CHAPTER 3
PAST AND CURRENT CONDITIONS, PROCESSES

In this chapter, the Elk River watershed is presented in the context of the values and key questions identified in Chapters 1 and 2.

COMMODITY VALUES

Throughout prehistory and history, the economy of the southern coast of Oregon has focused on the area's natural resources.

Subsistence

In preeuropean time, the Quatomah band of the Tututni group of Athapascan- speaking Indians occupied the Elk River drainage. They spent winters in permanent villages located near the mouth and along the lower section of the river. During the rest of the year they traveled to the uplands to fish, hunt, and gather, relying on the rich salmon supply as a major food source. They also relied on acorns, camas, berries, and deer.

Beginning in the 1820s, fur trappers and traders were the first non-Indians to harvest the coast's rich resources. Jedediah Smith's party crossed the Elk River in 1828.

The first settlement on the southern Oregon coast was Port Orford. Between the 1850s and the 1930s the dominant economic pattern along the Elk, , was subsistence living. The early settlers along the lower section of the river cleared the forest for ranches. Residents lived by hunting, fishing, raising livestock, and growing food. Bartering was common. Small scale mining occasionally provided cash to supplement this subsistence lifestyle.

Special Forest Products

One remnant of the subsistence living culture is the collection of special forest products. The National Forest is utilized for the collection of ferns, boughs, Christmas trees, mushrooms, firewood, and other items, this does provide some employment opportunities. Collection of these products is done under permit. The District office in Powers sells permits which are valid across the entire District. So it is difficult to track in which specific watershed the collection is taking place. The current value of the permits is approximately 10% of the market value of the products. The market values of individual products changes from year to year, so the interest in collecting varies from year to year.

When market values of some products such as beargrass are high, there can be considerable public interest in collecting this product. The District may receive many phone calls and personal contacts about these commodities. Compared to timber harvest or lumber processing the collection of special forest products makes a very small contribution to local employment.

Mining

In 1853, when gold was discovered at the mouth of the Elk River, the area experienced a short-lived mining boom. After the turn of the century, mining operations in neighboring drainages, such as the Sixes and Rogue Rivers, provided employment for Elk River residents. Subsequent mining on the Elk itself was small scale. After World War II, the lower price of gold made mining even less profitable.

The recreational portion of the Wild and Scenic River has been withdrawn from mineral entry. Mining will be allowed on those claims that predate the withdrawal and where valid existing rights are determined through mineral examination. Operations will be subject to mitigation measures that protect the river’s outstandingly remarkable values. Today, there is one mining claim with a completed validity exam and

Notice of Intent (NOI) on the Recreational portion of the river (Stinson 1997). This activity under the NOI is considered recreational rather than commercial because of its limited scale.

Other recreational scale mining, such as gold panning, is prohibited because mineral entry has been withdrawn. Rockhounding is allowed on National Forest land provided such activities are compatible with the Forest's standards and guides.

Mining activity for locatable minerals, such as gold, on private lands is not known, but presumed to be at a very low level. There is low potential for leasable minerals like coal, gas, and oil. The saleable minerals, rock, sand, and gravel have high potential within the watershed and are mined. In all of Curry County mining provides only .01% of the total county wide employment (McGinnis 1996).

Fishing

Commercial fishing began on the southern Oregon coast in the late 1800s with the construction of canneries and hatcheries. Residents near the mouth of Elk River found employment in these endeavors. Records from 1927 (Figure 2) indicate a commercial gillnet fishery operating near the mouth of the Elk River harvested significant numbers of coho, chinook, chum and steelhead (Bender 1970). In the mid-1900s a fleet of 60-70 fishing vessels operated out of Port Orford.

Figure 2: 1927 Commercial Gillnet Fishery Catch Records for the Elk River

Species	Total Pounds	Avg Wt./Fish	Estimated Catch
Coho Salmon	13,336 lbs.	10 lbs.	1,334 Fish
Chinook Salmon	14,889 lbs.	20 lbs.	744 Fish
Chum Salmon	2,238 lbs.	12 lbs.	187 Fish
Steelhead	5,952 lbs.	10 lbs.	595 Fish

In the 1980s Port Orford ranked second among Oregon coastal ports in total chinook catch value (Columbia River fishery excluded; Lukas and Carter 1985). An extension of the commercial fishing season until November 30 increased the contribution of Elk River chinook to fishermen and fish processors located in Port Orford. Because the November season is confined to the area near the mouth of the Elk River, it provides a good indication of Elk River quantities. In 1984 the November Port Orford chinook catch was 28,000 lbs, which was 30% of the year's catch at Port Orford, and 87% of the November chinook catch off the entire Oregon coast (Lukas and Carter 1984). By 1993, the November Port Orford chinook catch had dropped to 9,200 lbs (ODFW, Newport, Oregon). Commercial salmon catch has dropped significantly for Coos and Curry County ports from 2.8 million pounds in 1989 to 0.1 million pounds in 1994. Groundfish harvest (flounder, perch, rockfish, sole, and Pacific whiting) in the 1989 to 1994 period exceeded 20 million pounds each year (Anderson 1996). This shows the importance of the groundfish harvest relative to the salmon harvest for Oregon’s south coast ports.

The fall chinook run on the Elk also attracted sport fishing. Local residents recall the mid-1900s when they backed their pickup truck down to the river, caught salmon with nets, and flipped them into the back end until the bed was full. Since the mid-1980's, hundreds of sport anglers travel to the Elk each fall to fish for chinook and steelhead. Peak days of 50 drift boats and 300 bank anglers fishing some 13 miles of river are not uncommon. During 1993, thirty fishing guides from southern Oregon and northern California operated on the river.

Timber Production

Commercial logging in the Elk River watershed began in the mid-1800s. In 1851, the first shipment of cedar shingles left Port Orford for California. Until the 1930s, however, logging along the Elk River was small scale. The ranches on the lower part of the river produced lumber for their own use. During this time loggers split Port-Orford-cedar logs and floated them to a mill at the Marsh Ranch, where they were made into battery separators.

In 1936, Transpacific Lumber built a dock in Port Orford, and a logging railroad was built from the Elk River valley across the ridge to the dock. This marked the beginning of shipping Elk River lumber to larger markets in California.

National Forest lands were accesses for timber harvest beginning in the 1950's, coinciding with a progressively expanding road system. The timber industry became economically important, with over 300 million board feet of timber harvested from National Forest land between 1954 and 1989. Several mills were supplied predominantly by timber from the Elk River watershed. Western States Plywood, located on the Elk River, employed 230 people. It closed in 1974 because it could no longer compete with larger mills. In the past decade both the Moore Mill lumber production facility and the Rogge Mill, both located in Bandon, have closed.

The natural resource contribution of the Elk River to the local population is similar to Curry County overall, therefore readily available information about land ownership and employment in Curry County is applicable to the Elk River watershed. A high percentage of the watershed and the county is Federal ownership. The Elk River is 79% Federal and Curry County is 54% Federal. Historically, timber harvest came from both Federal and private lands within the county, and in the last decade Federal harvest has declined rapidly (McGinnis et al. 1996). Along with the drop in Federal harvest came increased lumber production efficiency as mills modernized equipment. These two factors have combined to reduce timber and lumber related employment (Anderson 1996).

Curry County has 181,000 acres of commercial timberlands (McGinnis et al. 1996), much of this is held by large commercial timber companies managing over 10,000 acres. By contrast private ownership in the Elk River is smaller at about 1000 acres or less.

Agriculture

Less than 10% of Curry County is in farmland, this includes berry production and nursery products, livestock pasture, and small woodlots. The value of farm products sold has increased dramatically in the county from $5.4 million in 1982 to $11.0 million in 1992 (McGinnis et al. 1996). The development of many new cranberry bogs has contributed to this trend, which reasonably represents the farmland in the Elk River watershed.

Current Condition

A succession of land designations has gradually reduced the amount of timber available for harvest on National Forest lands.

- 1984 - Congress designated the 9,394 acre Grassy Knob Wilderness, 9,394; roughly 20% of the wilderness acres reside within the Elk River watershed.
- 1988 - Congress designated a 19-mile segment of the Elk River as part of the National Wild and Scenic Rivers System.
- 1989 - The Siskiyou National Forest completed its Land and Resource Management Plan. This plan provides direction for management of the Forest's resources and allocated thousands of acres to designations such as Botanical, Supplemental Resource, Special Wildlife Habitat, Riparian, etc.
- 1990 - U.S. Department of Fish and Wildlife listed the northern spotted owl as Threatened, and established 3,000 acres of critical habitat within the Elk River watershed.
- 1992 - U.S. Department of Fish and Wildlife listed the marbled murrelet as Threatened.
- 1994 - The NFP was signed and it allocated 46% of the watershed to Late-Successional Reserves, while designating Elk River as a Key Watershed. The NFP also allocated 3,304 acres in the Matrix land allocation with an objective for timber harvest. Of these 3,304 acres, a reduction of approximately 46% could be expected for identification of all classes of Riparian Reserves.

The economy still depends on the area's natural resources, though no longer relying heavily on those in the Elk River. Employment in logging and commercial fishing have declined from past highs, while recreation and tourism has increased. At about the same time retired persons have moved to the area because of its amenity such as mild climate, sparse population, and natural setting. Restaurant, motel, and construction jobs remain steady, and there is a growing arts community.

