resource effects resulting from livestock grazing and associated human practices such as diverting water for irrigation, development of pasture land, and road use include the spread of non-native plant species, alteration of stream-side vegetation and channels (causing increases in stream temperatures and sedimentation), and reduction of summer base flows in streams.

Preliminary utilization/distribution inventories indicate that some areas are being underutilized by cattle, while other areas are being over utilized. Typically, where water is available, utilization of forage is good. Where water is absent, utilization tends to be poor.

Recommendations: Regulate grazing practices to allow for good utilization of forage by:

- developing water sources to modify utilization patterns, in areas with poor utilization,
- increasing plant production by seeding with native, palatable plant species,
- decreasing the length of use, and controlling animal movement in underutilized areas,
- using grazing as a tool to control brush, prepare seed beds for planting, and as a way to obtain income from forested lands, and
- seeding along some roadsides and in strategic locations to increase available forage.

Criteria to consider as part of managing forest-range program within those allotments in Elk Creek Watershed should include physical and biological feasibility and consequences, economic feasibility, social acceptability, and operational practicality.

Timber Harvesting - Economics

Findings: While timber harvesting activities have significantly declined in the last five years, expenditures related to designing, implementing and administering timber sales have increased. The result has been a reduction in timber sale receipts which supported road maintenance, timber stand improvement activities such as precommercial thinning and reforestation, and other restoration or enhancement projects, decline in the amount of commercial timber volume supplied to local wood processing companies, decline in available public use firewood cutting areas, an overall trend of increased logging system costs, and limited opportunities for small logging enterprises.

Recommendations: Use timber harvesting/logging as a tool to manage vegetation to meet Matrix, Late-Successional Reserve, and Riparian Reserve land allocation objectives. Implementation should include:

- prioritizing efforts to encourage the development of new markets and products to maximize the value of small diameter material, and considerations for applying various silvicultural prescriptions which address multiple resource objectives (see Table 15.).

Elk Creek Watershed Analysis

Butte Falls Resource Area - Medford BLM

Prospect Ranger District - Rogue River N.F.

TABLE OF CONTENTS

I. INTRODUCTION

A. OBJECTIVE OF WATERSHED ANALYSIS ..... I - 1
B. HOW THIS ANALYSIS WAS CONDUCTED ..... I - 1
C. REPORT ORGANIZATION ..... I - 2
D. LANDSCAPE LOCATION OF ELK CREEK WATERSHED ..... I - 3
E. MANAGEMENT DIRECTION ..... I - 8
1. Late-Successional Reserves ..... I - 8
2. Riparian Reserves ..... I - 8
3. Matrix ..... I - 8
4. Special Designations ..... I - 11

F. WATERSHED ANALYSIS UPDATES AND REVISIONS ..... I - 11

II. CHARACTERIZATION OF THE WATERSHED

A. INTRODUCTION TO THIS CHAPTER ..... II - 1
B. GENERAL PHYSIOGRAPHIC CHARACTERIZATION ..... II - 1
1. Climate - Precipitation ..... II - 6

C. EROSION PROCESSES ..... II - 7
D. HYDROLOGIC CHARACTERISTICS ..... II - 10
E. STREAM CHANNEL CHARACTERISTICS ..... II - 16
1. Stream Segment Descriptions ..... II - 16

F. WATER QUALITY ..... II - 18
G. VEGETATION ..... II - 21
1. Series/Plant Associations ..... II - 21
2. Landscape Patterns ..... II - 26
3. Disturbance Process ..... II - 32
4. Plant Communities of Special Importance ..... II - 33
5. Plant Species of Concern ..... II - 34

H. FIRE ..... II - 36
1. Fire Behavior and Potential ..... II - 36
2. Historical Perspective ..... II - 37
3. Current Conditions ..... II - 37
4. Fuel Models ..... II - 37

I. AQUATIC SPECIES AND HABITAT ..... II - 41
1. Fisheries ..... II - 41
2. Distribution ..... II - 42
3. Passage Barriers ..... II - 43
4. Hatcheries ..... II - 45

5. Aquatic Invertebrates ..... II - 44
6. Stream Temperature and Aquatic Resources ..... II - 45
7. Non-Point Source Sedimentation ..... II - 45
8. Stream Sediment Potential from Roads ..... II - 45

J. TERRESTRIAL SPECIES AND HABITAT ..... II - 47

1. Northern Spotted Owl ..... II - 51
2. Big Game ..... II - 52
3. Other Game and Nongame Species ..... II - 54
4. Special Habitats ..... II - 54

K. HISTORIC HUMAN LAND USE ..... II - 55
1. Native American Use ..... II - 55
2. Euro-American Use ..... II - 55
3. Federal Land Management ..... II - 57

L. RECENT HISTORIC AND CURRENT HUMAN USES ..... II - 57
1. Commercial Use: Timber/Roads ..... II - 57
2. Special Forest Products ..... II - 61
3. Privately-Owned Timberlands ..... II - 61
4. Livestock Grazing ..... II - 62
5. Fire Suppression/Facilities ..... II - 64
6. Elk Creek Reservoir/Dam ..... II - 64
7. Recreational Use ..... II - 65

III. ISSUES AND KEY QUESTIONS

A. INTRODUCTION ..... III - 1

B. ANADROMOUS FISHERY ..... III - 1
1. Findings ..... III - 1
2. Population Trends ..... III - 2
3. Aquatic Habitat Status ..... III - 3
4. Reference Conditions ..... III - 7
5. Aquatic Habitat Trend ..... III - 7
6. Key Anadromous Fish Production Areas ..... III - 7

C. FIRE RISK AND MANAGEMENT ..... III - 9
1. Findings ..... III - 9
2. Current Fire Risk ..... III - 9
3. Effects and Feasibility of Reintroducing Fire ..... III - 10

D. GRAZING AND LOGGING ..... III - 12
1. Future Trend of Grazing in the Watershed ..... III - 12
2. Economic Status of the Grazing Program ..... III - 13
3. Future Trend of Logging ..... III - 14
4. Economic Status of the Timber Program ..... III - 14

E. LATE-SUCCESSIONAL VEGETATIVE CONDITIONS ..... III - 15
1. Findings ..... III - 15
2. Hydrologic Vegetative Condition ..... III - 17
3. Riparian Reserve Boundary Widths ..... III - 17

F. PUBLIC ACCESS ..... III - 20
1. Human Use ..... III - 20
2. Road Density ..... III - 20
3. Ability to Maintain Existing System ..... III - 20
4. Current Status of Hazard Trees Along Federally Maintained Roads ..... III - 23

IV. MANAGEMENT RECOMMENDATIONS

A. INTRODUCTION ..... IV - 1

B. GENERAL ANALYTICAL RECOMMENDATIONS ..... IV - 1

C. ACTIONS TO ADDRESS ISSUES ..... IV - 2
1. Anadromous Fish Habitat - Hydrology ..... IV - 2
2. Fire Risk - Reintroduction of Fire ..... IV - 3
3. Late-Successional Conditions ..... IV - 4
4. Public Access ..... IV - 5
5. Grazing ..... IV - 7
6. Timber Harvesting - Economics ..... IV - 8

D. MONITORING ..... IV - 9

E. INTEGRATED LANDSCAPE OPTIONS ..... IV - 10,-15

SYNOPSIS OF SPECIALISTS REPORTS CONTAINED IN APPENDICES

REFERENCES

GLOSSARY

LIST OF MAPS

1. State-Wide Vicinity Map ..... I - 3
2. Vicinity Map (½" = 1 mile) ..... I - 4
3. Subwatersheds and Streams ..... I - 5
4. Ownership/Management Responsibility ..... I - 7
5. Federal Land Allocations ..... I - 9
6. Late-Successional Reserves Network ..... I - 10
7. Special Designations ..... I - 12
8. River Mile Index ..... II - 1
9. Color Relief Map ..... II - 2
10. Geologic Rock Type Map ..... II - 4
11. Slope Class Map ..... II - 5
12. Annual Precipitation ..... II - 6
13. Erosion Risk ..... II - 9
14. Transient Snow Zone ..... II - 13
15. DEQ 303(d) listing: Water Quality Limited Streams ..... II - 20
16. Vegetative Condition Classes ..... II - 22
17. Plant Series ..... II - 23
18. 1948-49 Historical Vegetation Type Map ..... II - 27
18a. 1993 Satellite Imagery Vegetation Type ..... II - 28
19. Successional Stages ..... II - 31
20. Historic Large - Fire Locations ..... II - 38
21. Fire Occurrence: 1970 to Present ..... II - 39
22. Anadromous Fish Distribution ..... II - 44
23. Sensitive Soils and Roads ..... II - 46
24. Big Game Winter Range ..... II - 53
25. Historic Land Use ..... II - 56
26. Historic Federal Harvest Areas ..... II - 58
27. Range Allotment Areas ..... II - 63
28. Anadromous Fish Habitat Condition ..... III - 8
29. Fire Hazard Map ..... III - 11
30. Late Successional Stand Conditions ..... III - 16
31. Hydrologic Recovery by Subwatershed ..... III - 18
32. Perennial Fish Bearing Streams ..... III - 19
33. Road Density by Subwatershed ..... III - 21

LIST OF TABLES

1. Comparison of Suggested Format with Elk Creek Watershed Report Format..... I - 2
2. Acres of Ownership or Management Responsibility..... I - 6
3. Gaging Station - Flow Data..... II - 10
4. Vegetative Condition Classes for Elk Creek Watershed..... II - 21
5. Plant Series and Associations in Elk Creek Watershed..... II - 25
6. Elk Creek Watershed by Successional Stages..... II - 30
7. Vegetative Condition Classes within Riparian Areas..... II - 32
8. Rare Plant Species of Concern..... II - 34
9. Special Status Terrestrial Species Occurrence: Elk Creek Watershed.....II - 47,- 50
10. At-Risk Anadromous Salmonid Stocks Within the Elk Creek Watershed..... III - 2
11. Comparison of Gold Rey Dam and Elk Creek: Average Salmonid Counts..... III - 3
12. Comparison of Average Gold Rey Dam - Elk Creek: Salmonid Escapement Counts III - 3
13. Federal Timber Sales: Elk Creek Watershed, 1983 - 1996..... III - 14
14. Specific Road Recommendations for National Forest..... IV - 6, 7
15. Integrated Landscape Options..... IV - 10

LIST OF FIGURES

1. Watershed Percent by Ownership/Responsibility..... I - 6
2. Precipitation and Runoff Patterns..... II - 7
3. Average Monthly Discharge in Elk Creek, Near Trail..... II - 11
4. Average Monthly Discharge Three Mainstream Gaging Stations..... II - 11
5. Annual Runoff in Elk Creek, near Trail..... II - 12
6. Flow-Duration Curve for Elk Creek, near Trail..... II - 14
7. Elk Creek/Monthly Flow as a Percentage of Flow in Rogue River at Grants Pass.....II - 14
8. Physical Processes and Human Influences on Aquatic and Riparian Ecosystems..... II - 17
9. Maximum Temperatures in Elk Creek (1993-4)..... II - 19
10. Turbidity in Elk Creek, near Trail..... II - 19
11. Relative Potential for Vegetation Competition..... II - 26
12. Relative Difficulty of Reforestation..... II - 26
13. Comparison of Current and Historic Vegetation Types..... II - 29
14. Forest Service Timber Harvesting Activities..... II - 59
15. Bureau of Land Management Timber Harvest Activities..... II - 59
16. Medford District Bureau of Land Management Timber Program..... II - 60
17. Rogue River National Forest Timber Program..... II - 60
18. Medford BLM Grazing Program..... II - 62
19. Rogue River National Forest Grazing Program..... II - 6

III. ISSUES AND KEY QUESTIONS

A. INTRODUCTION

This Chapter presents the key elements of the Elk Creek Watershed ecosystem that are the most relevant to the management, human values and resource conditions. These elements were identified by the Line Officers. Many of the initial issues and questions developed by the Line Officers were found to be primarily associated with the Core Topics, and as such, are discussed in Chapter II of this document. Within this Chapter is a discussion on those issues that were found to be unique (i.e., not a Core Topic or Question). This was the process assumption that the Analysis Team used to prioritize the issues.

Key watershed Issues are focused on five main areas:

- **Anadromous Fishery**
- **Fire Risk and Management**
- **Grazing and Logging**
- **Late-Successional Vegetative Conditions**
- **Public Access**

The following discussions will (in a somewhat consistent format), define the issue, present the Key Question(s) associated with it and present the findings of the Watershed Analysis Team. Some of the information contained in Chapter II also supports the answers to Key Questions. Chapter IV presents recommendations and identifies management opportunities.

B. ANADROMOUS FISHERY

This issue relates to the status and trends of the anadromous fishery within the Elk Creek Watershed, which is a component of the Rogue River anadromous fishery. The presence of anadromous fish is the basis for this watershed being designated as a Tier I "Key Watershed" under the Northwest Forest Plan. Tier I Key Watersheds contribute directly to the conservation of at-risk anadromous salmonids, and resident fish species (ROD B-18) by providing for the production of naturally reproducing anadromous salmonids to a river system.

Key Questions:

- What is the current status and trend of anadromous salmonid populations in the watershed?

- What is the current status and trend of aquatic habitat within the watershed?

- What are the differences between current and historic habitat conditions?

- What are the opportunities to meet restoration objectives? (See Chapter IV)

1. Findings:

As anadromous salmonids ascend their spawning streams they become reproductively isolated from one another and form locally adapted populations, also referred to as stocks (Waples 1991). To qualify as being distinct, a stock must represent an evolutionarily significant unit of that species which 1) must be substantially reproductively isolated from other conspecific population units, and 2) must represent an important component in the evolutionary legacy of the species.

Of the 175 "at-risk" anadromous fish stocks that occur in Oregon which are listed by the Forest Ecosystem Management Assessment Team (FEMAT 1993 - Table V-C-3), three occur within this watershed (Table 10.). The reasons for these stocks becoming "at-risk" are numerous, with many being out of the control of Federal land

managers. These include ocean harvest, hydroelectric dams and diversions, and hatchery management (PACFISH 1993). Loss and degradation of freshwater habitats, however, are the most frequently cited factors responsible for this decline (FEMAT 1993, V-11). The greatest concern for Federal land managers is native anadromous populations and the alteration or degradation of freshwater habitats.

Table 10. At-risk Anadromous Salmonid Stocks Occurring Within the Elk Creek Watershed.

Species (Stock)	Nehlsen et al.	Nickelson et al.
Coho (Middle and Upper Rogue)		Depressed
Summer Steelhead Trout (Rogue)	Moderate Risk of Extinction	Depressed
Winter Steelhead Trout (Rogue)		Healthy

FEMAT 1993, Table V-11

Because of concern over the rapid decrease in the distribution and numbers of anadromous salmonids across their entire Pacific Northwest range, numerous groups have submitted petitions to list two of these species under the Endangered Species Act. These include; coho salmon petitioned for listing by Oregon Trout, the Pacific Rivers Council, and others in August, 1993 across their entire range in Washington, Oregon and California; and steelhead trout petitioned for listing by the Oregon Natural Resources Council in February, 1994 across their entire range in Washington, Oregon, Idaho, and California. Currently the National Marine Fisheries Service has proposed Southern Oregon/ Northern California coho and Klamath Mountains Province steelhead (summer and winter) for listing as threatened under the Endangered Species Act of 1974. Final rulings for both species are expected sometime in 1996 or 1997.

It is critical to realize that all of these fish species (petitioned or not) at various stages in their life cycles will either utilize the stream corridors in this watershed at different times of the year for varying lengths of time, or only under certain environmental conditions. Coho and steelhead will be found throughout the year in the watershed in either adult or juvenile form. This can result in the potential of having these species during different life stages being affected by the same set of external physical variables, impacts or actions regardless of their origin. These can vary in timing, duration or magnitude but could potentially impact generations of fish.

2. Population Trends

Very limited information is available on Elk Creek relating to current and historic adult escapement numbers and trends. The most recent data available is from ODFW's trap and transport program for 1993-1994 and 1994-1995, while the best historic data is from estimates from the Elk Creek Dam EIS (ACOE 1980). This data does not allow for establishing any trends for recent years, but does allow for some comparison of current and historic adult escapement in Elk Creek and its relationship with the Upper Rogue River.

Currently, Elk Creek supports a small percentage of returning adult anadromous salmonids in the Upper Rogue River. This trend is seen in the very low proportion of the runs which have returned to Elk Creek , especially coho and steelhead (Table 11). Historically, however, it is estimated that returns to Elk Creek made up a much higher percentage (Table 12). Historic estimates may not be highly accurate, however they do provide some perspective as to the degree of change which has occurred in the number of returning anadromous salmonids to the Elk Creek watershed. Reasons for the disparity in current and historic coho and steelhead escapement numbers are complex, with a variety of single or interacting factors mentioned previously in this document, playing roles. Chinook escapement appears to approximate historic levels.

Table 11. Comparison of Gold Rey Dam and Elk Creek Average Anadromous Salmonid Counts for the 1993-1994 and 1994-1995 Return Years

	Years	Chinook	Coho	Steelhead
Gold Rey Counting Station	1993-1994, 1994-1995	14,605	7,086	8,685
Elk Creek Counting Station	1993-1994, 1994-1995	25	187	166
Approx. Average Percent of Upper Rogue Fish Returning to Elk Creek	1993-1994, 1994-1995	0.2%	3%	2%

Table 12. Comparison of Average Gold Rey Dam Anadromous Salmonid Counts 1942-1994 and Estimated Average Elk Creek Anadromous Salmonid Escapement for the 1993-1994 and 1994-1995 Return Years

Counting Station	Years	Chinook	Coho	Steelhead
Gold Rey Counting Station	1942-1994	17,664	2,176	7,721
Elk Creek Counting Station	Estimated Using USACE Elk Creek Dam EIS 1980 and Unofficial 1992 ODFW Estimates	<250	1,000	3,000
Estimated Average Percent of Upper Rogue Fish Returning to Elk Creek		1%	46%	39%

3. Aquatic Habitat Status

Recorded stream surveys were conducted in the Elk Creek watershed in 1965, 199, and 1994 to assess aquatic condition based on key aquatic features as they were defined for these time periods. The use of the 1965 survey in this analysis is limited to determining the general condition of the stream based on a qualitative narrative description.

The 1965 aquatic survey was conducted on February 18 and 19, and focused primarily on spawning areas, quality of spawning substrate, stream cover and limiting factors, primarily log jams, falls and beaver dams, which were considered obstructions or passage barriers. The 1991 and 1994 aquatic surveys were conducted in April and May in 1991 and August in 1994 based on ODFW stream survey methodology (ODFW 1991, ODFW 1994).