AMENITY VALUES

Scenery

Congress enacted the National Wild and Scenic Rivers Act in 1968. In 1988, the Omnibus Oregon Wild and Scenic Rivers Act added parts of forty rivers to the National Wild and Scenic River System. Part of the Elk River was designated Wild and Scenic under this legislation. Anadromous fishery, water quality and scenic quality are the Outstandingly Remarkable Values of the Elk River.

Under the Wild and Scenic Rivers Act, a river may be classified as Wild, Scenic, or Recreational. The Elk River has two classifications:

- The 2 mile segment of the North Fork Elk from the falls to its confluence with the South Fork is classified as a Wild river. Wild rivers are rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and water unpolluted. These represent vestiges of primitive America

- The 17 mile segment from the confluence of the North and South Forks of the Elk to Anvil Creek is classified as a Recreational river. Recreational rivers are those rivers that are readily accessible by road and that may have had some development along their shorelines.

The scenic quality within the river corridor and watershed results from a combination of rock formations, water clarity, waterforms, vegetative features and landforms. The lower section of the Recreational river flows through a steep canyon with exposed rock surfaces, forming an inner-gorge environment. Upstream, the gorge widens slightly, but the adjacent lands remain very steep.

The narrowness of the main river canyon limits the time a traveler would be able to view visual intrusions from the river road. The stream banks are well vegetated and limit the viewscape. The principle viewpoints are from the river road that parallels the river for nearly all of the recreational section.

Rock types in the watershed contribute to the variety of water color, and clarity. The Elk River flows clear to crystalline blue-green water. The water course has interesting patterns of deep pools interspersed with small boulder rapids. Steep whitewater cascades have larger boulders with numerous waterfalls and plunge pools. In winter, water cascades from steep tributaries and slopes along the Elk River.

The variety of the vegetation types in the watershed creates visual diversity. Large old growth conifers, big-leaf maple, red alder and other deciduous trees and shrubs, meadows and moss covered rocks within the corridor provide variety to the color, texture, and structure of the setting.

North and South Forks of the Elk: Upstream from the confluence, both forks of the river have steeper gradients. Slopes are densely forested above the North Fork. The road follows the South Fork, moving away from the river, with long, extended views. Past harvest and road activities can be seen above the South Fork.

Middle and Upper Elk: The Elk River from the Fish Hatchery to the confluence of the North and South Forks flows through a steep, narrow canyon. Streambanks are densely forested interspersed with bedrock outcrops. The Elk River road (Forest Service Road 5325) parallels the river's route, providing repeated short views to the river and steep south facing slopes throughout much of its stretch. Dense vegetation can limit views of the river during the spring and summer. In some viewpoints the "detail" of the landscape can be seen along the river bottom and on slopes above the river. The road is often the only obvious alteration of the otherwise natural setting.

Lower Elk: The lower portion of the Elk River (from the coast to the fish hatchery) flows through a wide valley bottom. The gently rolling hills, pastures, patches of forest and scattered farmhouses characterize a rural, pastoral scene. Portions of the lower river corridor are well developed with many homes. From Highway 101 to the Elk River Fish Hatchery, the Elk River road follows the south side of the wide valley. Long views extend to low-lying hills to the north, beyond the river. Timber management is evident on many of the slopes.

Tributary Landscapes: Blackberry, Butler, Panther and Bald Mountain Creeks are the main river tributaries. The uplands in these drainages have many roads and harvest units. Views are short to moderate, with some extended views in the upper slopes of the subwatersheds. The west half of Butler Creek is in the wilderness.

Wilderness: The Grassy Knob Wilderness is moderately to extremely steep and heavily vegetated. Views are generally short to moderate due to topography and vegetation. Forest Road No. 5105 follows the ridgetop, and the scenic condition is natural-appearing with a dense tree canopy mixed with shrubs along the National Forest section. Near ground views from private lands along Road 5105 show intensive management.

PUBLIC USE VALUES

Access and Travel
Recreation
Landownership and Management Policy

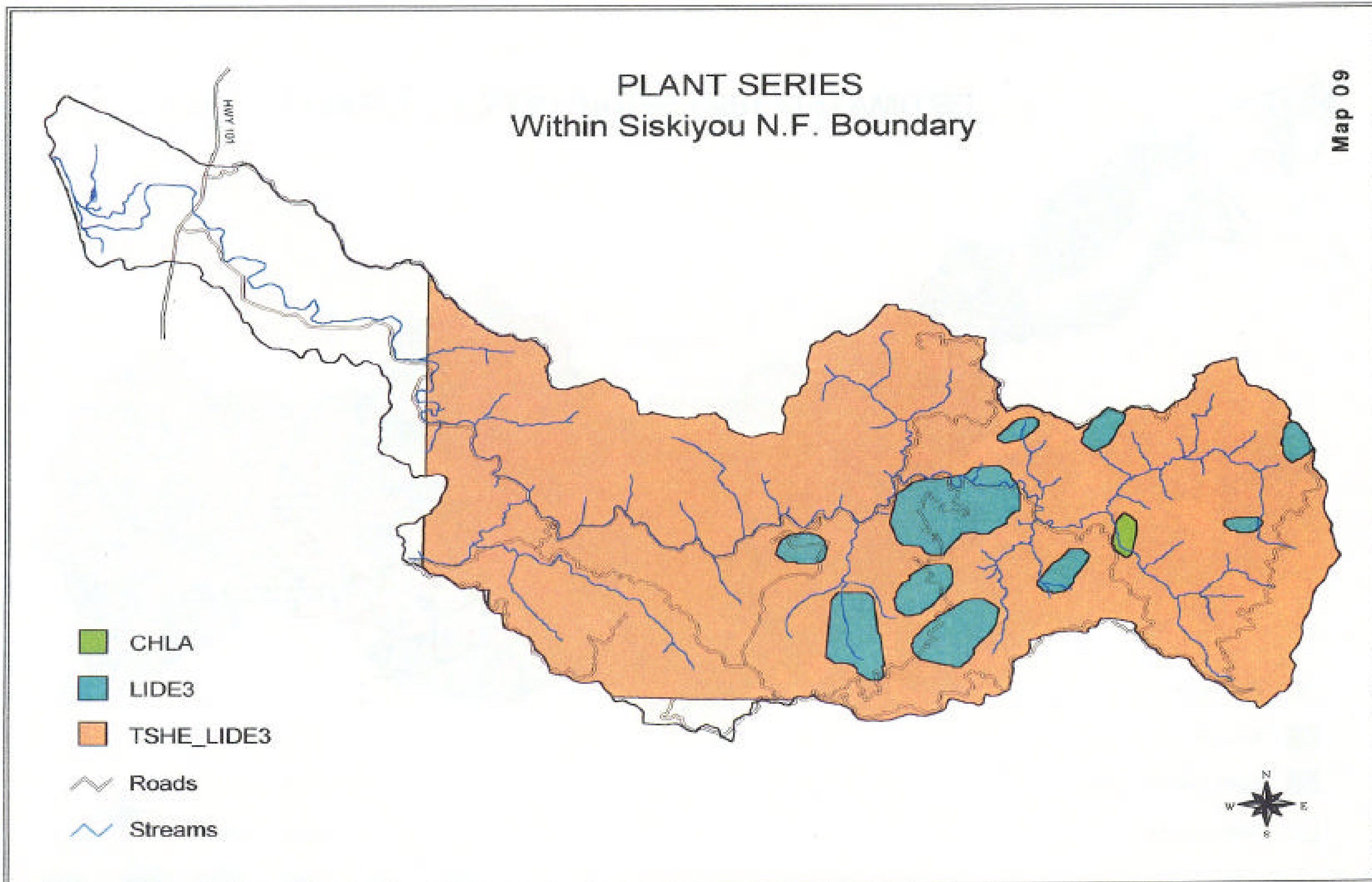
Access and Travel

In prehistoric times, the Elk River corridor provided a travel route between the coast and the interior. The main trail paralleled the river for most of the length of what is now the Recreation Section, then angled up to the main ridge north of the Wild Section. Segments of the trails are still evident.

This trail was the main access to the interior of the area prior to 1920 when the Middle Elk Road was built from Humbug to McGribble. This road was extended to Salal Springs in the early 1930's by the Civilian Conservation Corps (CCC's). As the logging industry developed in the mid 1950's and later, the road system developed until roads connecting the Elk drainage with the South Fork of the Coquille River and the Sixes River were constructed. Other roads now provide access from the east, west, south, and north.

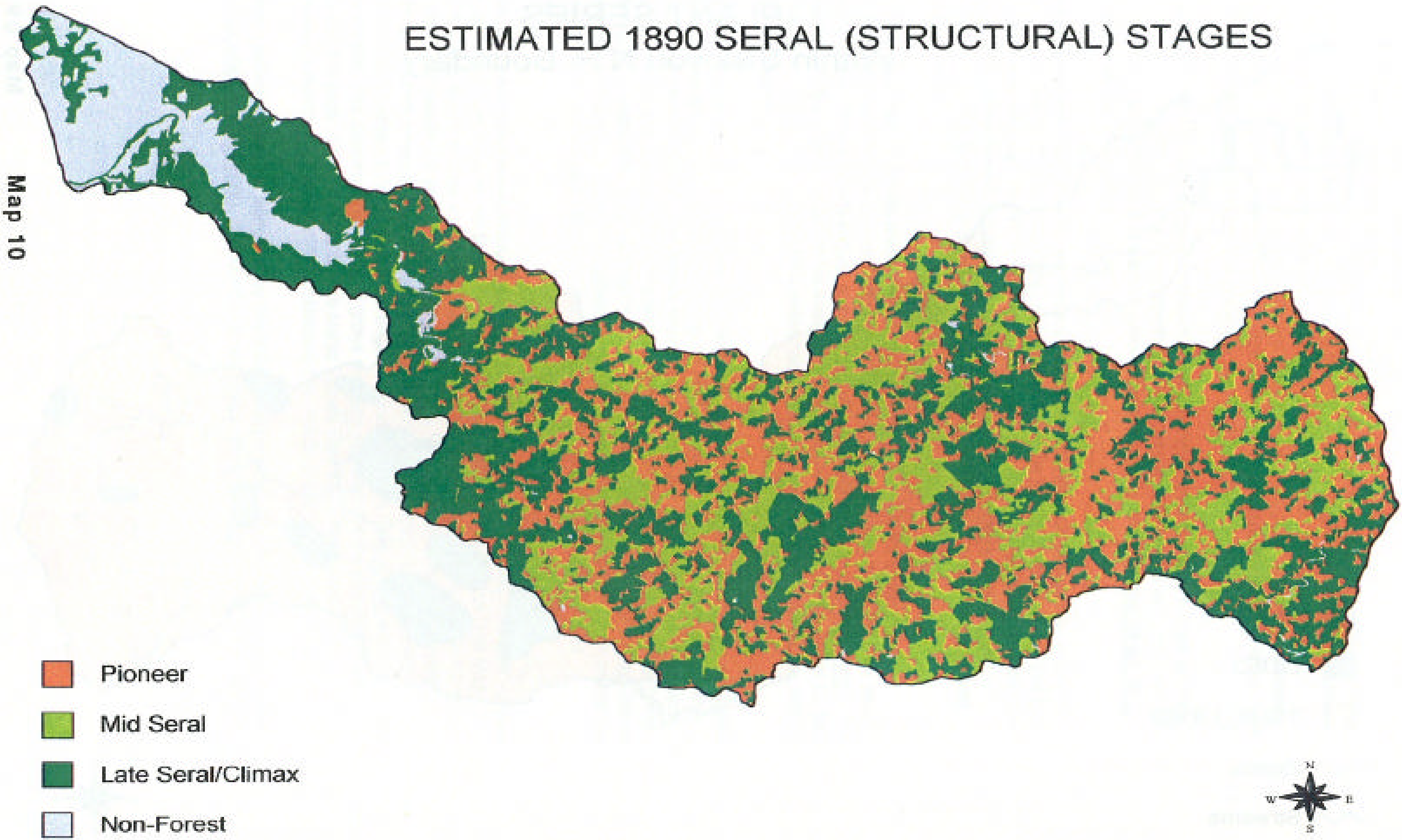
The Elk River road is still the main travel route between the coast and the interior of the Elk River watershed. The road provides access to National Forest land, private land, the south and east edges of the Grassy Knob Wilderness, and the wild and recreation portion of the Elk River. It receives local use from private landowners, logging companies, miners, and recreationists, as well as administrative (Forest Service, Bureau of Land Management, and Oregon Department of Fish and Wildlife).

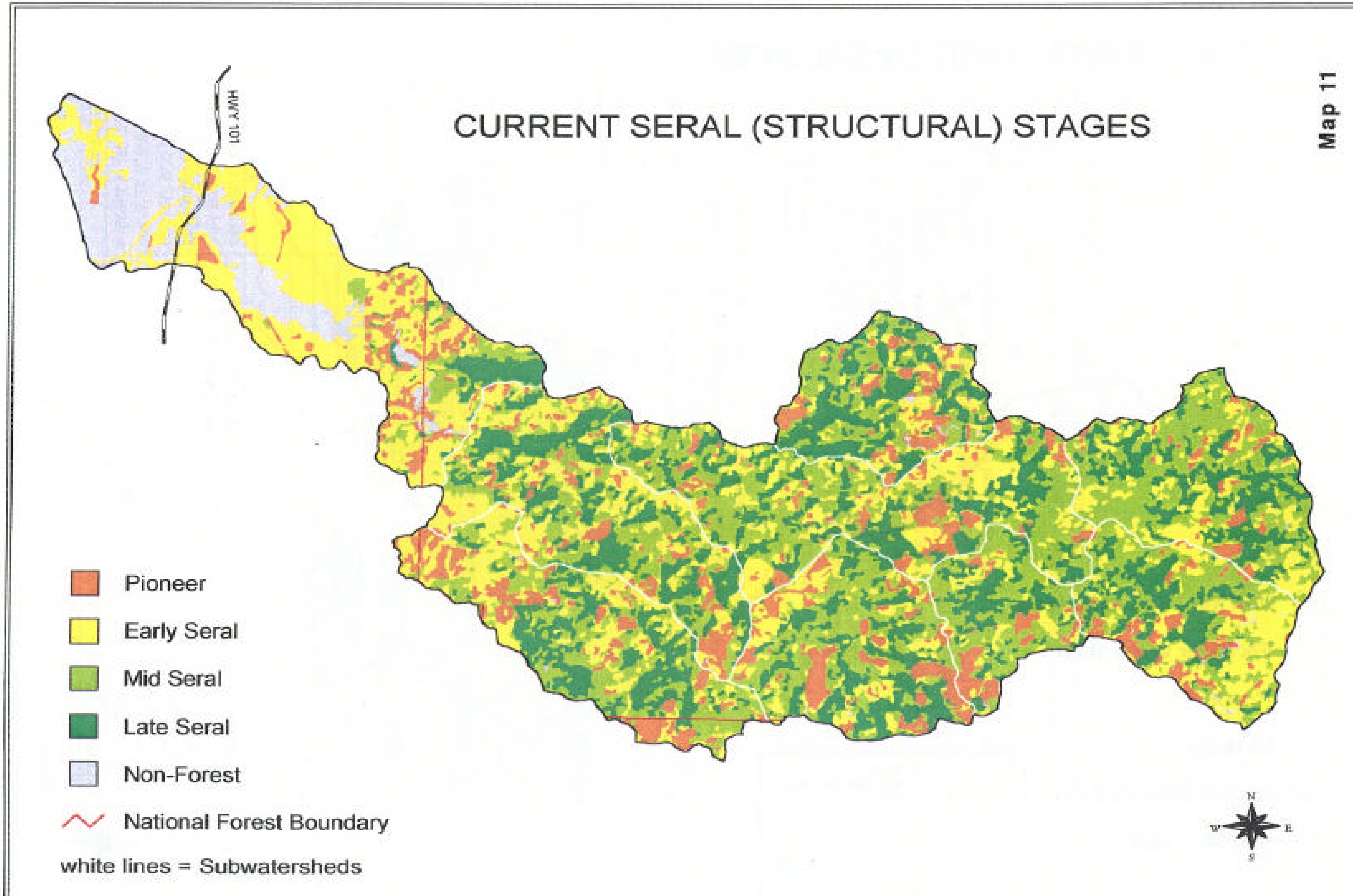
A traffic counter located on the Elk River road at the end of the county road, near the fish hatchery, in March of 1992, has counted an average of 1775 vehicles per month entering and leaving the National Forest. The highest period of use is generally May through October, with some peaks during the fishing and hunting seasons. The average daily traffic is generally 35 vehicles in the winter, up to 100 or more in the summer. The traffic patterns show most of the daily use is in July and August, where there have been instances of more than 100 vehicles per day. Since the counter was placed, the traffic mix has been 90 to 95% recreational, with the remainder split between commercial and administrative traffic. The recreation traffic appears to go down only slightly with an increase of commercial traffic. See Figure 3.


PLANT SERIES
Within Siskiyou N.F. Boundary
Map 09
HWY 101
CHLA
LIDE3
TSHE_LIDE3
Roads
Streams
N
W
E
S

Map 10

ESTIMATED 1890 SERAL (STRUCTURAL) STAGES




Map 11
CURRENT SERAL (STRUCTURAL) STAGES
HWY 101
Pioneer
Early Seral
Mid Seral
Late Seral
Non-Forest
National Forest Boundary
white lines = Subwatersheds
N
W
E
S