Streams surveyed in 1965 which were surveyed in 1991 or 1994 were Elk Creek mainstem from Flat Creek to 5.75 miles upstream, West Branch Elk Creek to 4.5 miles upstream, Sugarpine Creek to 3.0 miles upstream, Hawk Creek to 1.5 miles upstream and Bitter Lick Creek to 2.5 miles upstream. Streams surveyed in 1965 which have not been recently surveyed are Dodes Creek to 0.75 miles upstream and Elkhorn Creek to 0.75 miles upstream. Complete descriptions of inventory results are contained in Appendix K.

a) Elk Creek (Mainstem above Flat Creek)

1965: The survey was conducted in February and indicated that habitats were dominated by riffles (roughly 88%) with substrates dominated by cobbles, bedrock and boulders. Some deep pools were identified, however, the area of these was not recorded and they appear to be infrequent. In general, it appears that little large wood was present (no debris jams identified), spawning substrate was marginal and not abundant, and few deep pools were present. Information on side channels was not recorded, so the abundance of these features cannot be concluded. Although this survey is very qualitative and does not give standards for habitat quality it does point to this area as having somewhat limited quality salmonid habitat.

1991 and 1994: The survey indicated that aquatic habitats were dominated by scour pools (42%), with an average residual depth of 0.4 m. Twenty pools ≥1.0 m in depth were found in the survey reach. Riffles accounted for 35% of the habitat area, and had primary substrates of cobbles (33%) and gravel (22%). Silt, sand and organics in riffles was 12%. Stream substrate throughout the survey was composed predominantly of bedrock (29%) and cobbles (28%). Secondary channels made up 4% of the total habitat area.

Comparison of 1965 and 1991, 1994 Surveys. The discrepancy in habitat distribution (i.e. riffle dominated 1965, scour pool dominated 1991) is likely due to the winter survey in 1965, the spring survey in 1991 and summer survey in 1994. The higher winter flows in this larger stream would produce more riffle habitat. Stream substrates, large wood abundance, spawning gravel quality and abundance, and deep pool frequency appear similar for both surveys. Since survey results appear to be similar, it could be concluded that this section of Elk Creek is likely to have been in fair condition for at least the last 30 years.

Summary: Large wood pieces ranged between 0.4 and 4.5/ 100 m, with wood volume ranging from 0.8 - 6.8 m³/100 m. The average wood complexity rating was 1, indicating that woody debris was absent or very low in abundance, and contributing little to habitat complexity or cover. Boulders ≥0.5 m in diameter appear to be the dominant instream cover/ structure feature totaling 2,725 for the survey reach. The greatest boulder densities and numbers generally occur in rapids and riffle habitat units, although 25% of the total number are found in pool habitats. Overall conditions in the mainstem of Elk Creek above Flat Creek would be considered fair with respect to current ODFW aquatic habitat benchmarks.

b) West Branch Elk Creek

1965: The survey indicated that habitats were dominated by riffles (roughly 81%) with substrates dominated by bedrock, cobbles and boulders. Some deep pools were identified in the first 0.25 miles and appear to be well distributed. The remainder of the survey identified few deep pools, and they appear to be infrequent. In general, it appears that little large wood was present (no debris jams identified), spawning substrate was marginal and not abundant, and few deep pools were present. Information on side channels was not recorded, so the abundance of these features cannot be concluded. Although this survey is very qualitative and does not give standards for habitat quality it does point to this area as having somewhat limited quality salmonid habitat.

1991: Aquatic habitats were dominated by rapids (56.8%). Riffles accounted for 14.6% of the habitat area, and had primary substrates of cobbles (55%) and gravels (19%). Silt, sand and organics in riffles is 2% or less. Scour pools comprise 11% of the habitat area and had an average residual depth of 0.55 m. Stream substrate throughout the survey was composed predominantly of cobbles (41%) and bedrock (27%). Secondary channels made up 11% of the total habitat area.

Comparison of 1965 and 1991 Surveys: Habitat distribution for both surveys is similar (i.e. riffle and rapid dominated). The discrepancy in survey seasons (winter 1965, spring 1991) appeared to have had little influence on habitat type identification. This is likely due its smaller size. Stream substrates, large wood abundance, spawning gravel quality and abundance, and deep pool frequency appear similar for both surveys. Since survey results appear to be similar, it could be concluded that this section of West Branch Elk Creek is likely to have been in good condition for at least the last 30 years.

Summary: Large wood pieces ranged between 0.33 and 5.1/ 100 m, with wood volume ranging from nearly zero to 5.8 m³/100 m. The average wood complexity rating was 1.2, indicating that woody debris was absent or very low in abundance and not adding to habitat complexity or cover. Boulders >0.5 m in diameter were the dominant instream cover/ structure feature and totaled 7,112 for the reach. The greatest boulder numbers and densities occurred in high gradient units (cascades, rapids, falls and riffles), with 7% of the total number occurring in pool habitats. Overall conditions in West Branch Elk Creek would be considered good with respect to current ODFW aquatic habitat benchmarks.

c) Flat Creek

1965: The survey indicated that habitats were dominated by riffles (roughly 88%) with some cascades and falls (3-8 feet all passable at high water) and appears to have substrates which are dominated by bedrock, boulders and cobbles. Two long pools were identified between mile 0.75 and 1.0. The rest of the survey reach appeared to have few pools. In general, it appears that little large wood was present (no debris jams identified), spawning substrate was marginal and not abundant, and few deep pools were present. Information on side channels was not recorded, so the abundance of these features cannot be concluded. Although this survey is very qualitative and does not give standards for habitat quality it does point to this area as having limited quality salmonid habitat.

1991: Aquatic habitats were dominated by rapids (66%). Riffles accounted for 11% of the habitat area, and had primary substrates of cobbles (64%) and gravels (14%). The width to depth ratio for riffles was 18. Silt, sand and organics in riffles was less than 1%. Scour pools composed 12% of the habitat area and had an average residual depth of 0.45 m. Stream substrate throughout the survey was composed predominantly of cobbles (41%) and bedrock (32%). Secondary channels made up 4% of the total habitat area.

Comparison of 1965 and 1991 Surveys: Habitat distribution for both surveys is similar (i.e. riffle and rapid dominated). The discrepancy in survey seasons (winter 1965, spring 1991) appeared to have had little influence on habitat type identification, probably due to the small size of the stream. Stream substrates, large wood abundance, spawning gravel quality and abundance, and deep pool frequency appear similar for both surveys. Since survey results appear to be similar, it could be concluded that this section of Flat Creek is likely to have been in fair condition for at least the last 30 years.

Summary: Large wood pieces ranged between 0.6 and 1.4/ 100 m, with wood volume ranging from 0.3 to 7.3 m^3/100 m. The average wood complexity rating was 1.1, indicating that woody debris was absent or very low in abundance and adding little to habitat complexity or cover. Boulders $\geq$0.5 m in diameter were the dominant instream cover/ structure feature and totaled 4,569 for the reach. The greatest boulder numbers and densities generally occurred in high gradient units (cascades, rapids, falls and riffles), with 7% of the total number occurring in pool habitats. Overall conditions in Flat Creek would be considered fair with respect to current ODFW aquatic habitat benchmarks.

d) Sugarpine Creek

1965: The survey indicated that habitats were dominated by riffles (roughly 78%) with numerous cascades noted. Dominant substrates appear to be bedrock, boulders and cobbles. No deep pools were identified and overall pools appear to be infrequent. One debris jam was noted to be building up between the 1.25 and 1.5 mile mark on an old bridge just below the confluence of Hawk Creek. Good amounts of useable spawning gravel were noted above this area and were the highest for the entire survey. Throughout the rest of the survey spawning substrate was marginal and not abundant. Information on side channels was not recorded, so the abundance of these features cannot be concluded. Overall it appears that this stream has somewhat limited salmonid habitat.

1991: Aquatic habitats were dominated by rapids (58%). Riffles accounted for 14% of the habitat area, and had primary substrates of cobbles (52%) and bedrock (25%). The width to depth ratio for riffles was 22.1. Silt, sand and organics in riffles was less than 1%. Scour pools composed 11% of the habitat area and had an average residual depth of 0.55 m. Stream substrate throughout the survey was composed predominantly of bedrock (41%) and cobbles (35%). Secondary channels made up 6% of the total habitat area.

Comparison of 1965 and 1991 Surveys: Habitat distribution for both surveys is similar (i.e. riffle and cascade dominated). The discrepancy in survey seasons (winter 1965, spring 1991) appeared to have had little influence on habitat type identification, probably due to the small size of the stream. Stream substrates, large wood abundance, spawning gravel quality and abundance, and deep pool frequency appear similar for both surveys. Since survey results appear to be similar, it could be concluded that this section of Sugarpine Creek is likely to have been in fair condition for at least the last 30 years.

Summary: Large wood pieces ranged between 0.0 and 0.4 pieces/ 100 m, with wood volume ranging from 0.06 to 1.3 m^3/100 m. The average wood complexity rating was 1.2, indicating that woody debris was absent or very low in abundance and not adding to habitat complexity or cover. Boulders $\geq$0.5 m in diameter were the dominant instream cover/ structure feature and totaled 3,021 for the reach. The greatest boulder numbers and densities generally occurred in high gradient units (cascades, rapids, falls and riffles), with 9% of the total number occurring in pool habitats. Overall conditions in Sugarpine Creek would be considered fair with respect to current ODFW habitat benchmarks.

e) Hawk Creek

1965: The survey indicated that habitats were dominated by riffles (roughly 82%) with cascades and small falls noted. It appears that substrates are dominated by bedrock with some cobbles and gravels. Some deep pools were identified but appear to be infrequent. In general, it appears that little large wood was present (no debris jams identified), spawning substrate was marginal at best and not abundant, and few deep pools were present. Information on side channels was not recorded, so the presence or absence of these features cannot be concluded. Overall it appears that this stream has somewhat limited salmonid habitat.

1991: Aquatic habitats were dominated by rapids (72%). Riffles accounted for 9% of the habitat area, and had primary substrates of cobbles (52%) and bedrock (33%). Width to depth ratio for riffles was 13.9. Silt, sand and organics in riffles was less than 1%. Scour pools composed 8% of the habitat area and had an average residual depth of 0.5 m. Stream substrate throughout the survey was composed predominantly of bedrock (61%) and cobbles (23%). Secondary channels made up 0.3% of the total habitat area.

Comparison of 1965 and 1991 Surveys: Habitat distribution for both surveys is similar (i.e. riffle and cascade dominated). The discrepancy in survey seasons (winter 1965, summer 1991) appeared to have had little influence on habitat type identification. Stream substrates, large wood abundance, spawning gravel quality and abundance, and deep pool frequency appear similar for both surveys. Since survey results appear to be similar, it could be concluded that this section of Hawk Creek is likely to have been in fair condition for at least the last 30 years.

Summary: One large wood piece was counted in the survey. The average wood complexity rating was 1.0, indicating that woody debris was absent or very low in abundance and not adding to habitat complexity or cover. Boulders $\geq$0.5 m in diameter were the dominant instream cover/ structure feature and totaled 619 for the reach. The greatest boulder numbers and densities generally occurred in high gradient units (cascades, rapids, falls and riffles), with 5% of the total number occurring in pool habitats. Overall conditions in Hawk Creek would be considered fair with respect to current ODFW aquatic habitat benchmarks.

f) Bitter Lick Creek

1965: The survey indicated that habitats were dominated by riffles (roughly 93%) and appeared to have substrates dominated by cobbles and boulders. Some deep pools were identified in the lower 0.5 miles and appear to be fairly regular. Most of the quality spawning habitat was also found in the lower 0.5 miles. In general, the rest of the survey reach appeared to have few pools, little large wood (no debris jams identified), and spawning substrate which was marginal and not abundant. Information on side channels was not recorded, so the presence or absence of these features cannot be concluded. Although this survey is very qualitative and does not give standards for habitat quality it does point to this reach as having areas of good salmonid habitat among a majority of limited quality salmonid habitat.

1994: Aquatic habitats were dominated by riffles (72%) (Figure 2), and had primary substrates of cobbles (29%) and gravels (29%). The riffle width to depth ratio was 19.5. Silt, sand and organics in riffles was 2%. Scour pools accounted for 21% of the habitat area, and had an average residual depth of 0.4 m. Eight pools $\geq$1.0 m in depth were found in this reach (Figures 3a-3c). Stream substrate throughout the survey was composed predominantly of cobbles (29%) and gravels (29%) (Figures 4a-4c). Secondary channels made up 8% of the total habitat area.

Comparison of 1965 and 1994 Surveys: Habitat distribution for both surveys is similar (i.e. riffle and cascade dominated). The discrepancy in survey seasons (winter 1965, summer 1994) appeared to have had little influence on habitat type identification. Stream substrates, large wood abundance, spawning gravel quality and abundance, and deep pool frequency appear similar for both surveys. Since survey results appear to be similar, it could be concluded that, overall, this section of Bitter Lick Creek is likely to have remained in good condition for at least the last 30 years.

Summary: Three hundred and twenty-three large wood pieces were found, amounting to 9.3 pieces / 100 m, with wood volume amounting to 20.1 m^3/100 m (Figures 5a-5c). The average wood complexity rating was 1.7, indicating that woody debris was absent or very low in abundance and adding little to habitat complexity or cover. Boulders $\geq$0.5 m in diameter are another dominant instream cover/ structure feature and totaled 654 for the reach (Figures 6a-6c). The greatest boulder densities and numbers generally occurred in rapids and riffle habitat units, although 21% of the total number were found in pool habitats. Overall conditions in Bitter Lick Creek would be considered good with respect to current ODFW aquatic habitat benchmarks.

4. Reference Conditions

No recorded information for the Elk Creek watershed existed prior to Euro-American settlement and no recorded information was found relating to reference conditions. It could be speculated that habitat conditions were drastically different than they are today or were thirty years ago. Pre-historic streams would be expected to have a greater numbers of pieces and total volume of wood in the streams. As seen in the historic vegetation types shown on Map 18., a larger percentage of the watershed was in a late-successional condition. Under this condition, fires and high fire frequency in the watershed would have been the primary mechanism for delivery of large wood to streams. Beaver activity would be expected to be higher, as would the total area of side/ secondary channels. This would equate to greater diversity and stability of aquatic habitat throughout the Elk Creek watershed.

Reasons for the current condition are numerous, and cannot be targeted to one source. These sources are generally not well documented for this watershed, but can be inferred from common historical land use and settlement practices which took place throughout much of the Pacific Northwest. The combination of initial land clearing and development, initial road construction, timber harvest, active removal of large wood debris jams, floodplain settlement, wetlands drainage, beaver trapping, and removal of beaver dams may have all played roles in simplifying aquatic habitat in the Elk Creek Watershed.

5. Aquatic Habitat Trend

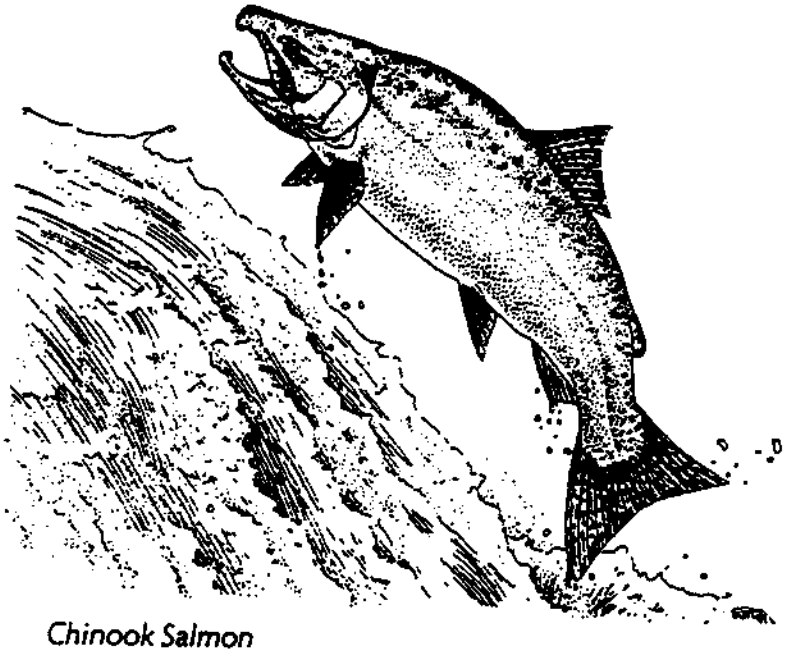
Currently, the best portions of Elk Creek in terms of salmonid habitat, are the West Branch Elk Creek, Bitter Lick Creek and Button Creek , although Button Creek receives limited anadromous salmonid use due to natural barriers.

From the available data, it appears that aquatic habitat has remained in either fair or good condition in this watershed over the last thirty years. It would be expected that trends on Federal lands should improve over the long term, through an emphasis in maintaining or creating late-successional characteristics in riparian areas and greater riparian protection. It is uncertain, however, when these benefits will be detectable at the watershed scale.

Map 28. shows the current aquatic habitat conditions for anadromous species of fish in the Elk Creek Watershed.

6. Key Anadromous Fish Production Areas

Using the total number of juvenile salmonid emigrants from a watershed, is one means by which to assess the production of anadromous salmonids throughout a watershed. Based on ODFW 1995 data, the most productive portions of the Elk Creek watershed for steelhead/trout are Berry, Alco and Middle Creeks. Additionally, West Branch Elk Creek produced relatively large numbers of steelhead/trout, though at lower levels than the streams mentioned previously. The West Branch Elk Creek and Sugarpine Creek appear to be the most productive for coho salmon.

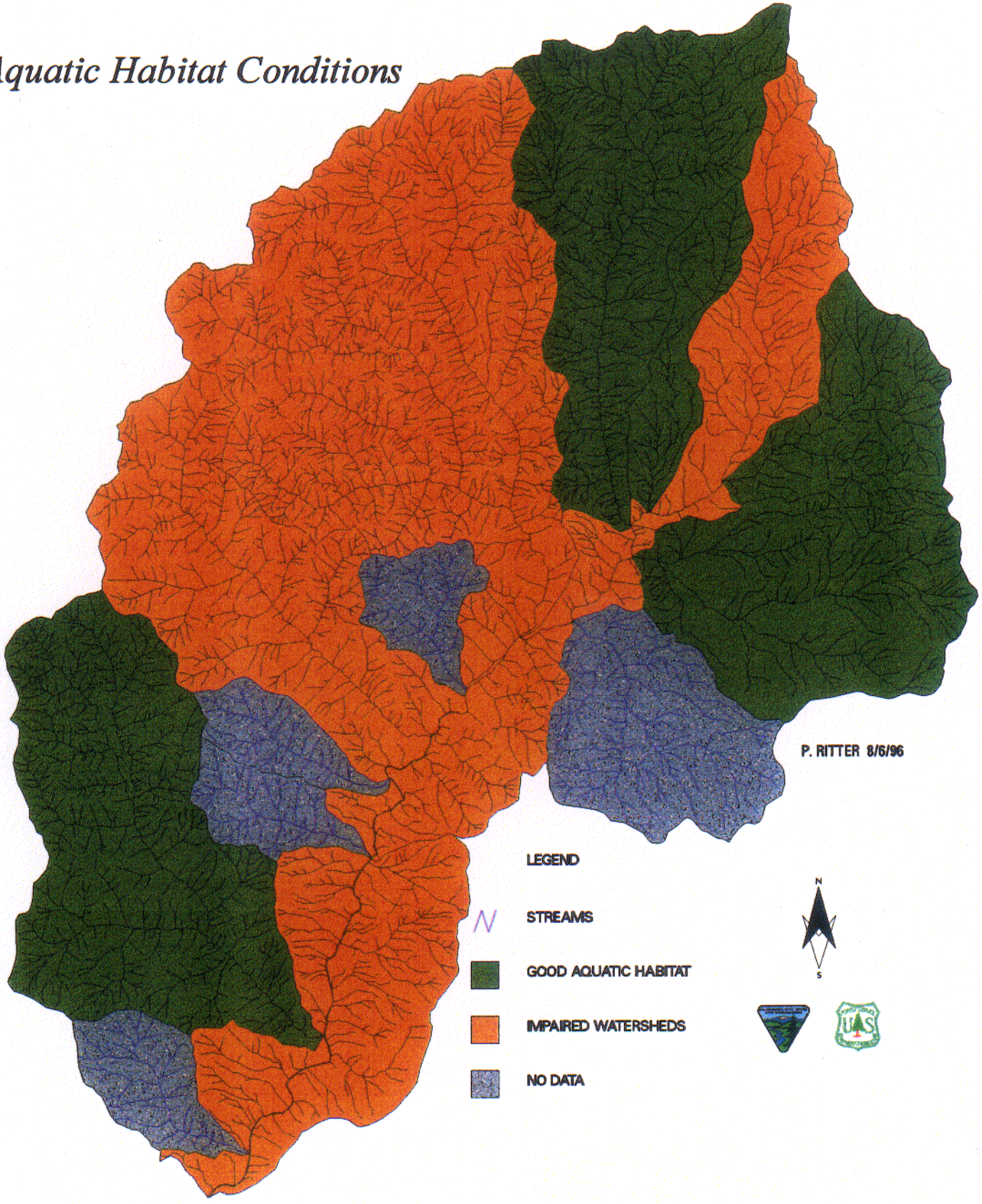


Chinook Salmon

Elk Creek Watershed

MAP 28

Aquatic Habitat Conditions



C. FIRE RISK AND MANAGEMENT

This issue relates to the historical fire event status and trends for fire within the Elk Creek Watershed. In addition to an analysis of the previous and current conditions, the Line Officers ask for some insight into the effects and feasibility of reintroducing fire into this ecosystem.