Map 12

IRON MOUNTAIN BOTANICAL AREA

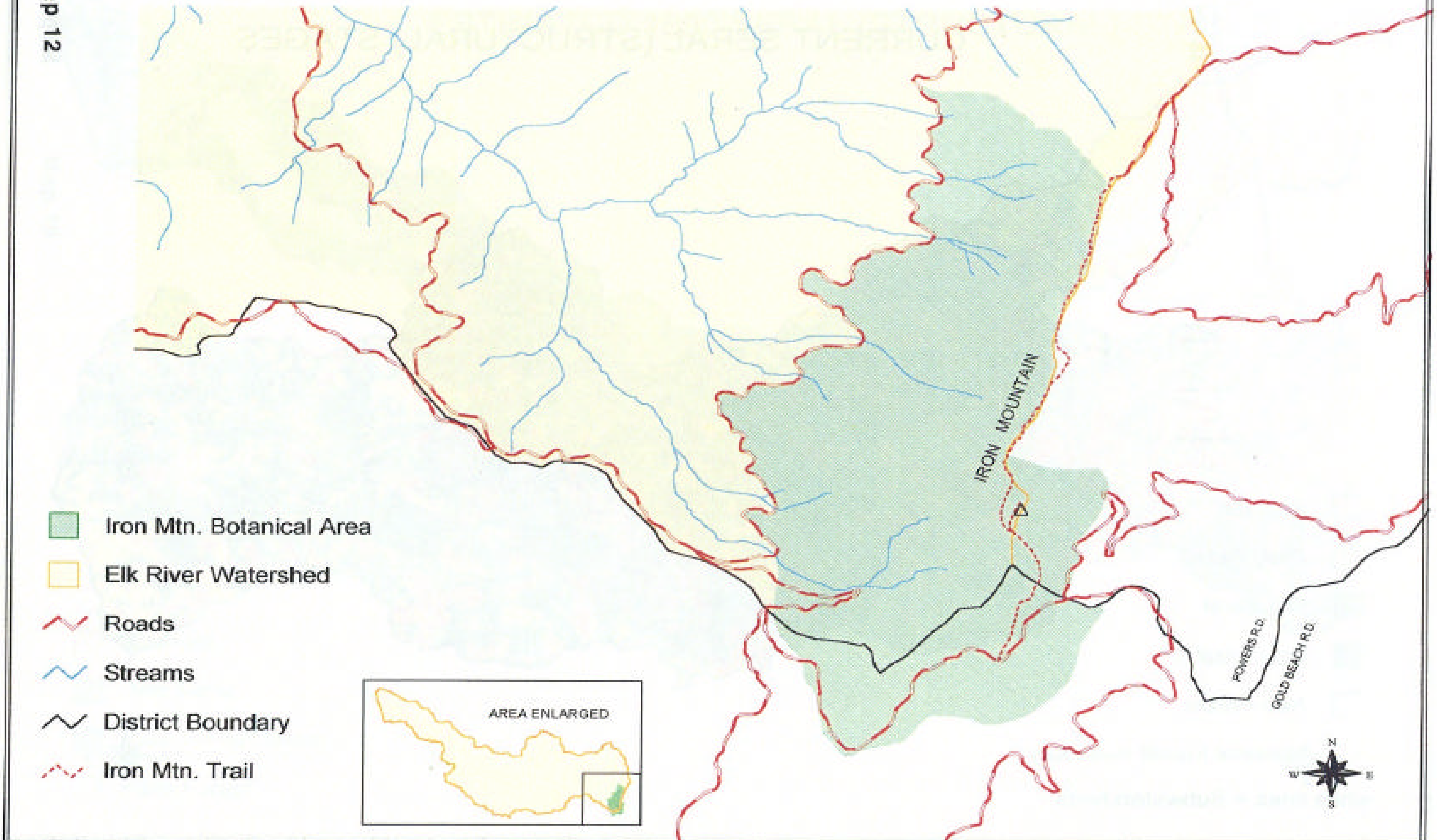
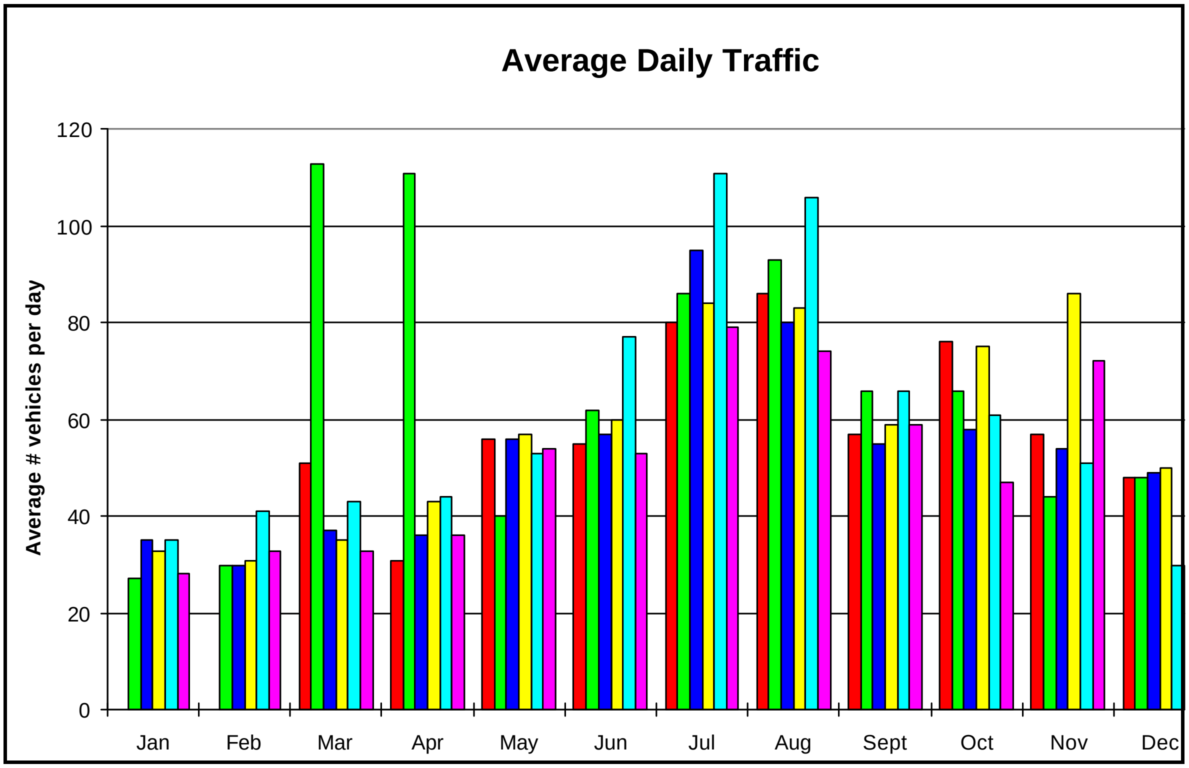
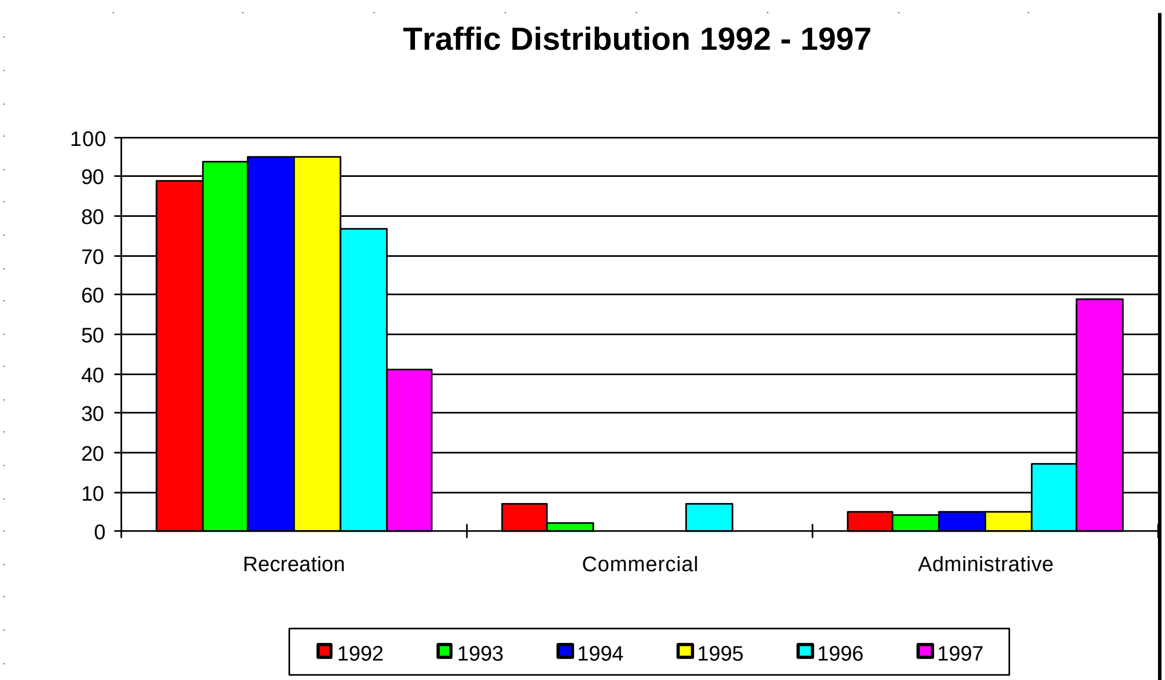


Figure 3: Elk River Traffic Patterns





There are currently about 127 miles of system and non-system roads under Forest Service Management within the Elk River watershed. There are also 68 miles of private, County, and Federal Highway roads within the watershed. Of the 127 miles of road under Forest Service management, 45 miles are maintained for passenger car use, 49 miles are maintained for high clearance vehicle use, and 20 miles are closed to vehicle use, but open for other non-motorized use. There are approximately 13 miles of non-system roads within the watershed. Of these 127 miles of road, 11 miles are double lane and paved, 99 miles are single lane and rock surfaced, and the remainder are single lane roads, with either native soil surface or native rocky surface. The safe travel speeds on most of the roads within the watershed is 25 miles per hour. Since the last Watershed Analysis in 1994, 10 miles of Forest Service managed roads have been permanently closed to protect other nearby resource values. There have been about 0.1 miles of new road constructed and not closed within the watershed. It is not known at this time how many temporary roads have been built, as these are returned to natural conditions after use, and are not considered 'system' roads.