Key Questions:

-How has fire historically influenced this ecosystem?

-Is the current condition posing an unacceptable risk?

-What would be the effect of reintroducing fire into this ecosystem?

-What is the feasibility of reintroducing fire into this ecosystem?

1. Findings

Fire has had a tremendous impact on shaping the vegetation type and age distribution within the watershed. Historical fire return intervals range from 15 years at lower elevations to 35 years at the upper elevations. The more frequent the fire return interval, the less intense the fire was. Multi-canopied stands were less common than is found today. Multi-canopied stands have the greatest potential for catastrophic crown type fires. These types of fires greatly increase the potential for erosion and impaired water quality.

Because of past frequent fires, fuels did not traditionally build up to current levels; thus the potential for stand replacement type fires is much greater today than in years past. This trend will continue until one of two things occurs:

1) Direct intervention in the form of a managed fuel treatment program.

2) Large stand replacement fire occurrence.

2. Current Fire Risk

To determine risk, fire starts from both natural and human caused fires were examined. Fires that originated entirely within the watershed were analyzed, as well as those that had the potential to spread into the watershed from adjacent areas. Because fires don't recognize boundaries, they will move across landscapes and from one watershed into another. In the upper reaches of the watershed by far the primary source of ignitions is lightning. Human caused ignitions increase as one moves closer to the valley floor. The rate of occurrence remains constant through the elevation bands. In the 25-year period that was examined (1970-95), there was an average 8.5 fire starts per year within the confines of the watershed. When fire starts that occur adjacent to and threaten the watershed are added to this figure, the average is 14.5 fire starts per year. This watershed would rate as a moderate to high risk when evaluated against interior valley vegetation types, such as those occurring in the lower reaches of this watershed. When the Elk Creek Watershed is evaluated against overall Cascade vegetation types, it would rate as one of the higher hazard areas.

The Key question was stated "Is the current condition posing an unacceptable risk?" The short answer is probably not; however that answer assumes that there will not be several more years of drought or a severe lightning storm such as the storm of 1987. This watershed has missed two to three fire cycles which has allowed greater fuels accumulations than would occur within the range of natural variability. There certainly is potential for a 10,000+ acre fire to occur. While this may not be an unacceptable risk it certainly poses a significant threat to water and air quality and is not necessarily consistent with the management goals of a Late-Successional Reserve. It is important to remember that fuel profiles are dynamic. The risk will continue to escalate over time. Eventually fuel loadings will build to a level that fire suppression is all but impossible. The question is really one of when and how do Federal agencies spend money? Up front to reduce fire intensities and minimize resource damage or during suppression efforts, or after the fire has caused major damage to the site and rehabilitation is necessary?

a) Fire Behavior

There is a discussion of flame lengths in the fire section of Chapter II, associated with fuel models. Flame length is directly linked to our ability to suppress a wildfire. The following is a description of suppression requirements and associated hazard ratings based on flame lengths:

LOW: Flame lengths < 4 feet - fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire. Example: FM 8, 11

MODERATE: Flame lengths of 4 - 8 feet - fires are too intense for direct attack on the leading edge by persons using hand tools. Hand line cannot be relied on to hold fire. Equipment such as bulldozers, pumpers, and retardant aircraft can be effective. Example: FM 10,6

HIGH: Flame lengths > 8 feet - Fires may present serious control problems, such as spotting, torching trees, and crown fires. Control efforts at the head of the fire will probably be ineffective. Example: FM 4, 12

Although flame lengths are one of the primary measures used to define hazards, it should be noted that some fuel models will have low flame lengths but extremely high rates of spread. For example, on steep slopes the grass fuel models may exceed 6600 feet of spread per hour. This exceeds the ability of hand crews or equipment for direct attack without air support. The information on flame lengths was developed using relatively flat ground. Steeper slopes will increase flame lengths and fire behavior. The fuel model layer provides the link to fire behavior predictions, which links to hazard assessment on the landscape basis. This hazard allocation is then linked to risk and resource values.

Map 29. shows Fire Hazard for the Elk Creek Watershed, developed for this analysis. Hazard ratings were determined as follows: a point value was assigned to slope class, aspect and vegetation type (fuel model). Each of these classes were then mapped according to vegetation information derived from satellite imagery. These layers were combined and their associated values were then totaled and values were assigned to the three categories of hazards. Using this methodology, the following acres were assigned, by Hazard class:

High Hazard: **43,220 acres**	Moderate Hazard: **39,710 acres**	Low Hazard: **2,432 acres**

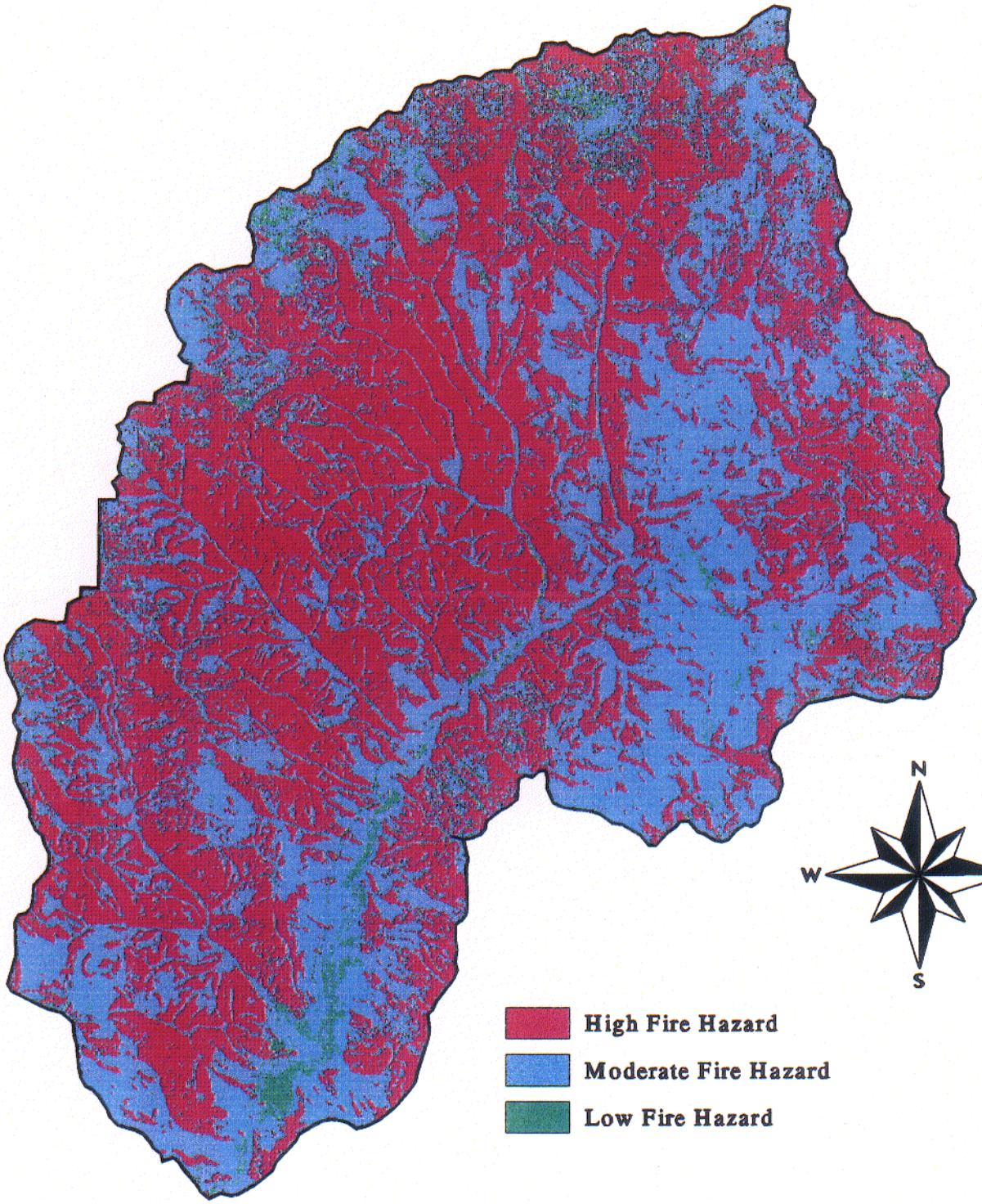
3. <u>Effects and Feasibility of Reintroducing Fire</u>

The Key Question here is "What would be the effect of reintroducing fire into this ecosystem? Specific effects are difficult to project. Fire effects depend on season, fire intensity and other variables. It is important to remember that one application of prescribed fire will most likely not accomplish management goals. Fire exclusion has a cumulative effect; to change current vegetation trends may require two to three prescribed fires to resume natural cycles. Most fire effects would be positive. An overall reduction in fuel loadings would be expected. Fire has effects on soil bacteria and fungi that are not fully understood; in addition these effects vary with fire intensities. In general, it can be stated that the cooler the fire, the less detrimental the effects. Fire will change soil chemistry such as pH levels, this will in turn affect nitrogen cycles, which can eventually affect vegetation succession.

Reintroduction of fire into this ecosystem, within this watershed is feasible. There are some impediments that must be addressed such as air quality and budget. Long-term smoke emissions from prescribed fire should be less than those from a wildfire occurrence of any magnitude. Air quality issues will pose problems for reintroduction of fire but these problems can be resolved over time and should not be allowed to overshadow biological considerations. Reintroduction of fire would be an expensive venture. However, it is an achievable goal. It should be introduced at the landscape level. Current Federal budgets do not provide the funds necessary to implement any significant projects at this time. Public opinion is changing with regard to fire and smoke; how much this would affect the program in the future remains to be seen. All burning would be done in compliance with the State Implementation Plan which has been approved by the Environmental Protection Agency. This document is not a decision document; it is merely a tool to present options to the reader; any decisions will need a National Environmental Policy Act (NEPA) compliance document before implementation. Fire may be introduced by several methods or combinations of methods. In addition, fire is not the only tool available to reduce fuels. Thinning and salvage may also meet these goals. Some combination of methods would be the most likely to be successful.

Elk Creek Watershed

Fire Hazard



Source: Landsat TM satellite imagery, 1993, and digital elevation data, edited 1990

0 1 2 3 Miles

July 1996

D. GRAZING AND LOGGING

The human activities of grazing and logging have long been a part of this watershed. This issue relate to the previous and current conditions of those portions of the environment that has or can support these activities and to the apparent trends for the future. Also at issue is the human economic viability associated with these activities, specifically for those occurring or supported within the Elk Creek Watershed.

Key Questions:

- What is the extent (reference and current conditions) of grazing and logging? (See Chapter II)

-What is the future trend of grazing in the watershed?

-What is the economic status of the grazing program?

1. Future Trend of Grazing in the Watershed

The future of the Federal livestock grazing program is a subject currently being hotly debated, both at the national and local levels. The grazing program was affected on Federally managed land in the Pacific Northwest with the implementation of the Northwest Forest Plan, in 1994. This Plan would be considered by some, to be overly restrictive. Others argue that grazing is being placed first and other uses of public land a distant second. At the center of the controversy is what does an American consider a "balanced use of public lands?" Issues under review include: to what degree will the traditional way of life (an "existence" value) be preserved and at what cost to other multiple-use benefits, to what level will ranching contribute to the maintenance and stability of small rural communities (a "monetary" value), what is the consequence if ranching units are forced out of business (a "capital" value), and is grazing a viable management tool for manipulating vegetation on public land (a "complementary" use)?

Within the Federally managed Late-Successional Reserve which includes approximately 50% of the Elk Watershed, range-related management is only allowed if it does not adversely affect late-successional habitat (generally 80+ year old forested stands). Land managers are directed to adjust or eliminate grazing practices that retard or prevent attainment of the Aquatic Conservation Strategy and Riparian Reserve objectives, and where objectives cannot be met, direction calls for relocating livestock and/or handling facilities (ROD C-17). Since retention and development of late-successional stands are now the main focus for management, future vegetation treatments will generally emphasize the development and maintenance of closed canopy large-tree stand characteristics, instead of past intensive timber management, which tended to create openings and build roads. Large block clearcutting and other types of intensive timber management are no longer considered acceptable under this new management strategy. Historically, clearcuts provided the greatest opportunities for grazing. Projected future silvicultural treatments such as thinning from below, small group selections (1/4-1/2 acre openings), precommercial thinning, pruning and other less intensive vegetation treatments will not create the same grazing opportunities as did historical intensive timber practices. Openings created in the last five years will provide short term grazing opportunities until grasses/forbs become overtopped by planted and/or natural tree seedlings.

Within the Matrix land allocation (ROD C-39), which consists of a total of 2,074 acres within the Elk Creek Watershed on public land, created openings are more likely to occur. Future silvicultural practices would most likely be designed to incorporate clearings. Such openings would provide for future grazing opportunities.

As most of Elk Creek Watershed is transitory range (where cattle move through forested areas that have natural or created grazing opportunities), it is highly probable that the amount of area available for grazing will decrease overall without pro-active management in the near future, as created openings develop into young, closed-canopy forests.

The greatest influences on aquatic and riparian habitat associated with grazing have been the removal of water for livestock purposes (primarily pasture irrigation for hay production), and the reduction of shade related streamside vegetation. The result has been a general failure on the part of past human activities to meet State water temperature standards. Residential development, past timber harvesting and road building has had a significant cumulative influence on changing the character of stream-side vegetation and resulting shade. Human uses such as ranching have not had much effect on the level of turbidity in streams. Range program managers concur that cattle tend not to use riparian areas within the Elk Creek Watershed, as drainages typically lie on steep slopes, with little grazing opportunities. The only exception to this has been along the lower mainstem of Elk Creek (see discussions on water

quality in Chapter II). Past livestock grazing practices have, in part, provided the opportunity for non-native weeds and other vegetation to invade areas adjacent to Elk Creek, while eliminating other more desired plant species. Non-native species come in through feed, vehicles and lack of irrigation.

If numbers and/or AUM's (Animal Unit Months -calculated as the amount of feed required to sustain one cow/calf pair for one month) are decreased, the future trend would be that some ranchers within the Elk Creek Watershed would lose some portion of their annual income. Specific income data for existing permittees was not available for this analysis, however, numbers by operator indicate that use of public and private land in this watershed is not large. Data also indicates that generally permittees are grazing less than 65 animals, with the exception of one permittee who grazes 124 head. Low numbers suggest that public and private land grazing is not supporting livestock operations that are large enough to support a farm/ranch family. The assumption was made based on program manager experience that a business that maintains less than 250 cows does not provide enough cash flow or profit to support a family. Based on the data available (number of cattle, length of the season, number of AUM's cited in Chapter II), it is assumed that today's permittees are generally securing less than 50% of their annual income from ranching and that operators most likely have other agricultural interests or enterprises. It is possible that a decrease in Federal grazing privileges may force some of these operators out of production, however to what degree is unknown. Further investigations would be necessary to make that determination. A potential indirect effect of reducing or eliminating public land livestock grazing may be that those operators that cannot afford to raise stock would lose the right to claim farmland status under county regulations, which could compound the financial impacts on certain households as tax benefits would be repealed. Information related to other indirect effects of reducing or eliminating grazing on public land was unavailable during this analysis. Possible economic impacts to unincorporated communities such as Trail and Prospect are unknown.

2. **Economic Status of the Grazing Program**

Specific range program information related to expenditures and receipts within the Cattle and Range Allotments in Elk Creek Watershed was not available. However, referring to Chapter II, Figures 17 and 18, expenditures for both the Rogue River National Forest (Forest Service) and Medford Bureau of Land Management exceed receipts. Significant increases in program costs since 1994 are primarily a result of environmental assessment work required to address the Northwest Forest Plan consistency and legal compliance obligations associated with renewing 10-year grazing permits (Note: expenditures recorded in the Figures in Chapter II were not adjusted to "real dollars", accounting for inflation). Despite fluctuations in grazing fees, receipts collected tended to remain fairly constant since 1986. Expenditures are predicted to go down once assessment work and reissuing of permits is completed. Costs related to maintaining facilities, such as pasture fences, water sources, etc. are low, compared to other allotments which maintain major developed facilities. Costs to ranchers, just as veterinary services, herding (including maintenance of horses), salting and supplemental feeding, association fees, lost or stolen cattle, moving livestock to and from, development appreciation etc. are predicted to increase in the future, however not substantially.

Although overall range program expenditures outweigh receipts, the estimated benefits of providing enough forage to sustain the current 343 animals using the allotments (or portions of) within the Elk Creek Watershed are valued at a dollar amount of $73,980.00 per season of use (the cost of purchasing hay on the open market). This value estimate is based on an average number of pounds that an animal consumes (for a cow and calf less than 6 months old) per month multiplied by the total number of head, which equals 137 tons of hay consumed per month. The cost to purchase a ton of hay was estimated to be $90.00. The cost to purchase enough feed to support 343 animals per month equals $12,330.00, multiplied by an average utilization period of 6 months.