The severe storms of November - December 1996 and January 1997 heavily damaged the road system and changed the traffic patterns and mix of vehicles. As of October 1997, there was an average of 1500 vehicles per month. The percentage of administrative traffic was nearly 60%, while recreation use was just over 40%, with no commercial traffic present. The Elk River road was heavily damaged, along with the tie through Roads 5544 and 5325180, which connect the river corridor to the Iron Mtn. Road 5502. There are 15 to 20 individual damage sites, which include areas of one lane on the main river road, to complete closures due to stream crossing failures on the tie through roads. Most of these sites will be under contract for repair by the fall of 1999. Other repairs will be accomplished as funding allows.

Recreation

With the construction of the Roosevelt Highway (Highway 101) in the 1920's, the southern Oregon coast became a popular recreation area well known for its scenic beauty. Recreational use within the river corridor has increased over the years. Fishing has become one of the most popular water-related activities of the area. Local residents of the area and visitors fish from drift boats or from the banks of the river, from the fish hatchery to the river's mouth.

Less recreation occurs inland from the fish hatchery, on National Forest land, and it is concentrated within the river corridor. Residents of nearby communities use the river in the summer months for swimming, picnicking, sightseeing, and mining. Elk River receives light whitewater boating use, primarily between the fish hatchery and Slate Creek. Kayaks are the most common river craft. Rafts are occasionally seen on several sections of the river.

A few local residents hike and camp in the area, but these activities remain at low levels, and are limited by wet winters and steep terrain. Eight dispersed campsites are located along the river, including Sunshine Bar, which has a capacity of 35 people. Most of these campsites are primitive; only Sunshine Bar has a vault-type toilet. The lower portion of Sunshine Bar was damaged by the November 1996 flood event.

Developed sites are found at Butler Bar and Laird Lake. Butler Bar has 8 camp sites and Laird Lake has 4 sites. Campgrounds are less than 50% full on summer weekends, and receive very little use in the winter months. The steep topography adjacent to the river limits the construction of additional developed recreation sites on National Forest. Additional discussion of recreation in the Elk River can be found in the Management Plan, Elk Wild and Scenic River (USDA 1994).

Three maintained ridgeline trails in the area receive light use: Barklow Mountain, Grassy Knob, and Iron Mountain trails. All three trails lead to abandoned lookout sites and offer scenic views of the surrounding mountains. The Pacific Ocean is visible from the summit of Grassy Knob. No trails exist within the river corridor. Trail use is generally related to hunting in the area, with some people hiking for pleasure. Approximately 80 visits occurred within Grassy Knob Wilderness in calendar year 1991 (the last year data is available).

None of the current campgrounds or dispersed areas meet accessibility standards stipulated in the Americans with Disabilities Act.

The Siskiyou Forest Plan FEIS identified three classifications of recreation experience in the Elk River watershed. The classifications are based on the Recreation Opportunity Spectrum (ROS), an inventory system which recognizes the quality aspects of recreation experience. The first class, Semi-Primitive Non-Motorized (SPNM), is characterized by a predominantly natural or natural-appearing environment of moderate to large size. User interaction is low, but there may be evidence of other users. This classification includes the Wild section of the river, the Copper Mountain Roadless Area, and the Grassy Knob Roadless Area on the west side of the Grassy Knob Wilderness, for a total of 4500 acres. The second type is Roaded Natural (RN), which includes most of the watershed and the Recreation section of the river (30,000 acres). The remaining classification is Wilderness (WRS - Semi-primitive) where recreation opportunities are predominantly unmodified and user interaction is moderate. This includes 9400 acres of the Grassy Knob Wilderness and much of the north half of the Recreation section of the river.

A portion of two subwatersheds, the North and South Forks are mostly unroaded. There has been discussion with community leaders about these roadless areas and adjacent areas in the Elk River watershed being redesignated as Wilderness. No formal proposal has been submitted through congressional representatives as of December, 1997.

ENVIRONMENTAL QUALITY AND ECOLOGY VALUES

Values associated with environmental quality and ecology are addressed in two categories; those associated with the **terrestrial ecosystem** and those associated with the **aquatic ecosystem**. Within each category are specific components which are key to each ecosystem's function. These key components are explored in this chapter.

TERRESTRIAL ECOSYSTEM - Vegetation

Landscape Patterns: Disturbance Frequency and Patch Size
Large Woody Material
Subwatershed

A diversity of plant communities and habitats occur within the Elk River watershed. This diversity is influenced by a number of factors including soil types, elevation, aspect, slope, slope position, climate, succession, and various disturbances. The wet coastal climate has been one of the most significant influences on the vegetation of the Elk River. Average annual precipitation ranges from 120 inches at the Elk River Hatchery to 160 inches in the headwaters, with the majority of the rainfall occurring between November and March. The summer dry seasons are moderated by frequent heavy fog, adding to soil moisture by what is known as “fog drip.” (Fog drip is moisture that has collected on vegetation where it may accumulate in sufficient quantities to drip atmospheric moisture to the forest floor).

Vegetation composition in the watershed is composed of a hardwood/conifer mixture of Douglas-fir (Pseudotsuga menziesii), western hemlock (Tsuga heterophylla), Port-Orford-cedar (Chamaecyparis lawsoniana), Jeffrey pine (Pinus jeffreyi), sugar pine (Pinus lambertiana), western white pine (Pinus monticola), Sitka spruce (Picea sitchensis), tanoak (Lithocarpus densiflorus), red alder (Alnus rubra), madrone (Arbutus menziesii), myrtle (Umbellularia californica), live oak (Quercus chrysolepis), chinkapin (Castanopsis chrysophylla), and bigleaf maple (Acer macrophyllum). Brewer spruce (Picea brewerana) is also found in the watershed. There is also a small population of brewer spruce found along the northern most range of Iron Mountain. The understory will normally consist of huckleberry (Vaccinium sp.), salal (Gaultheria shallon), rhododendron (Rhododendron macrophyllum), vine maple (Acer circinatum), willow (Salix sp.), and many others. The major plant communities vary in age from very young (early seral) to very mature (late seral - climax) size structures.

The Elk River can be subdivided into "plant series." A plant series is a classification based on the concept of potential natural vegetation, which is the vegetation that would be present under climax conditions. A climax condition would occur if the site were allowed to grow, undisturbed by fire, insects, diseases, flood, wind, erosion, or humans, in approximately 500 years, theoretically, a stable condition would occur. Plant series common to the Elk River are the Sitka Spruce, Tanoak, Port-Orford-cedar, and Tanoak/Western Hemlock (see Map 9). Each plant series can be further subdivided into plant associations which more specifically describe the characteristics of that particular stand type.

Douglas-fir is the prevalent overstory species in much of the watershed, except near the coast where Sitka spruce and shore pine (Pinus contorta) predominate. The coastal dune area is well vegetated by American dunegrass (Elymus mollis), and the nonnative European beachgrass, (Ammophila arenaria) (Shea 1997, personal communication).

In 1890 the watershed was dominated by late seral to mature western hemlock, Douglas-fir, and Port-Orford-cedar. Approximately 22,500 acres (39%) were probably in this condition at that point in time (Map 10; see Appendix B for definitions). The few natural meadows within the National Forest and the extensive grasslands on the lower flood plains and marine terraces have probably been present for thousands of years as a result of poorly drained soil types, exposure, river fluctuations, burning, and grazing by wild animals.

The current seral stage map illustrates present seral stage conditions in the watershed (Map 11). Tanoak and other hardwood stands are more common in the west end of the watershed, on drier south and west-facing slopes. These stands include some large California waxmyrtle (Myrica californica). The few open meadows in the watershed are concentrated in the flat lower valley flood plains, except for Bald Mountain meadows. Approximately 55% of the watershed is presently in mid-to-late seral stages and 7% in non-forested meadows.

The steep and narrow gorges of the main river and tributaries provide aquatic and wet cliff plant habitats. There are also high peaks and ridges present such as Mt. Butler, Grassy Knob, Copper, Barklow, and Iron Mountains. Permanent and semi-permanent standing bodies of water are rare, but Laird, Bluebird, Mountain Wells, and Panther Lakes provide this habitat. Other unique plant areas include the deflation plains, wetlands, and coastal estuaries near the mouth of the river, and the serpentine-peridotite soils on Iron Mountain. Native grasses and prairie vegetation may still be found in two meadows, such as the one just southeast of the summit of Bald Mountain, and another 1/4 mile east of the old McGribble Campground.

The westside of Iron Mountain above Road 3353 is the Iron Mountain Botanical Area. This area includes most of the west and south sides of Iron Mountain, and encompasses about 1,866 acres (see Map 12). The west side drains almost entirely into the headwaters of Elk River. At least 300 plant species occur on Iron Mountain, representing a very diverse flora (Baker 1956). This is partly due to the several different rock types which make up the mountain, such as serpentine, sandstone, siltstone, and metavolcanics. Approximately 60 species attain their known northern limits here, and nine species reach their southern limits. The California pitcher-plant grows on many acres across the westside in wet serpentine-peridotite bogs. Other unusual or rare plants include Bolander's hawkweed, Piper's bluegrass, Howell's manzanita, Volmer's lily, huckleberry oak, Sadler's oak, and Brewer spruce.