In conclusion, expenditures could be viewed as being offset by the benefits that relate directly to beef production. It should be noted that much controversy exists around the issue of grazing fees and their relationship to "fair market values." The "anti-grazing" viewpoint argues that what is considered low grazing fees represents a direct subsidy to privileged ranchers and places those operators in a position of unfair competitive advantage relative to other livestock producers and results in overgrazing. The flip side is that national interest is being generated concerning rural economic development. The issue is being raised that local communities and rural areas are given a comparative advantage in raising livestock to maintain local economic stability. Some groups are arguing that actual net cost to the Federal Treasury of Forest Service and Bureau of Land Management grazing programs is grossly overstated and misses the real point--more consideration should be given to joint production/multiple output opportunities with domestic grazing as one part of the management equation.

3. Future Trend of Logging

Generally, on Forest Service and Bureau of Land Management administered land, logging practices will be applied in a less-intensive manner over fewer acres. Since retention and development of late-successional stands are now the main focus for management for the majority of the watershed, future vegetation treatments will generally emphasize the development and maintenance of closed canopy large-tree stand characteristics, instead of past intensive timber management, which tended to create openings and build roads. The type of silvicultural treatments that may be applied are predicted to de-emphasize large clearcut (40+ acres) prescriptions and emphasize practices that include group selections, thinning from below or thinning throughout all size classes, etc. Logging practices that once focused on maximizing timber production would now be implemented in a manner that would meet either Matrix, Late-Successional Reserve, Riparian Reserve and Aquatic Conservation Strategy objectives. Likewise, private timber land owners have already shifted and are predicted to continue moving toward a management scheme that will maintain species diversity and complex stand structures. A greater awareness and sensitivity of the impacts of using ground-based yarding systems will most likely affect the type of yarding system employed in the future. Product development and new markets for small diameter material are predicted to allow for a greater utilization of traditionally "noncommercial" material.

4. Economic Status of the Timber Program

Overall, expenditures related to designing timber sales and required assessment work have increased over the last decade. New mandates to conduct more comprehensive surveys related to various sensitive plant and animal species have increased the amount of time and work load necessary to ensure compliance with current management direction. In Chapter II, Figures 16& 17 reflect the Medford District BLM and the Rogue River National Forest (RRNF) overall timber programs. Elk Creek Watershed is atypical as it contains some of the most productive timber land on the RRNF. It is highly probable that the cost of doing business and the timber receipts gained from this watershed are indicative of those relationships displayed in the late 1980's (Figure 17). This is assumed to hold true for Medford District BLM land also, based on high sell values listed below. Future economic benefits of the timber program on public land are predicted to drop. The primary reason is that logging costs will most likely be higher than in the past because: 1) the amount of volume removed on a per acre basis will be lower, 2) production rates will drop, and 3) generally more expensive yarding systems will be employed (tractor versus cable or helicopter), which can be as much as four times more expensive than ground-based systems. Historically, revenue from clear-cut units would typically subsidize the higher cost of lighter touch, stand maintenance thinnings, road maintenance and restoration. Indirect economic benefits resulting from timber receipts are predicted to occur to a lesser degree and less often than in the past, as future entries will most likely only generate enough revenue to cover the costs of commercial removal and treatment of created slash.

Table 13. Federal Timber Sales in the Elk Creek Watershed, Volume Offered and Values: 1983 -1996.

Year	Volume Offered	Sell Value
1983	BLM - 3.2 million board feet (MMBF)	$54,489.95
1984	BLM - 9.8 MMBF FS - 1.8 MMBF	$370,468.10 $381,907.90
1985	BLM - .664 MMBF	$27,842.00*
1986	BLM - 24.8 MMBF FS - 15.8 MMBF	$1,929,535.40 $896,808.40
1987	FS - 14.2 MMBF	$1,547,187.20
1988	BLM - 3.9 MMBF	$245,217.00
1990	BLM - 3.9 MMBF FS - 6.9 MMBF	$826,621.00 $1,181,893.60
1991	FS - 20.6 MMBF	$4,627,321.10
1996	FS - 2.5 MMBF	$848,356.40

* Right-of-way value was not available

E. LATE-SUCCESSIONAL VEGETATIVE CONDITIONS

This issue is associated with the vegetation within the watershed, and especially vegetation on Federally managed lands, much of which is allocated to Late-Successional Reserve. The current condition of the vegetation and successional stages has been presented in Chapter II. The focus here is on the assessment of the current condition (what does it mean) and on the potential and capability to develop and sustain late-successional conditions.

Key Questions:

-What is the potential capability to develop and sustain late-successional characteristics?

-What are the opportunities (and priorities) to accelerate or obtain Late-Successional Reserve Characteristics? (See Chapter IV)

1. Findings

The Elk Creek Watershed is currently composed of an estimated 15,558 acres (or 18%) of late-successional vegetation. On Federally managed lands, 14,079 acres (or 90% of the watershed acreage) is in a late-successional condition; out of which 11,531 acres (74%) are located on National Forest land and 2,548 acres (16%) on Bureau of Land Management administered land. Map 30. shows current late-successional conditions for the entire watershed. This map also shows Late-Successional Reserve allocations on Federally administered lands.

Prior to the 1900's, when federal practices to aggressively suppress fire were initiated, fire occurrences in the Elk Creek Watershed regularly occurred every 18-25 years in the lower elevations. Events tended to be of a low intensity, consuming primarily ground and understory vegetation, along with light fuels. Stand replacement fires were uncommon. When they did occur, areas consumed ranged from 50 to 250 acres in size. This fire history tended to favor early successional species, such as ponderosa pine, Oregon white oak and poison oak.

In the higher elevations of the watershed, where the True Fir Plant Series dominates, historic fire intervals ranged from 35-100 years between events. Fire intensities were characteristically of moderate to high severity due to the presence of heavy fuel accumulations. Infrequent fire, combined with the fact that bands of highly productive, deep soils exist, allowed forested stands to mature. In these areas, stands were most likely composed of large trees with closed canopies and large down woody material.

The Historical Vegetation Type Map (Map 18), generated from data collected in 1948-49, displays vegetative patterns and composition. Compared to current conditions, vegetation patterns were less fragmented between types, and species composition was much different.

In 1949, approximately 4,700 acres were composed of stands dominated by 22+ Dbh ponderosa pine. None exist today. It is predicted that such stands were fairly open and supported a rich shrub and grass/herb layer. Scattered clumps of hardwood dominated stands once existed in the low to mid elevations. Today, the presence of hardwoods is more widely distributed. It is predicted that historically, hardwood stands tended to be composed of widely-spaced large trees, with a shrub/grass understory that contained various age classes and plant species, growing in a mosaic pattern due to frequent fire events. Currently, hardwood stands tend to be occupied by small diameter oaks, densely growing, mature shrubs, with little grass or herbs present.

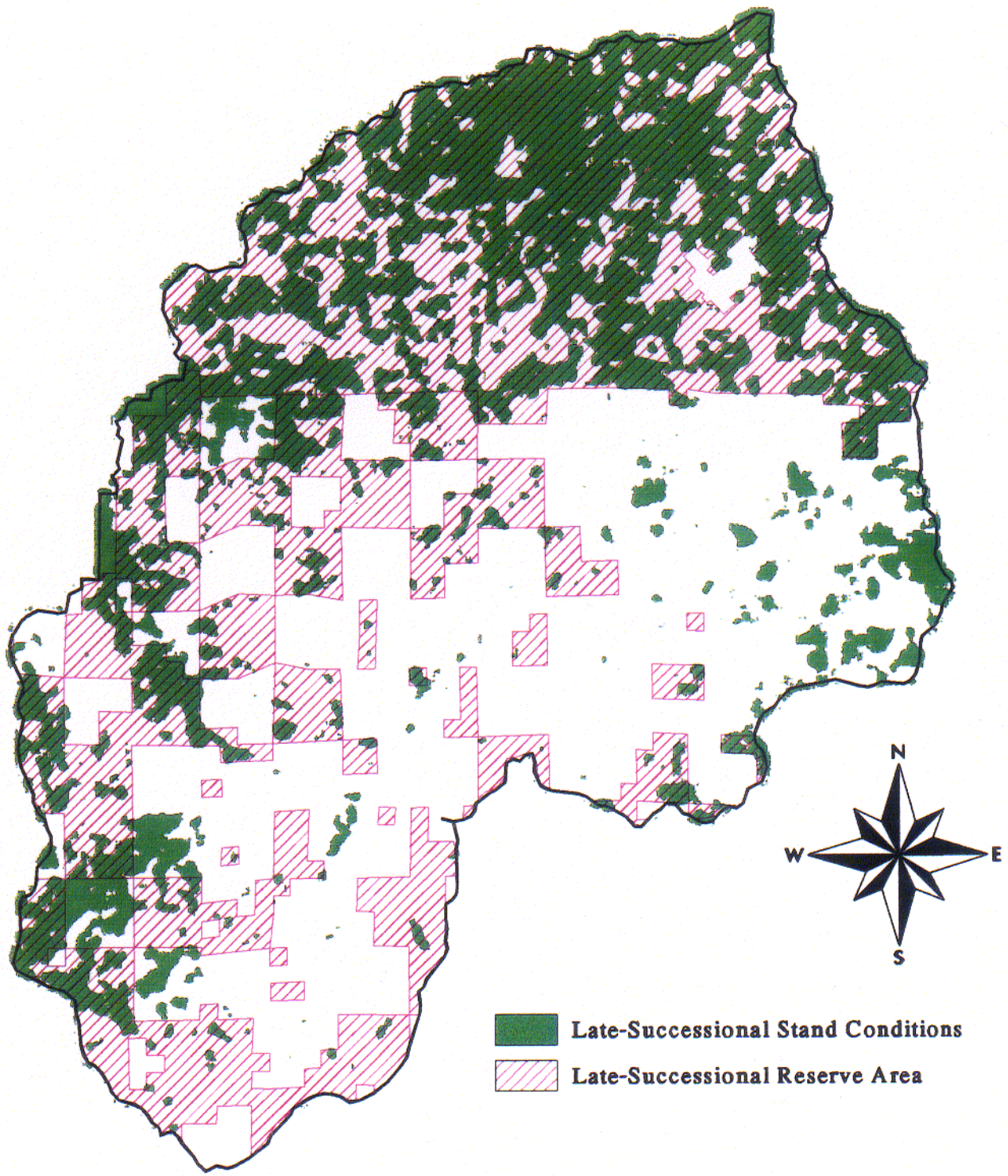
Although stand densities probably varied depending on elevation and site conditions, 1949 mapping indicates that stands dominated by Douglas-fir over 22" Dbh covered over 80% of the watershed. Vegetative typing from 1993 reveals that the amount of 22" DBH+ Douglas-fir stands have been drastically reduced, and tend to occur in a scattered, unconnected, and patchy pattern. These remaining irregular shaped patches tend to be less than 640 acres in size.

Many factors can be cited for the alteration of the vegetative landscape. For instance, it is probable that the lack of 22"Dbh+ ponderosa pine stands, (mapped as ponderosa pine less than 12" Dbh trees in 1949 in the lower portion of the watershed), was a result of tree harvesting by early homesteaders. The exclusion of fire has allowed stand densities to increase in the last forty-seven years, which has tended to favor the development of shade-tolerant species such as Douglas-fir, over ponderosa pine and oak. Competition for water and nutrients in what are considered "overstocked" stands has resulted in slow tree growth and vigor, indirectly increasing risk of beetle infestation and tree mortality. This is especially evident in the large pine component.

MAP 30

Elk Creek Watershed

Late-Successional Stand Conditions



Source: Landsat TM satellite imagery taken 1993

0 1 2 3 Miles

July 1996

Historic evidence provides direction for where the greatest opportunity exists to restore late-successional conditions. To counteract the effects of fire suppression, forest management will be required to control stocking levels and species composition. On private timber lands, management has already shifted to predominantly uneven-aged or select cutting. Uneven-aged management on Federally managed lands could be employed as a tool to regulate stocking levels to encourage the development of late-successional characteristics. It would also provide opportunities to reduce fire hazards and maintain and/or restore early successional species, while preserving canopy closure and eliminating further fragmentation of wildlife habitat.

2. **Hydrologic Vegetative Condition**

A simple model using current vegetative conditions was developed to display the effects of past management activities on hydrologic functions. Vegetative conditions were categorized into successional stages using satellite vegetation data by subwatershed, then placed into four overall "recovery" categories.

Successional stages were used in this analysis to define the temporal and spatial characteristics of created openings. The degree to which a subwatershed is considered recovered is based on the percent of vegetation that is defined as having reached a " recovered state" or naturally restored itself to allow for a proper functioning system. Listed in Table 6. and Map 19 is a display of what stage of recovery the openings are now in by subwatershed. The late-successional, grass/forb, and barren stages were considered to be 100% recovered (or functional). The mature 17-24" Dbh and mature 11-17"Dbh stages were considered to be 75% recovered. Open areas were considered 50% recovered, shrub-dominated areas were classified as being 25% recovered and early successional areas were considered to be 0% recovered. These categories and the results of this analysis are shown on Map 31.

There is no precise finding implied with this simple model. It is meant to show, in a relative sense, one measure of hydrologic recovery. Future analyses should incorporate geomorphic characteristics, validate current vegetation types, as well as develop a more precise estimation of disturbance mechanisms and effects. Subwatersheds in the least "recovered condition" should be considered the highest priority for future comprehensive analyses efforts and appropriate restoration.

3. **Riparian Reserve Boundary Widths**

Much attention has been given to the establishment and possible adjustment of Riparian Reserve widths on Federally managed lands. Since the Watershed Analysis team was not able to field validate stream orders, locations or fish-bearing stream status, the analysis focused on the broad scale values, processes, and patterns to establish context at the watershed scale. Stream location and stream buffer maps were generated using existing information, primarily digital elevation models (provided by USGS) for the entire watershed. Map 5. portrays the extent of Riparian Reserves on Federally managed lands. The extent (acres and miles) of riparian areas on both public and private land is disclosed in Chapter II.

On Federal lands, interim riparian buffer widths were modeled at two site potential tree heights - each side of fish-bearing streams, and one site potential tree height - each side, for all other streams, as outlined in the Northwest Forest Plan. Computer modeling used for this analysis assumed a site potential tree height to be 156 feet tall, based on existing silvicultural data for the Cascade Mountain Range. Fish-bearing streams that were modeled at two tree heights are shown on Map 32.

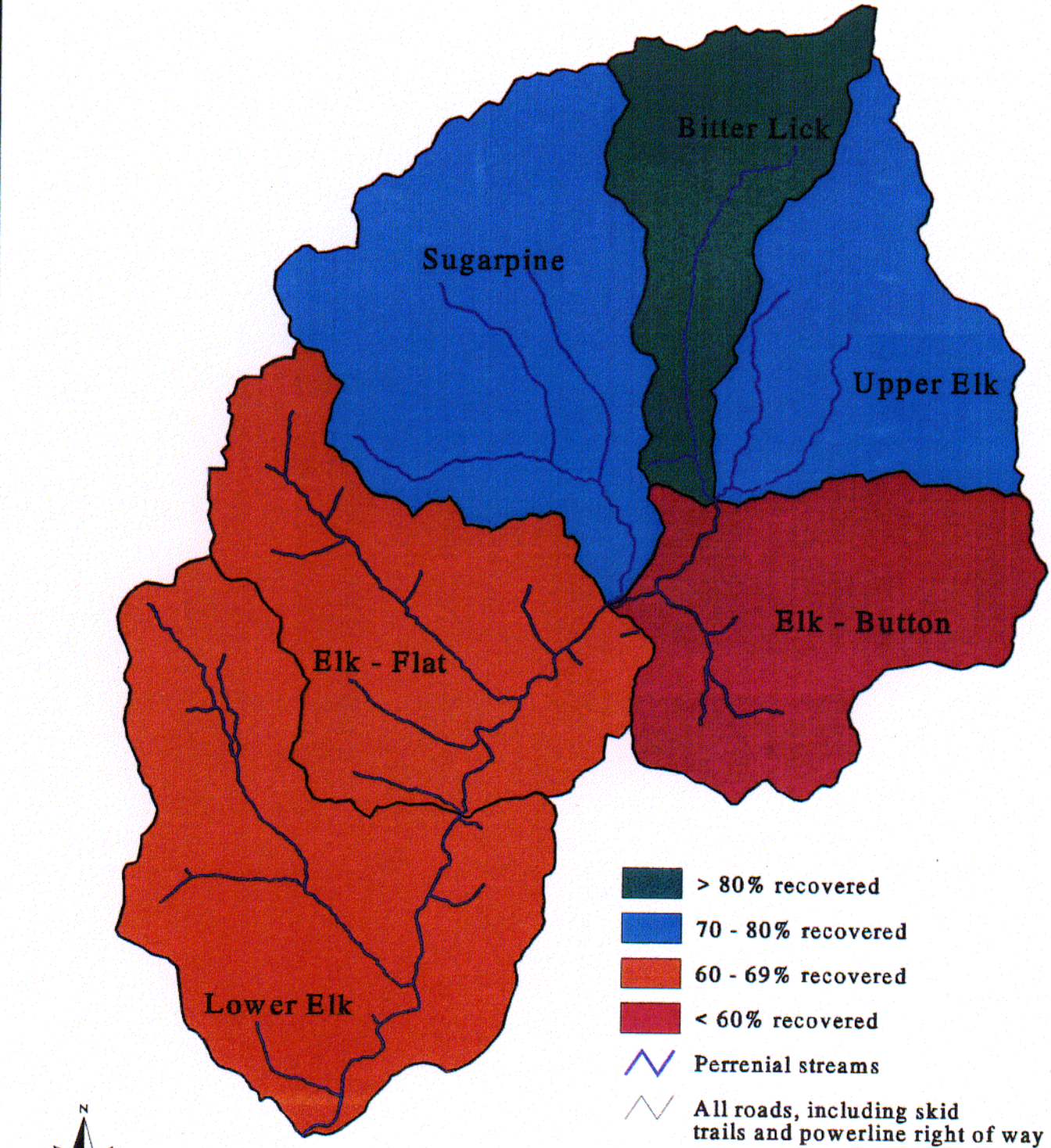
While vegetation and stream morphology within Riparian Reserves on Federally managed lands have been affected by past management such as timber harvesting and road building, generally those areas are moving toward a state of recovery. Vegetation is becoming re-established, trees are maturing, forest canopies are becoming more dense and disturbed soils are becoming stabilized and less prone to erosion. Overall, the way in which water is being intercepted or captured, stored and released is moving toward a more "natural" or "proper functioning" state. More than 90 percent of the Federally administered lands in the watershed are now allocated to Late-Successional Reserve or Riparian Reserve, which will facilitate the maintenance and restoration of riparian ecosystems.

These interim buffers seem to currently mimic the surrounding upland landscape and are in a variety of functional conditions. The Watershed Analysis Team did not have justification to change these widths. There may be little need to focus on buffer widths, since regeneration timber management is not prescribed or encouraged. Any management activity that encroaches on an intermittent riparian buffer should only consider buffer adjustments (below the site tree potential), if a comprehensive analysis has been done, at the subwatershed scale.

MAP 31

Elk Creek Watershed

Hydrologic Recovery by Subwatershed

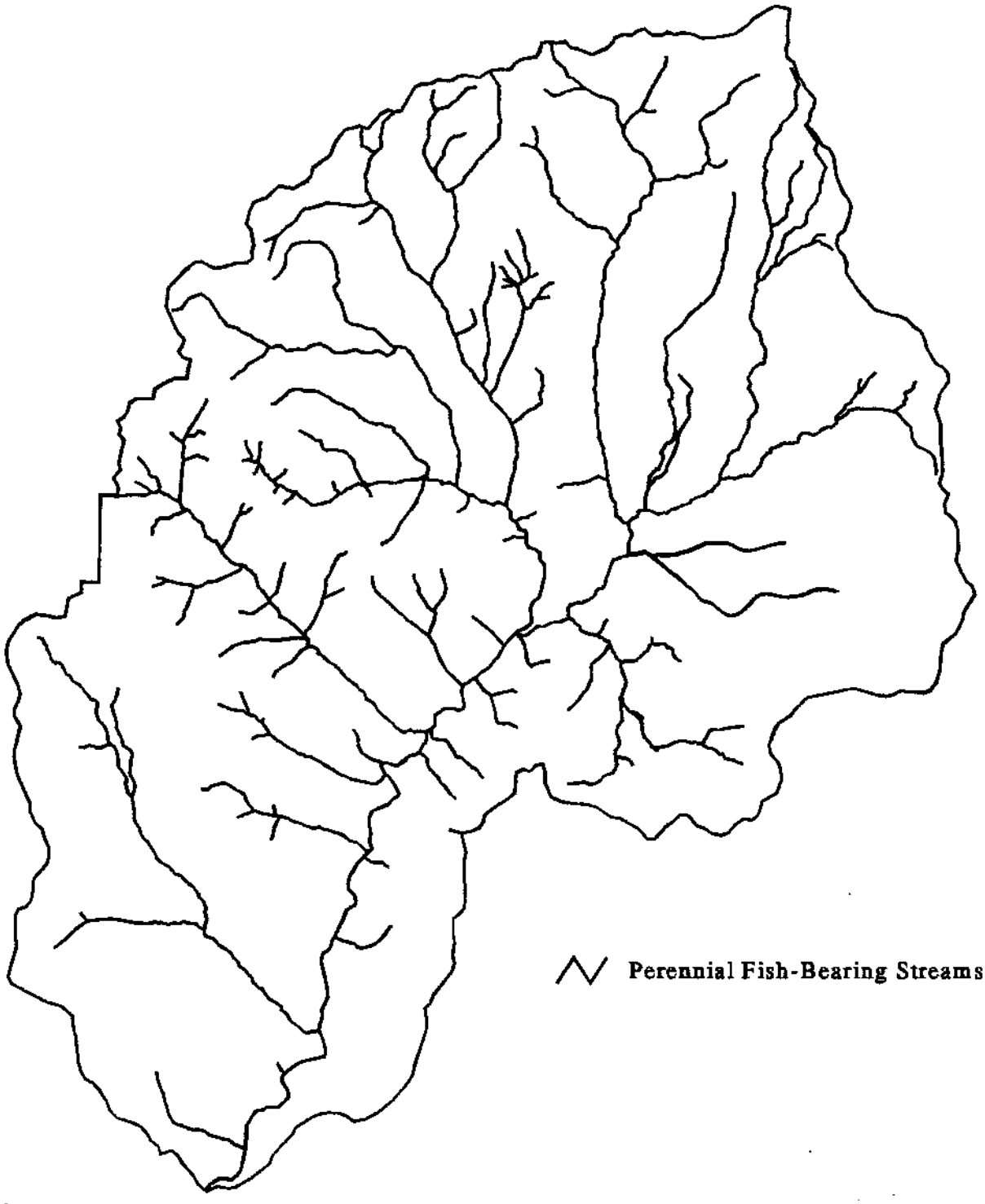


July 1996

MAP 32

Elk Creek Watershed

Perennial Fish-Bearing Streams



0 1 2 3 Miles

July 1996

On March 12, 1996, the Regional Ecosystem Office issued a draft Riparian Reserve delineation module. In it, the following statement was made, "The Record of Decision...indicates that there is little leeway to adjust [Riparian Reserve] boundaries on permanent streams; the ROD indicates that adjustment of Riparian Reserves on intermittent streams is allowed and anticipated." This draft module cites pages ROD B-13 to support this statement: "The prescribed widths of Riparian Reserves apply to all watersheds until watershed analysis is competed, a site-specific analysis is completed and described, and the rationale for final Riparian Reserve boundaries is presented through the appropriate NEPA decision-making process.

F. PUBLIC ACCESS

This issue relates to the existing Federal network of roads within the watershed, the current condition in regards to human safety and other resource concerns, and the two agencies' abilities to manage these roads into the future.

Key Questions:

-What is the current road density and human use of Federally administered roads?

-What is the Federal agencies' ability (trend including budget) to maintain the existing systems?

-What is the current status of hazard trees that threaten human safety, along open (system) Federally-maintained roads?

1. Human use

The majority of the Bureau of Land Management and Forest Service Development Road (FDR) systems were constructed to access and remove timber products. Currently, human use of Federally-administered roadways includes: accessing public land for hunting, camping, sight-seeing, hiking, gathering of firewood and other forest products, grazing, limited timber removal, timber stand improvement, fire suppression, mining and other administrative uses.

2. Road Density

Current road densities by subwatershed range from 2.74 to 7.29 miles per square mile, for an average of 5.58 miles per square mile for the watershed overall. This includes all roads, skid trails and access associated with the power line (see Map 33.). Several sections located in the lower elevations include road densities likely to be above 15 miles per square mile. High road density patterns usually indicate that intensive timber operations most likely occurred in the past, probably by applying a ground-based tractor system. Major access routes typically run parallel to the main stems of perennial streams, often within the flood plains. An estimated 74% of the roads are located on soils that are considered highly prone to soil erosion (refer to Map 23). The only area void of roads is the Bitter Lick Roadless Area.

Generally, moderate to high road densities (4+ miles per square mile) tend to result in modifications to stream channel morphology, riparian vegetation, sedimentation and surface erosion rates. Those roads open to year-round recreational vehicle traffic can disturb wildlife, especially blacktail deer and elk. Although road density is an important indicator to consider when evaluating watershed conditions, whether it be fisheries habitat, ability to provide for beneficial uses, or effects to migration corridors, equally important to consider are road grades, surface type, drainage design, and location. Specific road design information was not available during the analysis for this watershed.

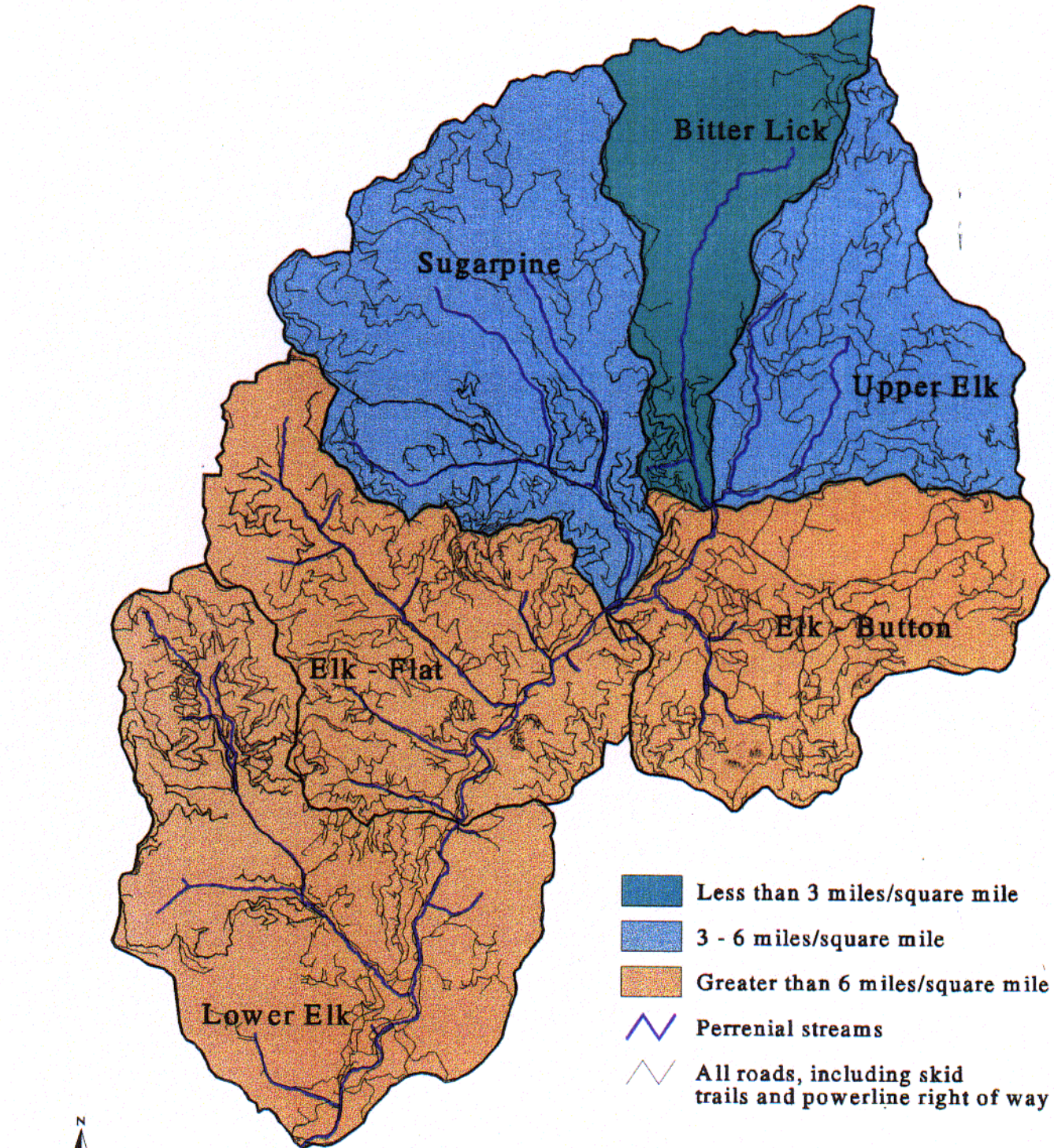
3. Ability to Maintain Existing Systems

Since 1984, 13.83 miles of road construction and 19.12 miles of road reconstruction occurred in association with eight timber sales on Forest Service administered land. Presently, a Forest Service timber sale is under contract to remove down trees resulting from a 1996 snowstorm event. Access roads within the watershed will be opened, primarily along Forest Service roads 6610, 6620, 6640, and 66. A minimum $1.75 per thousand board feet will be collected for maintenance, surface rock replacement and overhead costs.

The Forest Service collects road maintenance deposits to perform road work in-house or by contract. In 1984, these road maintenance collections from commercial haul funded 58% of the road maintenance activities on the Rogue River National Forest. Additional funding (42% of the road maintenance budget) came from appropriated dollars.

Elk Creek Watershed

Road Density by Subwatershed



July 1996

Currently, Forest Service appropriated funding is not available to maintain the existing road system in the Elk Creek Watershed at the current Road Management Objective (RMO) levels. Numerous maintenance Level 1 roads (which are designed to be closed after activity use is completed) are open to public access as funding is not available to construct barriers. Maintenance Level 3 roads (which are designed for general public access) are not being graded on schedule due to lack of funding. No funding exists to decommission roads (which includes pulling culverts, reestablishing drainage, camouflaging entrances, etc.) previously approved. Evidence of neglect is visible on all maintenance levels, including vegetation encroachment (reducing sight distance and loss of usable turnouts), shoulder failures and faded-out lettering on traffic, destination and warning signs. On National Forest System Roads, the Forest Service plans to conduct a hazard analysis on all roads and bridges subject to the Highway Safety Act in 1996. It is anticipated that even with the reduction in "open" road miles as recommended by the Watershed Analysis Team (see Chapter IV), the ability of the Forest Service to maintain roads at their designated RMO will not occur if appropriated funding or road maintenance collections do not increase.

4. Current status of hazard trees along open Federally-maintained roads

On National Forest, there is currently a large number of human safety hazard trees along open roads. Appendix N includes the assumptions and definitions for hazard trees and also includes specific inventories and locations where down trees, danger and hazard trees existed as of June 1996 on Forest Service administered land within Elk Creek Watershed. Locations are based on a road review by Forest Service employees as part of a 1995 summer project and in response to snow breakage/fall down resulting from an intense snowstorm that occurred in 1996. The 1995 survey involved approximately 32 miles, on which approximately 465 hazard and/or danger trees were noted. This averages over 14 trees of concern per mile of road. Some roads had more than 20 hazard/danger trees per mile. Of note are Forest Roads 6610, 6620, and 6640.

Specific hazard tree field-verified information was not available during this analysis for other lands besides National Forest. Based on available information related to the intensity and number of acres timber harvested in the last several decades on Bureau of Land Management administered land and privately-owned timber lands, it is predicted that the occurrence of hazard trees on these lands is less common, compared to Forest Service administered land.

Typical hazard tree along Forest Road 66

IV. MANAGEMENT RECOMMENDATIONS

A. INTRODUCTION

The purpose of this Chapter is to summarize the findings from previous Chapters and provide management recommendations to Federal land managers for public lands. The following recommendations include general analytical recommendations as well as recommendations that are responsive to the Issues and Key Questions from Chapter III. Throughout the discussions, needs for restoration have been incorporated. Section D. summarizes monitoring needs and Section E. provides an integrated set of management options based on landscape types and features.

B. GENERAL ANALYTICAL RECOMMENDATIONS

This Section captures recommendations that are primarily applicable to any subsequent analysis within the Elk Creek Watershed. These could include the next version of Watershed Analysis, either on the watershed or subwatershed scale, the next version of Late-Successional Reserve Assessment (watershed or Reserve specific) and/or any further analysis done for specific projects. In many ways, these recommendations would assist in filling data gaps uncovered during this process.

- Future landscape assessment and/or project analysis should include field verification of stream classes, location and morphology, their order of importance related to need and restoration opportunities within the watershed, and their status related to providing for beneficial uses.

- Subsequent planning and analysis should continue to validate reforestation access needs, public access needs and access needs for fire management.

- Comprehensive (cumulative effects) analysis to evaluate the hydrologic condition of the watershed should be done at the subwatershed scale.

- Data that evaluates owl demographics should continue to be collected.

- Data should be collected to determine and prescribe the amount and distribution of large coarse woody debris and snag densities.

- When closing Level 1 roads, review on a case-by-case basis the need for and effects of removing existing culverts.

- Update all Allotment Management Plans to assess the implications of the Northwest Forest Plan on the grazing program.

- Survey stream reaches every ten years or after 25 year flood events to determine changes and trends in aquatic habitat.

- Forest Service administered sections 1 & 11, and portions of sections 3, 13 & 15 in the Morine Creek area, (T.33S., R.1W., Jackson County), are recommended for re-allocation to LSR, where National Forest Land is contiguous with the LSR designation on BLM administered land. This may require an analysis and decision under NEPA.

- Complete Watershed Improvement Needs (WIN) inventory work to identify restoration needs related to existing roads.

- Resolve mapping discrepancies between Forest Service and Bureau of Land Management associated with big game winter range habitat.

- Work toward integrating Forest Service and Bureau of Land Management geographic information databases.

C. ACTIONS TO ADDRESS ISSUES

The format for this section borrows from Chapter III by summarizing the Issues and the Findings for the Elk Creek Watershed, the implications of these findings, the underlying objective(s), and statements or listings of recommended management actions.

1. Anadromous Fish Habitat - Hydrology

Findings: Human activities and artifacts, such as the presence of roadways within floodplains, have tended to create straightened channels which provide little resistance to water movement. The cumulative effects associated with past human activities have resulted in a limited amount of high quality, well-distributed salmonid habitat and is likely to have reduced overall survival rates of cutthroat and steelhead trout. The result has been an overall increase in the velocity and quantity of water flows during and shortly after storm events, which:

- periodically have dislodged debris jams,
- caused channels to down-cut and become confined (some streams can no longer reach the original floodplain even during flood events),
- increased the quantity, size and distance suspended particles are being transported, and
- increased the severity of streambank erosion and associated amounts of soil deposition.

In addition, alterations and removal of riparian vegetation, particularly the harvest of overstory conifer trees, as well as activities associated with road building, grazing and rural developments have:

- caused a reduction in the amount and distribution of streamside shade and large woody debris,
- reduced bank stability, and
- modified the morphology of many channels.

The way in which water is being captured, stored and released has been altered as a result of cumulative past human activities, primarily related to road building, timber harvesting, ranching and rural development. The result has been:

- an increase in stream temperatures, (five streams are considered to be "water quality limited" by the DEQ under the Federal Clean Water Act) including: Bitter Lick, Sugarpine, West Branch Elk Creek, Hawk (from the Mouth to the Headwaters) and Elk Creek (from the Mouth to Bitter Lick),
- occasional peaks in turbidity above natural rates, and
- increased rates and quantities of runoff and soil transport during and shortly after storm events, applicable to areas where runoff cannot infiltrate and becomes concentrated, primarily associated with impermeable road surfaces.

Recommendations: Restore anadromous fish habitat to increase survival rates by improving the abundance and quality of spawning gravels, deep pool habitat, side channels, overwintering habitat (channel structures and log jams which can shelter fish), while maintaining water temperatures and quality that can sustain multiple fish species within the Elk Creek Watershed.

The following specific recommendations would allow progress toward these objectives:

- encourage the development of late-successional riparian vegetation which would be typical and expected within the Elk Creek Watershed, especially where overhanging cover and root structure is lacking or where streambanks are eroding,
- reduce surface erosion and channeling of runoff within floodplains by reducing or eliminating known, identified sediment sources,
- encourage water conservation to increase summer base flows,

- provide shelter/cover for juvenile salmonids in pools by creating debris structures,
- protect fingerlings from traveling into water diversion channels by placing screens at diversion sites,
- slow down high water flow rates where feasible by placing large logs within channels, by creating side channels, and encouraging beaver colonization,
- restore slope-bound and alluvial valley stream segments to include low stream gradients with a high width-to-depth ratio and meandering side channels where feasible,
- encourage cooperative/voluntary participation of landowners, groups and agencies when planning and implementing watershed restoration projects within the floodplain of Elk Creek,
- protect known beaver habitat,
- remove obstructions to allow for fish migration for multiple fish species and life stages throughout the entire mainstem of Elk Creek by eliminating passage problems at all known human-created passage barriers,
- implement stream-specific recommendations for fisheries contained in the Aquatic Ecosystem Report, Appendix K, and Forest Service 1990 stream survey report (available at the Prospect Ranger District),
- import and place large wood in stream channels where amounts are considered deficit, taking into consideration landform, stream gradient, and floodplain width,
- encourage the development of conifer dominated late-successional Riparian Reserves, especially in West Branch Elk Creek (BLM),
- enhance or develop side channels/riparian areas, especially along West Branch Elk Creek, Sugarpine Creek, Flat Creek, Bitter Lick Creek and on the maintstem of Elk Creek, where feasible, and

Allow for the recovery of hydrologic conditions by:

- maintaining Riparian Reserve widths as recommended by the Northwest Forest Plan. Conduct specific analysis that determines conditions to attain Aquatic Conservation Strategy objectives, and
- coordinate with private land owners to encourage restoration on non-Federal lands.