Only one plant species is listed as "Sensitive" by the U.S. Forest Service within this watershed, Howell's manzanita (Arctostaphylos hispidula). It is found in small numbers on the summits of Mt. Butler and Iron Mountain.

Figure 4: Rare and Listed Plant Species in the Elk River Watershed

Common Name	Latin Name	Status	Habitat
Coast fawn-lily	Erythronium revolutum	Oregon Natural Heritage program "watch list"	Present in fair numbers on wet cliffs in the North Fork canyon, and in wet sites near McGribble Campground
Western lily	Lilium occidentale	Endangered by the Federal government	May occur in the wet coastal deflation plains
large-flowered goldfields	Lasthenia macrantha		
silvery phacelia	Phacelia argentea		
pink sand verbena	Abronia umbellata		
seaside gilia	Gilia millifoliata	"species of concern" (Rittenhouse 1997)	
Candystick	Allotropa virgata	On the U.S. Forest Service "survey and manage" list	Present on Iron Mountain
California fuschia	Zauschneria latifolia	not a listed species	Very rare on the Powers Ranger District. Its only known location on the district is in the headwaters of Butler Creek
Brewer spruce	Picea breweriana		North and west slopes of the Iron Mountain summit (Shea 1996)

Approximately 75 species of exotic plants grow in the watershed, including about 20 grasses, seven shrubs, and 50 forbs (Shea 1993; Appendix C). The fertile soils and forgiving climate are very conducive to these fast-growing nonnative species. Most became established as a result of overgrazing, escaped ornamentals, general vehicle traffic, timber harvest, road building, and other ground disturbing activities.

Of particular concern are the aggressive gorse and tansy. Tansy is widespread along roadsides and other disturbed areas in the watershed, and has been biologically treated for several years with both the tansy flea beetle (Longitarus jacobaeae) and the cinnabar moth (Tyria jacobaeae). Gorse is present on at least 28 sites on National Forest lands in the watershed, and these sites are regularly monitored and controlled by District personnel and contractors. Gorse plants and shoots are pulled by hand or by choker cable in the spring while the ground is loose and before the plants flower. Aggressive control programs have been in operation for several years. In 1996, numerous colonies of the gorse spider mite (Tetranychus lintearious) were established by the Oregon State University Extension Service in the extensive stands in the lower river valley floodplains and foothills. Many acres are presently covered by gorse from the National Forest boundary west to the Pacific Ocean as a result of plantings escaped from the Bandon area.

A seed mixture of several exotic species developed by the Oregon Department of Fish and Wildlife was routinely broadcast-seeded for revegetation projects in the watershed for many years. Sources of native seed are now available and the broadcast seeding of exotics is being discontinued.

Figure 5: List of Nonnative Species found in the Elk River Watershed.

Common Name	Latin Name
dogtail	Cynosurus echinatus
velvetgrass	Holcus lanatus
silver hairgrass	Aira caryophyllea
European beachgrass	Ammphila arenaria
oxeye daisy	Chrysanthemum leucanthemum
foxglove	Digitalis purpurea
Klamathweed	Hypericum perforatum
coast fireweed	Erechtites prenanthoides
tansy	Senecio jacobaea
Himalayan blackberry	Rubus discolor
Scotch and French brooms	Cytisus
gorse	Ulex europaeus
Japanese fleeceflower	Polygonum cuspidatum
moth mullein	Verbascum blattaria

Further information on Elk River plant species may be found in the Powers Herbarium plant collection, and in a Checklist of Common Plants on the Powers Ranger District (Shea 1992).

Another important exotic is Port-Orford-cedar root disease (Phytophthora lateralis). This disease affects Port-Orford-cedar (Chamaecyparis lawsoniana), which is a minor but valuable component of the Elk River watershed (see Map 13). Port-Orford-cedar provides an important component of the understory and/or overstory within the watershed. It can provide long-term woody material for fish and riparian structures, as well as large woody material and coarse woody material for small mammals, herbivores, amphibians, mosses, lichens, etc. on the forest floor. It has a high value as a timber product, as well as for special forest products. Large Port-Orford-cedar may provide an exceptional nesting and roosting habitat for woodpeckers and other bird species.

Humans have been responsible for the transport of the disease when mud containing spores attached to machinery was transported over long distances between infected and uninfected areas. Once the fungus is in a new area, it can move in water downslope from the infected site. High risk areas are streams, drainages, low laying areas downslope from infected areas, and roadways. Potentially high risk areas for disease spread are located in the Iron Mountain area of the Elk River. Port-Orford-cedar occurs in relatively high amounts in this area, partly due to the year around water flow and the ability of Port-Orford-cedar to out compete other species on the harsh serpentine sites.

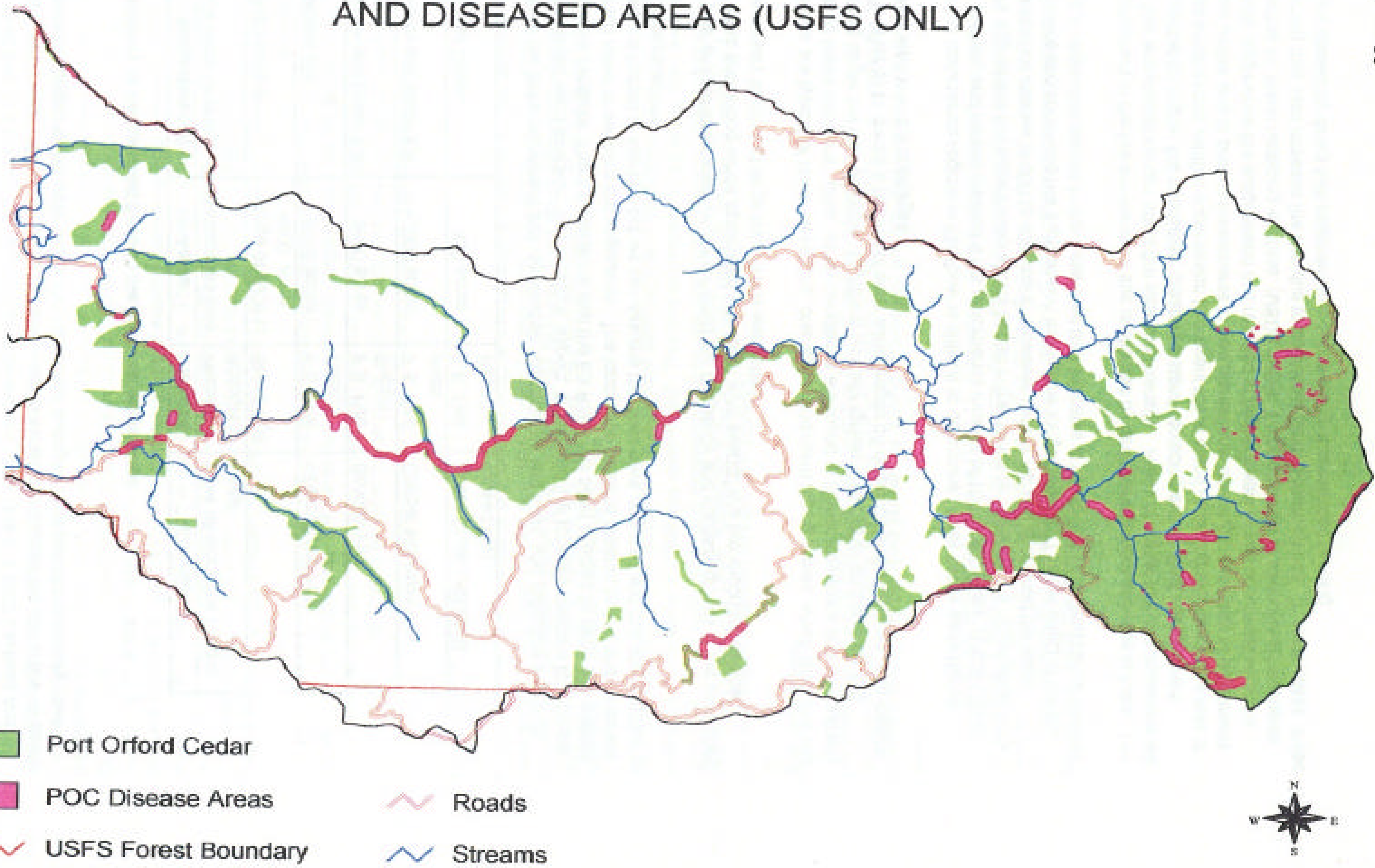
Landscape Patterns: Disturbance Frequency

Natural disturbances in the terrestrial ecosystem include large scale fires and episodes of windthrow caused by cyclonic events such as the Columbus Day storm of 1962. These disturbances have been relatively infrequent in the Elk River watershed. However, northwesterly high winter winds often occur and wind damage is common. In higher elevations snow and ice damage may also occur. Fire is the most common disturbance agent in all of the South Coast watersheds. (USDI-USDA 1995)

Disturbance interval is a measure of how often the vegetation is disturbed or set back to an earlier successional stage. The Elk River has a relatively long disturbance interval when compared to other watersheds with plant series typical of drier climates. General processes were deduced based on review of available aerial photographs, anecdotal fire references, fire report documents, tree stand age data and evidence of fire scarred trees and snags.