2. Fire Risk - Reintroduction of Fire

Findings: This watershed has missed 2-3 natural fire cycles which has resulted in a moderate to high fire hazard (based on vegetative and climatic conditions, related to topography). Records of human and natural fire starts, which averages 14.5 starts per year, combined with known evidence of fire such as charred stumps, logs and snags, suggest that fire events will occur. However, when, where, at what intensity and to what extent is difficult to predict. The implementation of the Northwest Forest Plan will generally result in further increases in vegetative densities, increased amounts of ground fuels (depending on future management activities), and most likely, slower access for fire suppression vehicles caused by reduced road maintenance and road decommissioning.

The safe re-introduction of fire within the Elk Creek Watershed would be complicated by:

- the exclusion of fire in most of the watershed which has resulted in large, continuous areas being characterized by moderate to heavy down fuels and densely growing, multi-layered vegetation, (increasing the difficulty and cost of containing controlled burns),
- the "checker board" ownership pattern in the southern half of the watershed,

- the presence of steep, rugged terrain which tends to favor preheating and drying of vegetation ahead of the fire front increasing risk of escape, limits feasible options for control methods, increases implementation costs, and poses logistical challenges for providing safe holding and fire line sites,

- limited vehicle access (primarily associated with the Bitter Lick Roadless Area),

- various vegetative types, some of which are highly flammable,

- limited funding and personnel, and

- restrictions placed on controlled burning associated with the Rogue River National Forest Smoke Management Plan, Oregon Smoke Management regulations and the Clean Air Act for air quality.

Recommendations: Protect values and resources associated with Late-Successional Reserves, the Tier 1 Key Watershed, public and private facilities and human life by:

- introducing controlled fire where fire risk and hazards are moderate to high and where protection of resources is most critical,

- applying fire in such a way as to maintain duff and litter by burning at a low to moderate intensity in a mosaic type pattern, which may include several repeated treatments. Recommend initiating fire hazard reduction activities in Fuel Models 8 & 10 (closed-canopy white fir and white oak), and

- by applying commercial thinning, precommercial thinning and pruning as methods to separate tree crowns and continuous fuels, along with treating slash (3 inches diameter plus). Slash treatments should occur soon after thinning activities are completed.

3. Late-Successional Conditions

Findings: The watershed is composed of 18.2 % late-successional forests, with 14,079 acres being located on public lands. Most late-successional forests tend to be located in irregularly-shaped patches scattered throughout the mid to upper elevations. Of the late-successional vegetation type on public lands, approximately 90% lies within the Late-Successional Reserve allocation.

An estimated 27,800 acres, or 32% is currently providing suitable habitat for the northern spotted owl on Federally administered lands. While it is not known what type of vegetative patterns and composition should exist in the designated Late-Successional Reserves to ensure the viability of 20 owl pairs (one of the goals of the LSR), it is recommended that the short-term objective (10 years) should be to maximize the extent of late-successional habitat. Although fifty-four historic owl sites were identified within the watershed, in the last decade, populations have declined.

Recommendations: Increase the amount and size of late-successional forest patches and vegetative conditions by:

- managing stands to develop multi-aged and multi-layered characteristics through thinning and uneven-aged management,

- maintaining oak woodlands,

- maintaining ponderosa and sugar pine components where historical or present occurrence is evident; apply density management around existing (large) ponderosa and sugar pines (BLM and FS) to maintain those components,

- experimenting with various silvicultural treatments in representative types to see how vegetation responds,

- on BLM lands, brushing and precommercial thinning stands in early-successional conditions to accelerate the development of late-successional characteristics (fire recommends accomplishing as early as possible to reduce fuels buildup). Of note are the Flat Creek, W Branch Elk Creek, Timber Creek and the Burnt Peak Fire Area, and

- on FS administered land, considering opportunities for density management in "off-site" pine stands. Lack of species diversity, especially for sugar pine, may be a concern and an opportunity in the upper portions of the watershed.

4. Public Access

Findings: Federally appropriated road maintenance dollars and funding generated by commercial timber revenues have decreased drastically since the early 1980's, resulting in an inability to maintain Federally-administered roadways to current management standards. The result has been:

- maintenance Level 1 roads, which would normally be barricaded after activity use is completed, are accessible to vehicle traffic,
- some roadway signs have deteriorated,
- the need to seasonally close roads without the funding or people required to enforce restrictions,
- unregulated off-road vehicle use,
- sediment production related to rapid runoff and channeling of water along roadways, and
- the presence of hazard trees in proximity to roads that can threaten human safety for forest users.

Road densities by sub-watershed range from 2.24 to 7.29 miles per square mile. An estimated 57% of the watershed contains greater than 6 miles per square mile. The result of moderate to high road densities has been:

- increased water discharge rates, peak flow quantities, and turbidity,
- straightening of stream channels, reduction in the number of side channels and increased deposition, and
- increased disturbance and poaching of blacktail deer and elk.

Recommendations: Reduce the number of road miles accessible to vehicle use and associated maintenance costs on Federally-administered Maintenance Levels 1 and 2 roads by:

- decommissioning Maintenance Level 1 roads not needed for timber stand improvement, fire suppression access, or commercial activities (eventually ALL Level 1 roads should be considered for decommissioning within designated LSR's).
- applying and enforcing seasonal use restrictions,
- reducing maintenance level objectives or standards, where appropriate,
- designing future projects (such as timber sales) so that they permit or generate funding to accomplish or assist with road closing, constructing barricades, and road decommissioning.

Reduce road-related soil transport, particularly within or in proximity to stream channels and floodplains by:

- repairing fillslopes, travelways, cutslopes, ditches and culverts where down-cutting, surface rutting, puddling, and other signs of erosion is occurring,
- limiting vehicular traffic during periods of wet weather on unsurfaced roadways, and
- relocating the Bitter Lick and Sugarpine Trailheads (see discussion in Roads Recommendations section).

a) Specific Road Recommendations

National Forest: The following table displays recommendations for changing the way in which Forest Service administered roads should be managed. Access and Travel Management objectives were considered for various Forest Management activities including public, recreational, timber, timber stand improvement, fire and other special interests in relation to current Road Management Objectives (as of May 1996). Recommended changes to forest system roads and their status are described in the table below.

Table 14. Specific Road Recommendations for National Forest.

Recommended Action	Road Number	Current Maintenance Level	Length in Mile(s)	Section Of Road
Decommission	6610210	1	0.10	6610 to end
	6610550	1	0.11	6610 to end
	6610556	1	0.10	6610 to end
	6610635	1	0.57	Fawn C. P. to 6610
	6610816	1	0.15	6610810 to end
	6610817	1	0.10	6610810 to end
	6610842	1	0.14	6610800 to end
	6620300	1	0.20	6620 to end
	6620589	1	0.18	6620 to end
	6620593	1	0.09	6620590 to end
	6620610	1	0.10	6620 to end
	6620860	1	0.07	6620 to end
	6620890	1	0.10	6620 to end
	6640109	1	0.09	6640107 to end
	6640150	1	0.40	6640 to F.S. boundaries
	6640200	1	0.27	6640 to end
	6640245	1	0.20	6640250 to end
	6640320	2	0.30	6640 to end
	6640400	1	0.20	6640 to end
	6640450	1	0.10	6640 to 6640250
	6640505	1	0.20	6640500 to end
	6640562	1	0.03	6640560 to end
	6640815	1	0.40	6640810 to end
	6640830	1	0.15	6640 to end
	66028	1	0.13	6600020 to end
	66280	1	0.21	66 to end
	6600350	2	0.03	6600300 to end
	6600375	1	0.10	6600300 to end
	6600379	1	0.10	6600300 to end
	6600390	1	0.20	66 to end
	6600425	1	0.10	66 to end
	6600435	2	0.18	6600430 to end
	6470690	1	0.30	6470 to end
	6470720	1	0.20	6470 to end
	6470750	1	0.10	6470 to end
	6470780	1	0.40	6470 to end
	6470785	1	0.10	6470 to end
	6470790	1	0.10	6470 to end
	6470793	1	0.15	6470 to end

Recommended Action	Road Number	Current Maintenance Level	Length in Mile(s)	Section Of Road
Change to Maintenance Level 2	6610	3	6.82	BLM road to end (1.52 Elk WA. Bdry.)
	6610600	3	4.29	6610 to 6620
	66300	3	3.93	66 to 6470
	6470	3	3.40	Boundary to 6640
Relocate the Bitter Lick Trailhead so that it could be accessed from road 6620 (would allow for the possible decommission of road 6620050). Coordinate with recreation.	6620050	2	0.28	6620 to private (last 0.4 mile is on private land).
Relocate the Sugarpine Trailhead so that it could be accessed from road 6610 (would allow for the possible decommission of road 6610050). Coordinate with recreation.	6610050	2	0.28	6610 to end
Change to Maintenance Level 1 and close/barricade	6620515	2	0.42	6620500 to end

Bureau of Land Management administered roads: The process for assigning Road Management Objectives has not been completed as of July 1996 for Bureau of Land Management administered roads. Future road review processes should consider opportunities to reduce road densities, especially when located on sidehills, lowland areas, or in big game winter range. In addition, the following criteria should be considered when determining future road decommissioning opportunities and priorities:

- roads less than 0.5 miles in length,
- roads that include multiple stream channel crossings,
- roads in proximity to Riparian Reserves and stream channels,
- natural surfaced roads (versus surfaced), and
- roads located on geologically unstable terrain, or where constructed on soils with a high potential for erosion.

5. Grazing

Findings: Livestock grazing is not a major human enterprise within the Elk Creek Watershed, and some of those who have permits with the Federal government, do so as a secondary source of income. The current costs and revenues associated with the grazing program for the Federal government are expected to continue into the future. Major resource effects resulting from livestock grazing and associated human practices such as diverting water for irrigation, development of pasture land, and road use include:

- the spread of non-native plant species,
- alteration of stream-side vegetation and channels (causing increases in stream temperatures and sedimentation), and
- reduction of summer base flows in streams.

Preliminary utilization/distribution inventories indicate that some areas are being underutilized by cattle, while other areas are being over utilized. Typically where water is available, utilization of forage is good. Where water is absent, utilization tends to be poor.

Recommendations: Regulate grazing practices to allow for good utilization of forage by:

- developing water sources to modify utilization patterns, in areas with poor utilization,
- increasing plant production by seeding with native, palatable plant species,
- decreasing the length of use, and controlling animal movement in underutilized areas,
- using grazing as a tool to control brush, prepare seed beds for planting, and as a way to obtain income from forested lands, and
- seeding along some roadsides and in strategic locations to increase available forage.

Criteria to consider as part of managing forest-range program within those allotments in Elk Creek Watershed should include:

- physical and biological feasibility and consequences,
- economic feasibility,
- social acceptability, and
- operational practicality.

6. Timber Harvesting - Economics

Findings: While timber harvesting activities have significantly declined in the last five years, expenditures related to designing, implementing and administering timber sales have increased. The result has been:

- a reduction in timber sale receipts which supported road maintenance, timber stand improvement activities such as precommercial thinning and reforestation, and other restoration or enhancement projects,
- decline in the amount of commercial timber volume supplied to local wood processing companies,
- decline in available public use firewood cutting areas,
- an overall trend of increased logging system costs, and
- limited opportunities for small logging enterprises.

Recommendations: Use timber harvesting/logging as a tool to manage vegetation to meet Matrix, Late-Successional Reserve, and Riparian Reserve land allocation objectives. Implementation should include:

- prioritizing efforts to encourage the development of new markets and products to maximize the value of small diameter material, and
- considerations for applying various silvicultural prescriptions which address multiple resource objectives (refer to Table 15.).

D. MONITORING

Ongoing monitoring efforts within the watershed should include:

- Monitor trends in juvenile salmonid use and abundance at all aquatic habitat restoration projects.
- Continue stream temperature and stream flow monitoring.
- Monitor the aquatic benthic macro invertebrate community to determine changes and trends in the benthic community over time and as a result of implementation of aquatic habitat restoration projects.
- Continue to monitor adult anadromous salmonid escapement into Elk Creek.
- Monitor soil conditions to evaluate the effects of vegetation manipulation prescriptions as related to landscape structure and design strategy.
- Continue to monitor spotted owl demographics as an indicator of watershed health in the portion designated as LSR.
- Monitor road conditions and drainage.
- Monitor plantations for survival, vegetative competition and development.
- Monitor fuel levels and associated fire hazards.
- Monitor the scope and intensity of insect and disease occurrences.
- Monitor coarse woody debris levels and snag densities.
- Monitor terrestrial wildlife species habitat and distribution.
- Monitor non-native plant populations and encroachment.
- Monitor water diversions and compliance with water use permits.
- Monitor recreational use, hunting levels and use of special forest products.
- Monitor the effects of grazing on late-successional, riparian and aquatic values.

E. INTEGRATED LANDSCAPE OPTIONS

The following table presents an integrated approach to the recommendations and management options for Federally managed lands within the Elk Creek Watershed. It is organized by landscape types or features.

Table 15. Integrated Landscape Options.

LANDSCAPE FEATURE	OBJECTIVES	APPLY TO	MANAGEMENT OPTIONS
Existing Late-Successional Forests	-Maintain stand characteristics such as moderate to high canopy closure, multispecies/multilayered assemblages of trees, moderate to high numbers of trees with physical imperfections, moderate to high accumulations of large down logs and snags. -Reduce fire hazards so that fire events occur infrequently and at a low intensity (stand replacing fire occurrences would be rare). -Manage so that the potential for large-scale disturbance events (other than fire) would be low. -Maintain species diversity. -Maintain habitat linkages/corridors within this Watershed and that provides a network with adjacent late-successional forested areas.	-Late-Successional Reserves. -Interim Riparian Reserves. -Areas important for habitat connectivity. -Areas at high potential for debris torrents, flows or avalanches . -Special habitat buffers. -Bitter Lick Roadless Area.	**Applicable to all series:** *Vegetative Manipulation* -Promote large-tree, multiple-layered stand characteristics by applying silvicultural prescriptions such as thinning from below where healthy overstory trees are retained or by thinning throughout all size classes to allow for the removal of some overstory trees if necessary to reduce stocking densities. Retain both vigorously growing and defective trees (broken tops, forked stems, leaning trees, etc.). -Carry stand densities which are sustainable over time, which can maintain large-tree stand characteristics and diversity resilience. -Introduce pine as a component where evidence exists of occupancy (presence of old stumps, seedlings, etc.) as a contingency to mitigate for probable lack of fire due to continued suppression practices. -Apply group selections where stands are even-aged to promote structural and species diversity. -Monitor stocking levels to determine appropriate management of understory tree species and densities to ensure the long term maintenance of existing uneven-aged stands. -In areas where root disease is present, consider planting resistant species, modifying thinning densities or forego treatment: dependent on type of root disease occupying the site. -Where overstory trees display characteristics that indicate resilience to windthrow (e.g., stunted height growth), consider reducing stocking levels by thinning from below; retain the overstory. -When planting, apply appropriate animal control measures (such as baiting, netting or tubing) and manage for competing vegetation (i.e., brush cutting, scalp and mulch, chemical applications). -Prioritize management in stands less than 80 years in the LSR's; consider stands greater than 80 years where lack of management would forego future options to develop late-successional forest conditions. -Consider discriminating against white-fir, where intermixed with other conifer tree species. -Thin madrone where overstocked to encourage the development of large tree characteristics -Consider hand pulling weeds, cleaning of equipment during project implementation, and spot chemical treatment to reduce the potential for spreading non-native plant species.

LANDSCAPE FEATURE	OBJECTIVES	APPLY TO	MANAGEMENT OPTIONS
Existing Late-Successional Forests (continued)	See above.	See above.	*Watershed Restoration/Mitigation* -Maintain/protect duff and litter layers when treating created slash to: protect site productivity, minimize potential for soil transport, and to allow for the slow release of excessive water flows. -Consider applying low-intensity prescribed fire or lopping and scattering slash concentrations, especially on steep, clay-rich soils. -On existing skid roads where compaction has reduced the infiltration capacity and rate (causing rapid, excessive water flows): consider re-contouring and distributing slash, plant litter and other available organic material and/or planting cover to absorb moisture, maintain soil structure, trap sediment, slow down flow rates, soil crusting and retard the rate of soil freezing. -Reduce road densities and associated harassment to black tail deer, elk, other wildlife species sensitive to open roadways: close unneeded roads. -Repair roads (refer to Table 14.) -When designing new skid roads on clay-rich soils: design roads in such a way to avoid wet areas and only allow operations when soils are dry reintroduce low-intensity prescribed fire to maintain site productivity, especially on shallow soils (may require multiple applications over several years). *Other* -Consider landscape values before or during future project development. -On Forest Service administered land (sections 1 & 11, and portions of sections 3, 13 & 15 in the vicinity of Moraine Creek -T.33S., R.1W.) - consider re-allocating this area to Late-Successional Reserve. **White fir Series:** -Entries should be spaced to minimize disturbance to soils and tree damage associated with logging (recommend 30+ years between entries). Restrict the harvest operating season to exclude springtime logging when white-fir is most susceptible to stem scaring, (damage tends to increase risk of disease and wood fiber decay). -Enhance species diversity where white-fir dominates the majority of the stand by introducing low-intensity prescribed fire and thinning to encourage natural encroachment and growth of Douglas-fir. -For true firs (pure) on high elevation, north slopes: basal area should range from 180 to 240-square feet/per acre. Where sugar and ponderosa pine is present: basal area should range from 80 to 120-square feet/per acre. -Created openings should range from 1/5-1/2 acre in size. -Restore fire return intervals to an average frequency between 35-40 years. **Douglas-fir Series:** -To maintain sugar pine and ponderosa pine: basal area should range from 100 to 180-square feet/per acre. -Create small openings between 1/4-1/2 acre in size around large, healthy oaks and pine, where overtopping of conifers is occurring. -Restore fire return intervals to an average frequency between 18-25 years. -When planting, generally implement between October and April (moisture will be the most limiting factor affecting plant growth in this series).