PORT ORFORD CEDAR OCCURRENCE AND DISEASED AREAS (USFS ONLY)

Map 13



The vegetation patterns we see today are the result of past disturbances, prior to the 1850s this included lightning caused fires and the burning done by native americans. From the mid 1800's settlers and miners added disturbance influences to the landscape which sometime included the use of fire. A policy of fire suppression began in the early 1900s and intensified during the mid part of the century. (see Figure 6)

Figure 6: History of Widespread Fires in the Elk River Watershed

Year	Subwatershed	Acres	Source	Comments
1868	Elk River Drainage	Widespread fires	Historic Accounts	Fires all along the Oregon Coast.
1910	Blackberry & Panther	~range of 2000 to 4000 acres	Stand Age	
1929	Middle Elk	9000 acres	F.S. Fire Report	Grassy Knob Fire
1929	North and Upper Elk	9600 acres	F.S. Fire Report	Barklow Fire
1930's	North and South Elk	~2000 acres	F.S. Fire Atlas	Copper Mountain Fire
1961	Butler Creek	330 acres	F.S. Fire Report	Butler Creek (industrial caused fire)

Components of the fire environment include weather, topography, and fuels, and individual elements such as wind speed, wind direction, fuel moisture, aspect, slope, and fuel tonages combine to produce characteristic fire behavior. There is evidence that the Elk River has been effected by large and intense wildfires, which killed or set back the vegetation. The landscape patterns created by low and moderate intensity fires are harder to identify, but we can assume that they have occurred and that they function to reduce fuel accumulations.

The nearly year around moist weather pattern limits the frequency and intensity of fires in the watershed. The dry air mass and strong winds associated with "east wind events" are two important weather elements necessary to product large fires in this watershed.

Moist conditions are typical of lower elevations, drainages, and north facing slopes, which limits fire size and intensity at these locations. Drier, windy conditions are found at higher elevations and on southerly aspects making larger fire size possible. Lightning typically ignites fires higher on the slope and ridgetops. This tends to create a pattern of early seral stages on ridgetops and midslopes, with mature and old growth stands in the drainages.

The natural fire disturbance regime in Elk River is difficult to determine. Fires set by early Native Americans, settlers, and miners created a fire disturbance interval of 100 to 300 years. (USDI-USDA. 1995) More aggressive fire suppression efforts began in the 1930s lengthening the hypothetical non-harvest disturbance interval to 300 to 400 years. However, timber harvest shortened the stand replacement time and continued fire suppression mimics the longer regime. The net effect of the two processes is a vegetative pattern in the watershed that indicates a 100 to 200 year disturbance interval.

The only component in the fire environment that is effected by land management activities is fuels. The quantity of fuel accumulations can affect fire size and intensity. Areas of higher fuel accumulations will have the potential for higher fire intensities, creating a stand replacing event. Past management practices has emphasized wildfire suppression to prevent these stand replacing events and the loss of merchantable timber and to protect investments in tree plantations, thinnings, and other developments. In many cases, aggressive fire suppression has resulted in higher levels of fuel accumulation and a greater potential for stand replacing wildfires. (USDA 1989) Timber harvest or silvicultural treatments such as thinning may also increase fire risk due to additional slash accumulations. In some cases, these conditions are abated by direct fuel treatment like debris piling or prescribed burning.

Landscape Patterns: Patch size

The forested portion of the watershed is a patchwork of different age classes. At one time, the river corridor was forested all the way to the coast. Much of the lower watershed is now cleared and its predominant use is agricultural. Low intensity fires have left most mature patches of conifers on north-facing slopes. Moderate intensity fires have occurred on the upper one-third of west-facing slopes averaging 75 acres in size. High intensity fires have occurred most often in upper, south-facing slopes and average 280 acres in size. The maximum size of existing patches is approximately 4000 acres; the minimum patch size is measured at less than one acre. The patches created by historical disturbance events such as fire or windthrow generally vary between 20 and 200 acres. For the Northwest Coast LSR, which includes Elk River, patch sizes are smaller than the Siskiyou National Forest as a whole. This is the case for the Western Hemlock (TSHE) and Tanoak (LIDE3) Plant Series (USDI-USDA. 1995).

Timber harvest in the watershed has created different types of patches than the natural patterns created by wildfires and windthrow. The harvested areas generate single-storied stands similar to high-intensity, stand replacement fires. Harvested areas are dissimilar in that they are generally 10 to 40 acres and smaller than those created by either moderate or high intensity wildfires. Harvested areas also tend to have very smooth uniform edges which are not a feature of natural disturbance events.

Large woody material

Fire, wind, insects, and disease produce the snag and large woody material (LWM) component within the watershed. Large woody material (LWM) is plentiful after each natural disturbance, and decay causes it to gradually decrease through time. LWM reaches its lowest level about 100 years after disturbance (Harmon et al., 1985). At stand age 100 years, tree mortality begins to add large wood back to the forest floor at a rate greater than the decay rate. These levels of LWM accumulation, around age 100 are used to develop standards, guidelines, and monitoring standards for management activities (see Siskiyou Supplement on LWM/WRT/Snags). (Harbert 1993).

Subwatersheds

Elk River has six major tributaries with drainage areas known as subwatersheds. The six subwatersheds range in size from 3,000 to 9,000 acres and are displayed in Map 14. Within the watershed, numerous smaller tributaries to Elk River (known as "facing" drainages) are grouped into lower, middle and upper areas.

The Elk River is a structurally diverse (Map 11) watershed. A clear depiction of this is shown in Figure 7, which utilizes a stacked bar graph to display the distribution of late, mid, early, pioneer, and non-forest seral stage structure across subwatersheds. For more information on the definitions of these seral stage structures, as well as a complete list of acres and percent of seral stages per subwatershed please see Appendix B, seral stage structure.

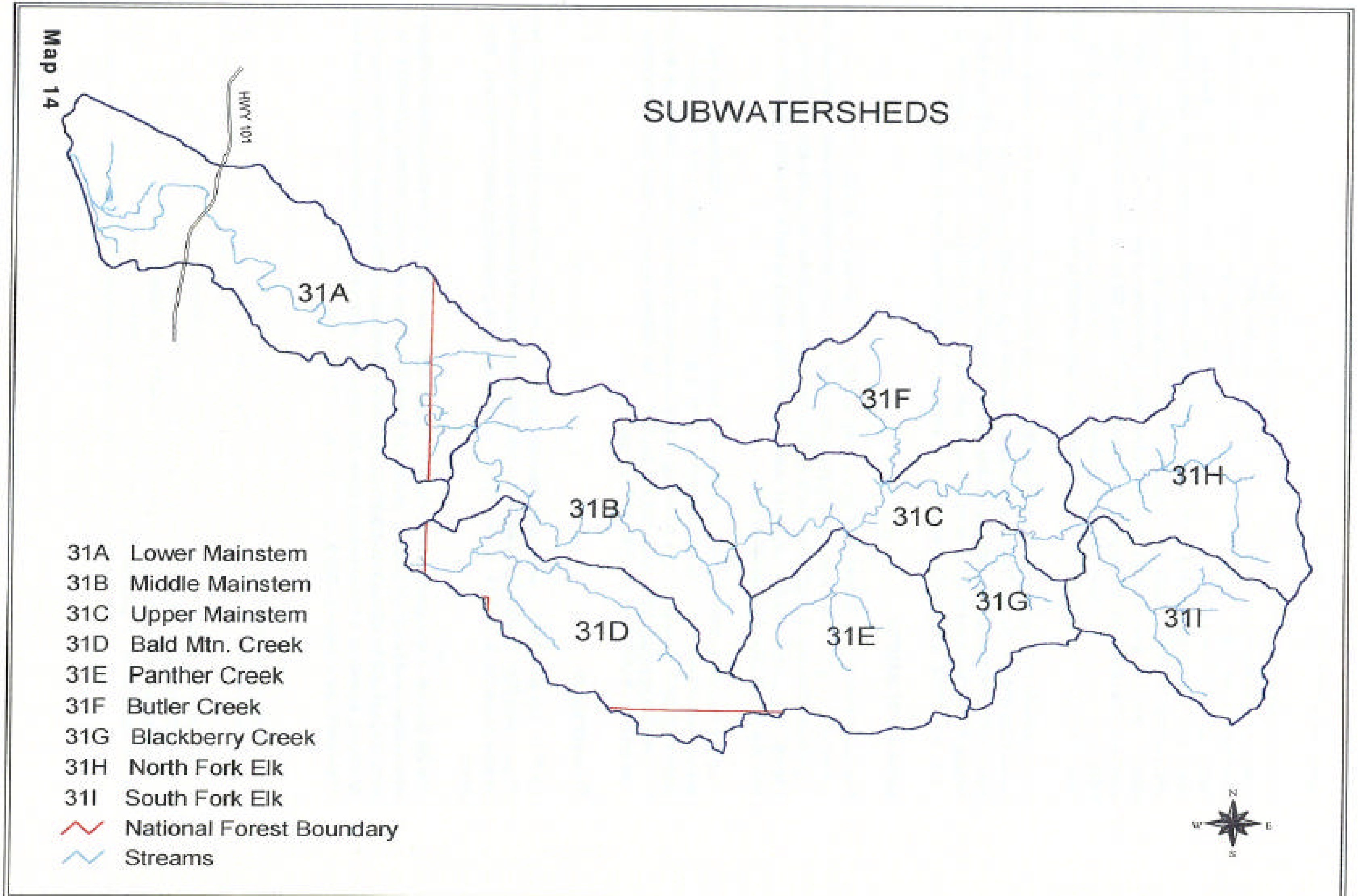
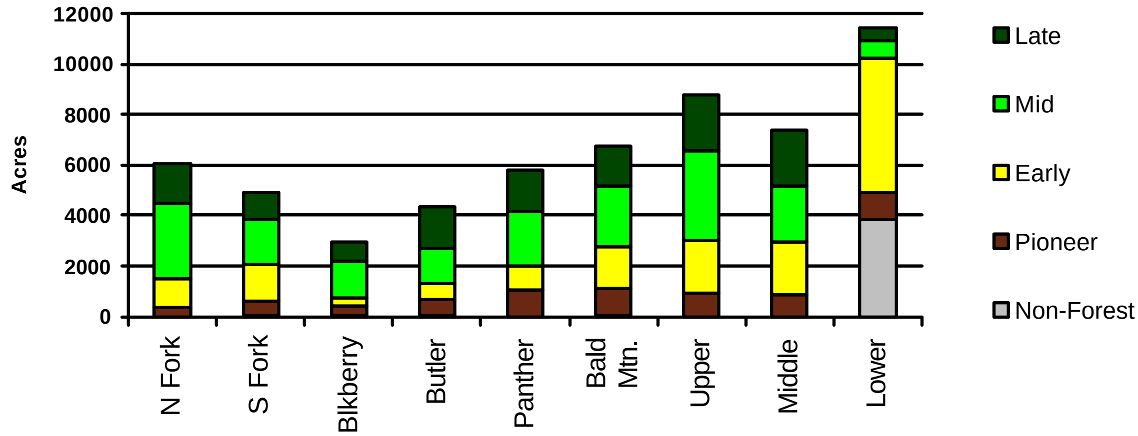