LANDSCAPE FEATURE	OBJECTIVES	APPLY TO	MANAGEMENT OPTIONS
Existing Late-Successional Forests (continued)	See above.	See above.	**Shasta red fir Series:** -Create openings should range from 1/5-1/4 acre in size. Where the creation of openings is desirable, limit to small areas: minimize vegetative competition (potential for competition at the higher elevations is high), reduce potential loss of organic matter (existing amounts are naturally low), protect less-developed soils (compared to other plant series), decrease chances of mechanical logging damage (trees are highly susceptible to rot), and maintain existing mirco-sites (short growing season at the highest elevations in the Watershed are most sensitive to local environmental modifications). -Where long-stolon sedge exists, reduce potential for spread and associated vegetative competition by minimizing ground disturbance. Consider aerial logging methods and slash treatment by handpiling/burning, or lop and scatter. If burning is desirable, limit to extremely low intensity. -Where groundwater flow patterns have been modified as a result of timber harvesting, allow natural processes to restore severely disturbed sites. -Consider single tree selection: remove 2-4 trees out of a clump (clump = 10 or more trees). -Restore fire return intervals to an average frequency between 40-100 years. -When managing on south-facing slopes, orient openings on the contour along the east-west axis to minimize soil drying, especially on coarse textured soils.
Pine and oak savannas	-Maintain an open "park-like" stand structure dominated by oak, pine, native grasses, forbs and scattered shrubs. -Maintain early successional species diversity. -Accelerate tree growth of white oak to increase acorn production. -Increase pine and oak populations, improve large-pine and oak tree health; encourage the spread and development of this landscape type (where sustainable). -Provide suitable habitat for black tail deer and elk to meet ODFW's management objectives.	-Late Successional Reserves. -Low to mid elevation stands dominated by pine, oak and grasses. -Special habitats.	**White Oak Series:** -Manually thin small-diameter white oak. Where multiple-stems exist, thin to retain a dominant stem to encourage the development of a single-stem large tree. -Remove competing conifers by applying precommercial or commercial thinning silvicultural prescriptions. -Consider clearing around large, healthy pine. -Treat older brush patches through manual cutting, piling and burning or through spot burning to reduce fire hazards and to provide/enhance forage for big game. -Apply frequent low-intensity prescribed fire. Restore fire return intervals to an average frequency between 10-15 years. -Consider lop and scatter of created slash combined with the application of prescribed fire to increase site productivity-create seed beds to encourage natural pine/oak regeneration. -Consider using continuous line ground lead, suspended cable and/or horse logging systems on slopes greater than 15% to reduce potential damage to shallow or compactable soils. -If surveys indicate the presence of hedgehog dogtail (a common grass), review grazing practices (presence of this plant species indicates intensive grazing use). -Consider hand pulling, cleaning of equipment during project implementation, and spot chemical treatment to reduce the potential for spreading non-native plant species. -Close roads to reduce overall road densities and associated harassment to big game.

LANDSCAPE FEATURE	OBJECTIVES	APPLY TO	MANAGEMENT OPTIONS
Existing plantations less than 30 years old	-Convert even-age and/or single species plantations to include other tree species and manage to develop structural diversity. -Improve grazing opportunities. -Accelerate tree growth. -Allow for scenic improvement. -Promote future snag and down wood recruitment. -Protect from damage or loss from fire.	-Late-Successional Reserve and Matrix. -Critical viewing areas or areas adjacent to developed trails. -Moderate use transitory grazing areas. -Subwatersheds that are more than 60% hydrologically recovered (refer to Map 30.)	**All Series:** Maintain existing road access to allow for feasible, future management opportunities and fire suppression. -Create small openings and spot plant with tree species natural to that site, which are not currently present (consider especially where plantations are pole-size). -Use timber harvesting as a tool to feather and "soften" blunt edges around existing rectangular clearcuts (consider creating scalloped shaped adjacent openings to modify clearcut shapes). -Consider applying variable spaced precommercial thinning silvicultural prescriptions to promote stand structure diversity. -Protect young stands from large-scale fire damage: precommercially thin, prune (prioritize in 1-2" diameter class), treat existing and/or created slash within and/or adjacent to plantations (especially where fuel loading is in excess of 11.5 tons per acre that would most likely carry flame lengths in excess of 8 feet in height), or where brush is inter-mixed, break up continuous fuels through cutting, piling and spot burning where feasible. -Seed some portion of the scattered existing openings with palatable native grasses. -Consider reducing tree densities and introducing native tree species in "off-site" pine plantations. -Consider restoration activities, such as rehabilitating skid roads that are channeling runoff and road repairs. -Where root disease occupies less than 5% of the treated area, consider thinning within the infected zone while favoring the retention of the healthiest trees. Where more than 5% of the area is infected, thin but favor the retention of resistant tree species or forego activities.
Alder-dominated stands	-Allow for the natural encroachment and establishment of conifer species.	-Riparian Reserves. -Hydrologically impacted areas.	**Roadways:** -Consider alternatives to brushing related to road maintenance. -Consider blocking vehicle access (year-round or seasonally) to allow for the natural encroachment of other plant species. -Consider decommissioning roads to reduce the potential spread of blackstain (associated with scrapes or wounds incurred from the use of road maintenance equipment).
Cliffs/Rock Outcrops	-Maintain the natural integrity for scenic and resource values.	-Areas characterized by rock formations (such as Needle Rocks in the Elk Watershed).	-Coordinate with the responsible botanist and wildlife biologist when managing vegetation (growing on or adjacent to cliffs/rock outcrops) for possible restricted operating season and/or presence of threatened, rare or sensitive plant and animal species (i.e., peregrine falcon habitat).
Rural Settings	-Safe use and protection of public and private lands.	-Public land in proximity to private land.	-consider opportunities to develop partnerships with landowners, agencies and/or organizations, including coordination with local nonprofit and environmental groups.

LANDSCAPE FEATURE	OBJECTIVES	APPLY TO	MANAGEMENT OPTIONS
Aquatic	-Maintain or restore habitat and unobstructed migration corridors for at-risk stocks of anadromous salmonids and resident fish species. -Maintain or restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species. -Maintain or restore water quality, quantity and functions (capture, storage and release) to support the biological, physical and chemical integrity of the system to provide for social and resource values.	-Elk Creek and its tributaries.	**Applicable to All Stream Segments:** -Increase the abundance of deep pool habitat and provide cover structures (debris complexes). -reduce or eliminate unwanted sediment sources, which could include: adjustment of grazing practices, revegetation with native plant species within Riparian Reserves, road decommissioning, limiting to seasonal use, and/or modification of existing instream large wood/rock features. -Protect Riparian Reserves from intensive large-scale fires by reducing "ladder" fuels through thinning from below (primarily in the less than 16" diameter size class) or by precommercial thinning. Treat small-size, highly flammable created and existing woody material if conditions would carry flame lengths in excess of 4 feet in height, if a fire were to occur. -Consider opportunities to introduce large logs into stream channels where amounts are considered deficit. -Consider removing obstructions to fish migration, especially along the mainstem of Elk Creek. -Manage to increase summer base flows: Flat Creek-through August 1; Sugarpine and Bitter Lick Creeks-through Sept. 7. -Flat Creek: create side channels-prioritize in Reaches 1 & 2; cover structures-prioritize in Reaches 3 & 4. (See Appendix K for descriptions of stream reaches) -Sugarpine Creek: create side channels-prioritize in Reaches 1 & 3; cover structures-prioritize in Reaches 2 & 3. -Bitter Lick Creek: create side channels-prioritize in Reaches 1 & 3; cover structures-prioritize in Reaches 2 & 3. **Canyon stream segments:** -Maintain cool stream temperatures by managing adjacent vegetation for late-successional forest, where sustainable over time (high tree densities, herbaceous cover, large down logs, etc.). -Create and/or protect cascades, important for macroinvertebrate production. **Alluviated canyon stream segments:** -Create and/or maintain lateral scour pools associated with meanders and riffles to provide habitat for macroinvertebrates. -Maintain streamside shade to ensure "cool" water temperatures by managing for a closed tree canopy where growing conditions allow and would be sustainable over time. -Create side channels where needed. -Where terraced formations are occupied by hardwoods exist, consider maintaining the hardwood component by applying low-intensity prescribed fire and/or thinning. **Slope-bound and alluvial valley stream segments:** -Encourage cooperative, voluntary participation to screen unscreened water diversions and to remove human created passage barriers to the maximum extent practical. -Restore low-gradient (high width to depth ratio), meandering channel morphology by creating numerous side channels, debris complexes, cover structures in pools, and by planting of native plant species along barren stream channels. -Protect known beaver locations and encourage beaver colonization.

LANDSCAPE FEATURE	OBJECTIVES	APPLY TO	MANAGEMENT OPTIONS
Meadows	-Maintain natural meadow openings to provide for animal and plant species diversity and to support livestock grazing.	-Wet and dry meadows throughout the Watershed.	-Refer to the result of the utilization/distribution inventory for Butler Butte and Whaleback Allotments (final results will be completed in December 1996). -Consider developing water sources and treating slash on gentle slopes where utilization is low -Review grazing practices where over utilization is occurring. Coordinate with ranchers -Eliminate or reduce encroachment of conifers in natural meadows. -Consider opportunities to reduce non-native plant species such as colonial bentgrass, medusa-head grass, Kentucky bluegrass and star thistle.
Roadways /Public Use Areas	-Provide safe access and use of public roads consistent with Road Management Objectives. -Maintain current recreational opportunities. -Foster cooperation for hunter access with private landowners.	-All Forest Service and Bureau of Land Management administered roadways. -Campsites and areas of interest. -Jackson Access & Cooperative Travel Management Area.	**Roadways:** -Fall danger and hazard trees adjacent to "open" roads. -Apply standard road maintenance practices - look for opportunities to fund work during project implementation. -Upgrade and/ or restore roadway signing where needed. **Public Use Areas:** -Provide safe access and parking. -Consider opportunities for "safe forest use" education (i.e., fire prevention, trash cleanup) -Continue efforts to coordinate with ODFW, Boise Cascade and other private landowners
Powerline Corridor	Allow for periodic maintenance in a safe manner.	Area parallel to the powerline (to the limit of the right-of-way).	**Outside Riparian Reserves:** -Consider introducing a dwarf native plant species that minimizes the need and cost of maintenance. **Within Riparian Reserves:** -Minimize the reduction of the existing tree canopy, consider removing or topping only those trees that present an existing or near future hazard. -Coordinate with Pacific Power for possible relocation of that portion that presently exists within the Sugar Pine Creek drainage or placing lines underground. -Minimize the potential for soil transport into channels associated with access roads: consider constructing water dips, outsloping, spot surfacing, if feasible, avoid use during wet weather
Brush-dominated patches	-Maintain species and structural diversity which existed prior to fire exclusion. -Provide high quality forage for black tail deer and elk.	-Low elevation south slopes. -Big Game Winter Range.	-Apply aerial or ground initiated prescribed fire to created a mosaic of age classes and to encourage the spread of native grasses and forbs. -Consider manually cutting, piling and burning of brush. -Where slopes are less than 15%, use equipment to cut and mulch or to cut and pile in strategic locations.

ELK CREEK WATERSHED

SYNOPSIS OF APPENDICES

Much of the scientific information used for the analysis of the Elk Creek Watershed is contained in individual resource reports. Within these reports there is often raw data and supporting charts graphs, etc. Additional data is stored in the Geographic Information Systems (GIS) on the Rogue River National Forest. The following synopsis is designed to provide a brief summary of the content of each individual appendix section. The Appendices for the Elk Creek Watershed are contained in a separately bound document, available at the Prospect Ranger District and the Forest Supervisor's Office of the Rogue River National Forest and the Medford District Office of the Bureau of Land Management.

APPENDIX A - **Process Documentation;** includes the analysis team Charter, Key and Core Topics and Questions, and the analysis team biography. (18 pages)

APPENDIX B - **Public Involvement;** includes the public involvement strategy and a copy of the pamphlet. (5 pages)

APPENDIX C - **Non-agency Input;** input from Boise Cascade Corporation. (2 pages)

APPENDIX D - **Hydrologic Report and Data;** includes watershed hierarchy, precipitation, runoff patterns, stream profile data, turbidity data, information on water rights and historical flood data. (100 pages)

APPENDIX E - **Soils Report;** includes soils input, Soil Resource Inventory and Jackson County soils and forest type codes. (24 pages)

APPENDIX F - **Geology Report;** geologic history of the Elk Creek Watershed. (11 pages)

APPENDIX G - **Vegetation Report;** silvilcultural and vegetation input, information on Plant Series and Associations, formulas used to infer Plant Series from satellite imagery, and information on FS and BLM harvest activities. (46 pages)

APPENDIX H - **Fire and Fuels Report;** historic and current condition information and fire risk analysis calculations. (7 pages)

APPENDIX I - **Botanical Report;** plant information for Elk Creek Watershed. (3 pages)

APPENDIX J - **Satellite Imagery and GIS;** information on coding, coverage and how data was used for vegetation analysis. (20 pages)

APPENDIX K - **Aquatic Ecosystem Report;** aquatic habitat inventories and salmonid sampling data for the major fish-bearing streams in the Elk Creek Watershed. (303 pages)

APPENDIX L - **Terrestrial Wildlife Report;** habitat distribution and occurrence for special status species, spotted owl summary, big game summary, and input from Forest Service. (24 pages)

APPENDIX M - **Historical Narrative;** brief review of human prehistory and history of Elk Creek Watershed. (9 pages)

APPENDIX N - **Human Uses Information;** Elk CARE Team roadside hazard tree inventory - 1995, guidelines and definitions for hazard trees, information on special forest products and recreation input. (23 pages)

APPENDIX O - **Livestock Grazing Input;** data on grazing and allotments, summary of utilization inventories for Butler Butte and Whaleback Allotments - 1995. (12 pages)

APPENDIX P - **Transportation Management;** Forest Service road listing, FS road recommendations - 5/28/96, FS historical road data and road maintenance collection information. (15 pages)

Elk Creek Watershed Analysis

REFERENCES

Applegarth, John. 1992. Herpetologist, Eugene BLM District, Eugene, Oregon. Personal Communication

Atzet, Thomas and Lisa A. McCrimmon. 1990. Preliminary Plant Associations of the Southern Oregon Cascade Mountains Province, USDA-Forest Service, Pacific Northwest Region, Siskiyou NF

Badura, G.J. and P.N. Jahn. 1977. Soil Resource Inventory for the Rogue River National Forest. USDA-Forest Service

Brown, Carroll A. 1960-71 History of the Rogue River National Forest. Vols. I and II. Rogue River National Forest, Medford

Bull, Evelyn, Richard S. Holthausen, Mark G. Henjum. 1992. "Roost Trees used by pileated woodpeckers in Northeastern Oregon, Journal of Wildlife Management. 56(4):786-793

Bureau of Land Management Special Status Invertebrate Species List. 10-30-92

Burt, William H. And Richard P. Grossenhider. 1976. A Field Guide to the Mammals, the Peterson Field Guide Series, Houghton Mifflin Co., Boston

Busby, P.J., T.C., Wainwright, and R.S. Waples. 1994. Status review for Klamath Mountains Province steelhead. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-19, 130p

Chapman, D.W. and K.P. McLeod. 1989. Development of criteria for fine sediment in the northern Rockies ecoregion. EPA 910/9-87-162. U.S. Environmental Protection Agency, Region 10, Seattle, WA

Circuit Court for Jackson County. 1919 Rogue River Decree (Adjudication of water rights for the upper Rogue River basin.) Medford Printing Company, Medford

Cross, Steven P. 1992. Southern Oregon State College Biology Professor. Notes from Oregon Wildlife Society Bat Workshop

Daniel, Theodore W., John A. Helms and Frederick S. Baker. 1979. Principles of Silviculture. McGraw-Hill, New York

Everest, Fred H. 1973. Ecology and management of summer steelhead in the Rogue River. Oregon State Game Commission. Corvallis, OR

Hammond, Paul. 1992. "Special Status Butterfly Species List" report

Hammond, Paul. 1994. "Rare Butterfly Assessment for the Columbia River Basin in the Pacific Northwest", Eastside Ecosystems Management Strategy Project

Hegne, Barbara. 1989. "Yonder Hills": Shady Cove, Elk Creek, Persist, Trail, and Etna. Privately published, Eagle Point

Hobb, Stephen D., et al, editors. 1992. Reforestation Practices in Southwestern Oregon and Northern California. Forest Research Laboratory, Oregon State University, Corvallis, Oregon

Hydrosphere Data Products. 1994. Hydrodata: USGS Daily Values, Volume 7.3

Irving, J.S., and T.C. Bjornn. 1984. Effects of substrate size composition on survival of kokanee salmon and cutthroat trout and rainbow trout. Technical Report 84-6. Idaho Cooperative Fisheries Research Unit, University of Idaho, Moscow, ID

L.E. Hubbard, Herrett, T.A., Kraus, R.L., Ruppert, G.P., and Counts, M.L. 1995. Water Resources Data Oregon Water Year 1994. USGS Water-Data Report OR-94-1. 473 pages

LaLande, Jeff. 1980. Prehistory and History of the Rogue River National Forest: A Cultural Resources Overview. Rogue River National Forest, Medford

LaLande, Jeff. 1996. "Elk Creek Watershed: History Narrative", unpublished document, Rogue River National Forest, Medford, Oregon

Leonard, William P., Herbert A. Brown, Lawrence L. C. Jones, Kelly R. McAllister, and Robert M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society. 168 pp

Marshall, David B. 1992. Sensitive Vertebrates of Oregon, Oregon Dept. Of Fish & Wildlife

Moffatt, R.L., R.E. Wellman, and J.M. Gordon. 1993. Statistical summaries of streamflow data in Oregon: Volume 1 - Monthly and annual streamflow, and flow-duration values. U.S. Geological Survey Open-File Report 90-118. Portland, Oregon

Nickelson, T.E., J.D. Rogers, S.L. Johnson, M.F. Solazzi. 1992. Seasonal changes in habitat use by juvenile coho salmon (Oncorhynchus kisutch) in Oregon coastal streams. Canadian Journal of Fish and Aquat. Sci. Vol. 49 p. 783 - p. 789

Nussbaum, Ronald A., Edmund D. Brodie, Jr., and Robert M. Storm. 1983. Amphibians & Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho

Oliver, Chadwick D. And Bruce C. Larson. 1990. Forest Stand Dynamics. McGraw-Hill, New York

Oregon Department of Environmental Quality. 1996. DEQ's 1994/1996 303(d) List of Water Quality Limited Waterbodies and Oregon's Criteria Used for Listing Waterbodies. 61 pages

Oregon Department of Fish and Wildlife. 1994. Rogue basin fish management plan. Rogue District Office. Central Point, OR

Oregon Natural Heritage Program Database Information. 1994.

Oregon State Department of Geology and Mineral Industries. 1943. Metal Mines Handbook (Jackson County volume). State Printer, Portland, Oregon

Prchal, Mark. 1996. "A Geologic History of the Elk Creek Watershed", unpublished document, Rogue River National Forest, Medford, Oregon

R.E. Wellman, Gordon, J.M., and Moffatt. R.L. 1993. Statistical Summaries of Streamflow Data in Oregon: Volume 2 - Annual Low and High Flow, and Instantaneous Peak Flow. U.S. Geological Survey Open File Report 93-63. 406 pgs

Regional Ecosystem Office. 1995. The Federal Guide for Watershed Analysis, Version 2.2. Portland , Oregon

Sandoz, Joli. 1995 "Taming Elk Creek with Mud and Sticks." Southern Oregon Heritage, Vol. 1, Number 1. Southern Oregon Historical Society, Medford

Schroeder, Richard L., 1982. "Habitat Suitability Index Models: Pileated Woodpecker". U.S. Dept of Interior, U.S. Fish and Wildlife Service. FWS/OBS-82.10.39 15pp

Statewide Comprehensive Outdoor Recreation Plan (SCORP). 1994. Oregon Parks and Recreation Department

Tappel, P.D., and T.C., Bjornn. 1983. A new method of relating size of spawning gravel to salmonid embryo survival. North American Journal of Fisheries Management, 3:123-135

United States Environmental Protection Agency (EPA). 1986. Quality criteria for water. Office of Water Regulations and Standards, Washington, D.C.

US Army Corps of Engineers, Portland, District. 1991. Elk Creek Lake, Rogue River Basin, Oregon. Final Environmental Impact Statement Supplement No. 2

US Army Corps of Engineers, Portland District. 1990. Elk Creek Lake, Rogue River Basin, Oregon. Final Environmental Impact Statement Supplement No. 2, Appendixes

USDA-Soil Conservation Service. 1993. Soil Survey of Jackson County, Oregon

US Department of Agriculture, Forest Service. 1990. Land and Resource Management Plan for the Rogue River National Forest

US Department of Agriculture, Forest Service. 1995. Draft: The Forest Service Program for Forest and Rangeland Resources (RPA)

US Department of Agriculture, Forest Service and US Department of Interior, Bureau of Land Management. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl. Portland, Oregon

USDA, Forest Service, and USDI, Bureau of Land Management. 1993. PACFish Strategy (Draft)

US Department of Army. Army Corps of Engineers. 1980. Elk Creek Lake, Rogue River Basin Oregon, environmental impact statement. Portland, District, Portland, OR

U.S. Forest Service. 1906-89. Numerous selected items from the Forest's historical records collection, including: maps, timber plans, grazing reports, annual fire reports, and miscellaneous correspondence

US Department of Interior, Bureau of Land Management. Medford District Proposed Resource Management Plan, Environmental Impact Statement, (Final) October 1994

US Department of Interior, Bureau of Land Management. 1995. Record of Decision and Resource Management Plan - Medford District, Medford, Oregon

Waples, R.S., 1991. Definition of "species" under the endangered species act: application to Pacific salmon. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-F/NWC-194

Wernz, Dr. James, Report to Nature Conservency Data Base, Dept. Of Entomology, Oregon State University

ELK CREEK WATERSHED ANALYSIS

GLOSSARY OF TERMS

GLOSSARY - A

Alluvial - originated through the transport by and deposition from running water.

Alluvial stream - a stream whose boundary is composed of appreciable quantities of the sediments transported by the flow and which generally changes its bed forms as the rate of flow changes.

Alluviated canyons - alluviated canyons historically were productive segments of the stream system; with complex braids and side channels, coarse wood and deep scour pools. These were areas of deposition and stored wood and sediment.

Alluvium - stream-deposited debris.

Anadromous fish - those species of fish, such as salmon and steelhead, which are born and reared in freshwater streams, migrate to the ocean to grow and mature, and return to freshwater to reproduce.

Andesite - a medium dark-colored volcanic rock with less magnesium and iron that basalt.

Anthropogenic - caused by humans.

Aquatic - growing or living in or upon water.

Aquatic Conservation Strategy (ACS) - a strategy from the Northwest forest Plan, developed for public lands, to restore and maintain the ecological health of watersheds and aquatic ecosystems to help protect habitat for fish and other riparian-dependent species and resources.

ARC-INFO - a computer software program that represents geographic feature and their relationships in a digital model.

Ash-flow tuff - a tuff deposited by a superheated gaseous cloud.

GLOSSARY - B

Bankfull stream width - the discharge which just fills a stream to its banks.

Basalt - a dark-colored volcanic rock rich in magnesium and iron.

Benthic- relating to, or occurring at the bottom of a body of water.

Biodiversity - the variety of life forms and processes, including a complexity of species, communities, gene pools and ecological functions.

Biomass - the total quantity (at any given time) of living organisms of one or more species per unit of space (species biomass), or of all the species in a biotic-community (community biomass).

Bryophytes - any of a division of plants consisting of mosses and liverworts.

GLOSSARY - C

Channel - a natural or artificial waterway that periodically or continuously contains moving water, or which forms a connecting link between two bodies of water.

Chlorophyll - a green pigment or chemical compound found in plant cells essential to the photosynthetic process.

Clean Water Act - Federal Water Pollution Control Act, as Amended (Public Law 100-4). The objective of this law is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.

Climax - the final stages of a vegetation succession through seral stages to the most stable, moisture and shade-loving association the site can support.

Coarse Woody Debris: (CWD) - portions of trees that have fallen or been cut and left in the forest; usually found in pieces at least 16 inches in diameter and 16 feet long.

Colluvium - pertaining to loose and incoherent deposits, usually at the foot of a slope or cliff, being brought there chiefly by gravity.

Colluvial and bedrock canyons - these stream types have a low width to depth ratio, bedrock and/or boulder streambed, and the ability to transport sediment and wood downstream. Canyon streams are often topographically shaded and are important for cold water production and coarse wood supply.

Conspecific - of the same species.

Conspecific population units -populations of the same species.

Created openings - openings in the forest created by the silvicultural practices for regeneration harvest treatments.

Crown fire - a fire that advances from top to top of trees or shrubs more or less independent of the surface fire.

Cumulative Effects - the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over an extended period of time.

GLOSSARY - D

Demographic - dealing with the statistics of distribution, density, etc. of populations of species.

Dendritic - a drainage pattern characterized by irregular branching in all directions with the tributaries joining the main stream at all angles.

Digital elevation data - data on elevation, stored in a computer and referenced by horizontal locations. The data used in this analysis was provided by the US Geological Survey and is a series of sample points spaced 30 meters apart.

Disturbance - a force that causes significant change in structure and/or composition through natural events such as fire, flood, wind, or earthquake, mortality caused by insect or disease outbreaks, or by human-caused events such as the harvest of forest products.

GLOSSARY - E

Ecosystem - a community of plants, animals, other living organisms, and the nonliving factors of their environment, whose interactions result in an exchange of materials and energy between the living and nonliving components of the system.

Ecosystem Management - a strategy or plan to manage ecosystems to provide for all associated organisms, as opposed to a strategy or plan for managing individual species.

Endangered Species - Endangered Species Act (ESA) - an act to provide a means whereby ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered and threatened species, and to take such steps as may be appropriate to achieve the purposes of the (relevant) treaties and conventions.

Environmental Protection Agency (EPA) - an independent agency of the U.S. Government with cabinet level status.

Ephemeral Stream - a stream or portion of a stream that flows only in direct response to precipitation and receives little or no water from springs and no continuous supply from snow or other sources. Its channel is above the water table at all times.

Escapement - the act of escaping. In this document, this is referring to adult anadromous salmonids which have escaped all forms of mortality and survived to return to spawn in their natal streams.

Extirpation - to destroy or remove completely, as in presence of a certain species.

GLOSSARY - F

Fire hazard - a fuel complex defined by kind, arrangement, volume, condition, and location that form a special threat of ignition.

Fire interval - (or fire-return interval) - the number of years between two successive fire events in a given area.

Fish-bearing stream - any stream that contains any type of anadromous or inland fish population.

Fish and Wildlife Service (F&WS) - a division within the U.S. Department of the Interior.

Forest Health - the state of and ecosystem in which processes and functions are adequate to maintain diversity of biotic communities commensurate with those initially found there.

Forest succession - the orderly process of change in a forest as one plant community or stand condition is replaced by another, evolving toward the climax type of vegetation.

Fry - fish which have recently hatched.

Fuel model type - an identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread and difficulty of control under specific weather.

GLOSSARY - G

Genetic introgression - the infiltration of genes from the gene pool of one species into that of another.

Geomorphic - pertaining to the form of the earth or its surface features; e.g., a geomorphic province or geomorphic terrain type.

Geomorphology - the science that treats the general configuration of the earth's surface; specific to the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures and the history of geologic changes as recorded by these surface features.

Gully erosion - erosion of soil or soft rock by running water that forms distinct, narrow channels that usually carry water only during and immediately after heavy rains or following the melting of ice or snow.

GLOSSARY - H

Hydrologic - pertaining to the geographic location, quantity, quality and timing of water flow and yield from forested lands.

Hummock - a low, rounded hill or tract of heavily wooded land, higher than a surrounding marshy area.

GLOSSARY - I

Intermittent stream - any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition from flow during wet seasons. The groundwater table lies above the bed of these streams during the wet season but drops below the bed during dry seasons.

Isohyetal lines - map connecting points having an equal amount of precipitation during a given time period.

Introgression - the entry or introduction of a gene from one population or species into another.

GLOSSARY - J, K

Key Watershed - as designated by the Northwest Forest Plan, a watershed containing (1) habitat for potentially threatened species or stocks of anadromous salmonids or other potentially threatened fish, or (2) those where high water quality is important.

GLOSSARY - L

Land and Resource Management Plan (LRMP) - a plan which gathers and coordinates the direction to be followed in the overall management of a National Forest. Included in the Forest Land and Resource Management Plan are applicable National and Regional management direction and standards and guidelines for the management of a National Forest.

Landscape - an area composed of interacting ecosystems that are repeated because of geology, landforms, soils, vegetation, climate, species and human influences.

Late-Successional Reserve (LSR) - a Northwest Forest Plan allocation where reserves are identified with an objective to protect and enhance conditions or late-succession and old-growth forest ecosystems, which serve as habitat late-successional and old-growth forest related species including the northern spotted owl.

Lithic debitage - prehistoric evidence of human inhabitance via the presence of human created stone tools, etc.

GLOSSARY - M

Macroinvertebrate - large or prominent animals which lack a spinal column. In this document this term is generally associated with aquatic insects which inhabit the stream bottom.

Mass movement - the downslope movement of earth caused by gravity. Includes but is not limited to landslides, rock falls, debris avalanches, and soil creep. It may be caused by natural erosional processes, or by natural disturbances (e.g., earthquakes or fire events) or human disturbances (e.g., mining or road construction).

Matrix: - a Northwest Forest Plan allocation for land allocated outside Congressionally Reserved Areas, Late Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administrately Withdrawn Areas and Riparian Reserves where production of timber and other commodities is an important objective and where the forests within these areas also function as connectivity between late-Successional Reserves to provide habitat for a variety of organisms associated in both late-successional and younger forests.

Monitoring - an essential component of natural resource management that provides information on the relative success of management strategies by observing and checking on the ongoing or completed projects within a designated area to evaluate if objectives and anticipated or assumed results of that management plan are being realized or if implementation is proceeding as planned.

Mycorrhizal fungi - fungi with a symbiotic relationship with the roots of certain plants.

GLOSSARY - N

National Environmental Policy Act (NEPA) - an Act passed by Congress in 1969 that declared a national policy to encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the Nation and to establish a Council on Environmental Quality.

Non-game - species of animals not managed for sport hunting.

Noxious Plant - a plant specified by law as being especially undesirable, troublesome, and difficult to control.

GLOSSARY - O, P

Probable Sale Quantity (PSQ) - the annual amount of timber commodities likely to be sold on a sustainable basis under the Northwest Forest Plan; applies to Matrix and Adaptive Management Areas.

Perennial stream - a stream that typically has running water on a year-round basis from its source to its mouth.

Permittee - the holder of a special use permit.

Plant Series - an aggregation of plant associations, named after the same climax-dominant species.

Plant Associations - a plant community type based on land management potential, successional patterns, and species composition; the lowest level of the classification hierarchy.

Precommercial - describes the diameter of size of forest material that is not commercially sold as a product.

Pumper shows - jargon for developed water sources along roads.

Pyroclastic - a volcanic deposit of broken rock fragments formed by a volcanic explosion or aerially ejected from a volcanic vent.

Physiographic province - a geographic area having a similar set of biophysical characteristics and processes due to effects of climate and geology, which result in patterns of soils and broad-scale plant communities. Habitat patterns, wildlife distributions, and historical land use patterns may differ significantly from those of adjacent provinces.

GLOSSARY - Q, R

Rain-on-snow event - when thick snow packs are melted by warm rains causing peak flow events. Rain-on-snow events usually occur within the transient snow zone, early to late winter.

Reforestation - the natural or artificial restocking of an area with forest trees most commonly used in reference to artificial restocking. Reforestation is done to produce timber and other forest products, protect watersheds, prevent erosion and improve other social and economic values of the forests, such as wildlife, recreation and natural benefits.

Regeneration - the actual seedling and saplings existing in a stand, or the act of establishing young trees naturally or artificially.

Residualism - the result of an anadromous fish losing the ability to migrate to the ocean, and taking up residence in fresh water.

Resource Management Plan (RMP) - a land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act.

Rill Erosion - land erosion forming small, well-defined incisions in the land surface less than 30 centimeters in depth.

Riparian Reserve - a Northwest Forest Plan allocation which incorporates a strategy for reserves providing an area along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis and where special standards and guidelines direct land use.

Riverain Habitat - relating to, formed by, or resembling a river.

GLOSSARY - S

Salmonid - any fish belonging to the family *Salmonidae*. In this document this term is used to refer to the combination of both salmon and trout.

Satellite imagery - digital data remotely sensed from the Landsat satellite; useful for vegetation assessment. Satellite imagery, once geocoded and terrain-corrected, is used in a GIS.

Schlerophyll brush species - characterized by leathery, small and highly flammable leaves; developed in a climate with relatively cold/wet and hot/dry seasons.

Sedimentary - rock formed by sediment which was transported from its source by water such as sandstone and shale, or rocks formed by precipitation from solution such as gypsum, or from secretions of organisms such as limestone.

Sensitive Species - those species that (1) are recognized by the Federal land management agencies as needing special management to prevent their being placed on Federal or State lists, (2) have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species or (3) are on an official state list.

Seral stages - a stage or recognizable condition of a plant community that occurs during its development from bare ground to climax, for example, many coniferous forests progress through six recognized stages: grass-forb; shrub-seeding; pole-sapling; young; mature; over mature old-growth.

Sheet erosion - the more or less uniform removal of soil from an area by raindrop splash and overland flow, without the development of water channels exceeding 300 mm in depth.

Smolt - verb - the physiological process that prepares a juvenile anadromous fish to survive the transition from fresh water to salt water.

Soil compaction - an increase in bulk density (weight per unit volume) and a decrease in soil porosity resulting from applied loads, vibration, or pressure.

Species diversity - the number, different kinds, and relative abundance of species.

Streambank erosion - the removal of streambank material by flowing water.

Stream discharge - the quantity of flow passing through a stream cross section in a unit of time.

Subwatershed - a lessor order of perennial stream drainage pattern, contained within a watershed.

Succession - a series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax such as the development of series of plan communities (called seral stages) following a major disturbance.

Surface erosion - a group of processes whereby soil materials are removed by running water, waves and currents, moving ice, or wind.

GLOSSARY - T

Taxol - a chemical compound that can be derived from the bark of Pacific yew (*taxus brevifolia*), used to treat human cancer symptoms.

Threatened Species - any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species.

Transitory range - land that is suitable for grazing use of a none-enduring or temporary nature where for example grass may cover an area for a period of time before being replaced by trees or shrubs not suitable for forage.

GLOSSARY - U, V, W, X, Y, Z

Vent - an opening at the earths surface through which volcanic materials are extruded or the conduit through which they pass.

Volcanic - of, thrown from, characteristic of, or caused by a volcano.

Watershed - the total area above a given point on a stream that contributes water to the flow at that point such as the entire region drained by a waterway which drains into a lake, reservoir, or the ocean.

Watershed Analysis - a systematic analysis for evaluating geomorphic, watershed and ecological processes to meet specific management and social objectives for watersheds of approximately 20 to 200 square miles (fifth field watersheds).

Watershed restoration - a comprehensive, long-term program of watershed improvement to benefit watershed health and aquatic ecosystems, including the habitats supporting fish and other aquatic and riparian-dependent organisms.

Full maintenance of the 2,834 miles of Forest Development Roads on the Rogue River National Forest transportation system in 1984 could not have been accomplished with the 42% appropriated funding available. This situation was recognized by the Forest Service and projections of real appropriated funding levels were developed in program requests to Congress. Forest Service Region 6 (R-6) assumptions, as late as 1992, predicted appropriated road maintenance funding would need to increase to offset reduced collections from commercial timber activities. This has not come to pass. As of 1996, R-6 no longer anticipates any increase in funding.

As timber activities decline, road maintenance collections from timber haul declines. On Forest Service administered land within the Elk Creek Watershed, acres harvested decreased by 55% from the late 1980's to the early 1990's. Timber harvested acres decreased further into the mid 1990's by 74%. Similarly, Bureau of Land Management has experienced a 96% reduction in acres harvested between the late 1980's and early 1990's.

In 1997, appropriated road maintenance dollars are expected to fund 100% of Rogue River National Forest noncommercial road maintenance activities. Anticipated funding will be 41% of 1984 funding, in terms of 1984 dollars. Stewardship of the FDR transportation system will be totally dependent on National Forest System funding to the Forest Service as appropriated by Congress. The traveling public will not benefit from commercial haul road maintenance deposits as experienced in the 1980's. Collections will only supplement road maintenance commensurate with commercial activities. The Forest Service will receive reduced road maintenance funding as national emphasis for a balanced Federal Budget continues. Competition for limited dollars will become more intense if R-6 timber volume continues to decline.

In response to reduced 1995 road maintenance funding (Rogue River National Forest 1995 funding was 44% of 1984 dollars adjusted for inflation) and concerns for watershed health, the Forest Service began the process of reviewing the existing transportation system for possible restoration activities and opportunities to either reduce maintenance levels or decrease the amount of road miles in the system. The Road Maintenance Objectives (RMO's) for roads located on Forest Service land were reviewed by interdisciplinary teams in 1995 (Prospect Ranger District review process), and as part of the 1996 Watershed Analysis effort. Recommendations are discussed in Chapter IV.

The Bureau of Land Management will be reviewing their transportation in the future to determine restoration activities, modifications in maintenance levels and possible reduction in road miles.

The Western Federal Lands Highway Division of the Federal Highway Administration (FHWA), in conjunction with the USDA Forest Service, USDI Bureau of Land Management, and Jackson County Department of Public and Parks is planning to upgrade two segments of Elk Creek Road (Oregon Forest Highway 159) in 1997. The FHWA's proposal has been divided into two segments: Segment 1, between milepost (MP) 8.5 and MP 11.2 and Segment 2, between MP 11.2 and MP 13.0. The width and design of the existing road do not meet modern highway safety standards, and the asphalt surfacing is deteriorating. Under the proposed project, both segments would be improved to meet Jackson County's road standards. In Segment I, the road would be widened, some of the curves would be straightened, and the roads base and pavement structure would be reconstructed. In Segment 2, the road would be notch-widened and then overlain with an asphalt concrete pavement. The environmental assessment is currently available for review and comment.

Boise Cascade is currently in the process of developing a road maintenance and improvement plan for their Southern Oregon ownership. As part of this effort, Boise Cascade roads within the Elk Creek Watershed will be evaluated in 1996. All culverts that do not meet 50 year flood event specifications will be replaced or a backup drainage system will be designed. Boise's objective is to have all their roads and culverts improved within 10 years, with the highest priority placed on roads that are creating undesirable amounts of sedimentation.

Unregulated off-road vehicle use on Federal and private land is creating safety problems (in areas where non-licensed use is mixing with regular vehicular traffic) and causing damage to road surfaces (when use is occurring during wet weather). Boise Cascade may reduce public access in the future in response to increases in off-road vehicle recreational use during the winter and spring to offset maintenance costs. The Forest Service plans to provide assistance in traffic control and sign placement.

As part of a multi-agency habitat and cooperative road closure program (including Boise Cascade, Oregon Department of Fish & Wildlife, the Army Corps of Engineers, Bureau of Land Management and private landowners), seasonal road closure restrictions are planned. The objectives of this cooperative agreement include improving deer winter range, minimizing the amount of trash dumping, and reducing road maintenance costs.