Map 14
SUBWATERSHEDS
HWY 101
31A
31B
31C
31D
31E
31F
31G
31H
31I
31A Lower Mainstem
31B Middle Mainstem
31C Upper Mainstem
31D Bald Mtn. Creek
31E Panther Creek
31F Butler Creek
31G Blackberry Creek
31H North Fork Elk
31I South Fork Elk
National Forest Boundary
Streams

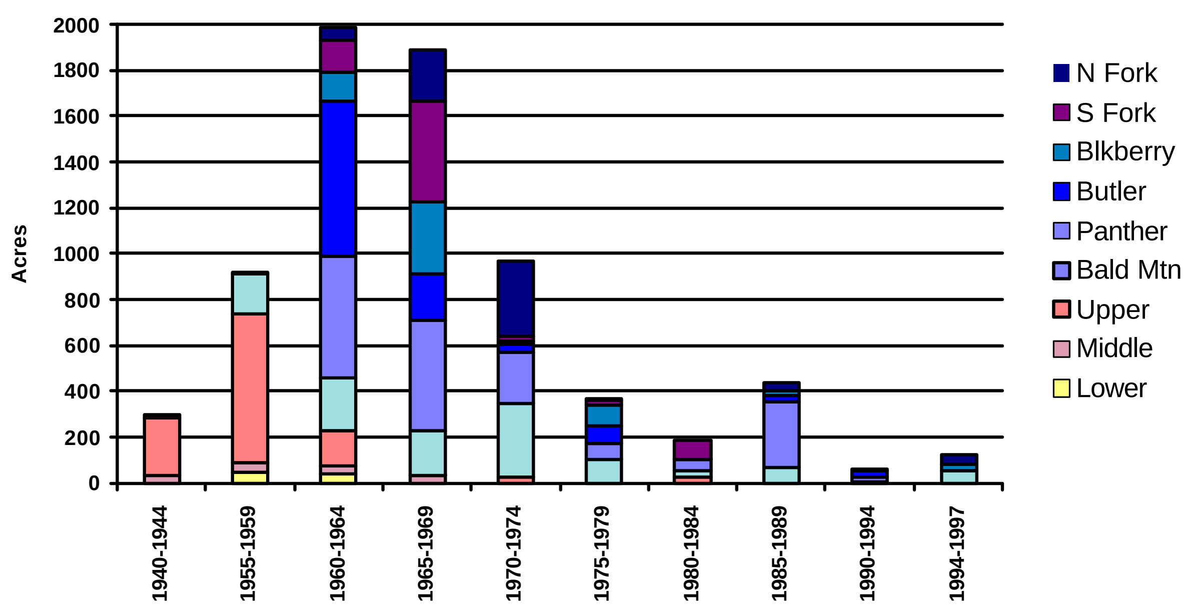
Figure 7: Seral Stage Structure by Subwatershed

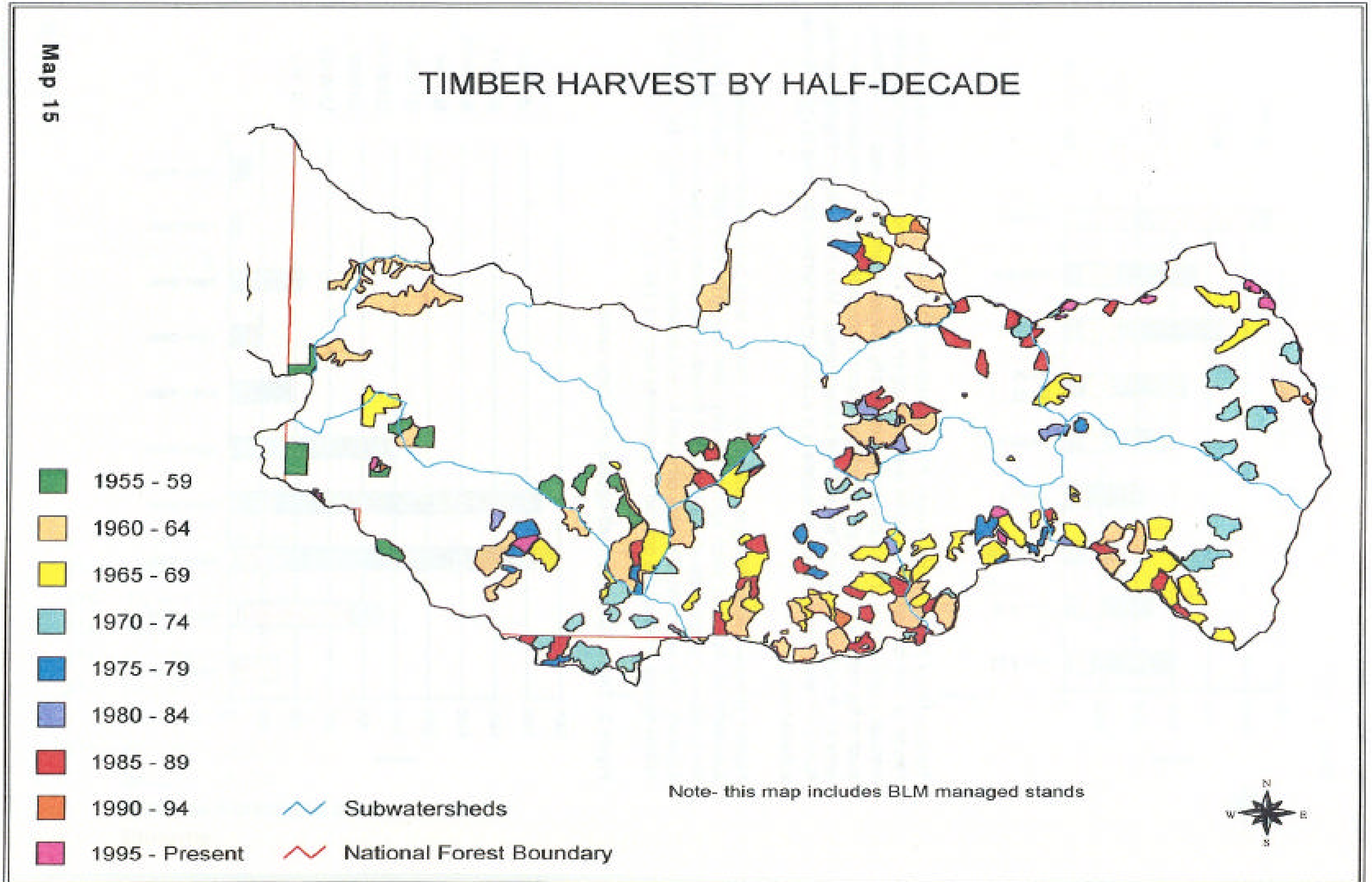


Typically timber harvest tended to occur in close association (physically on the landscape) with other harvest units to form contiguous blocks of similar seral structure. In essence, a minimally fragmented landscape across many of the subwatersheds created by past management (see Map 15). As shown, much of the past timber harvest on Federal lands occurs in connected blocks. Exceptions to this are units within the North Fork and Panther Creek subwatersheds. More information on fragmentation within North Fork and Panther Creek Subwatersheds is available in the narrative pertaining to each individual subwatershed.

Figure 8 provides a visual display of past harvest on Federal lands by half-decade across each subwatershed. As shown, timber harvest was very prolific during the early 1960's. This was primarily due to salvage harvest of the effects of the 1962 Columbus Day storm that blew down hundreds (703) of acres within the watershed. The peak of harvest in the watershed can be attributed to this event and related salvage. Harvest has dropped off significantly since the 1960's.

Figure 8: Timber Harvest by Half-Decade on Federal Lands

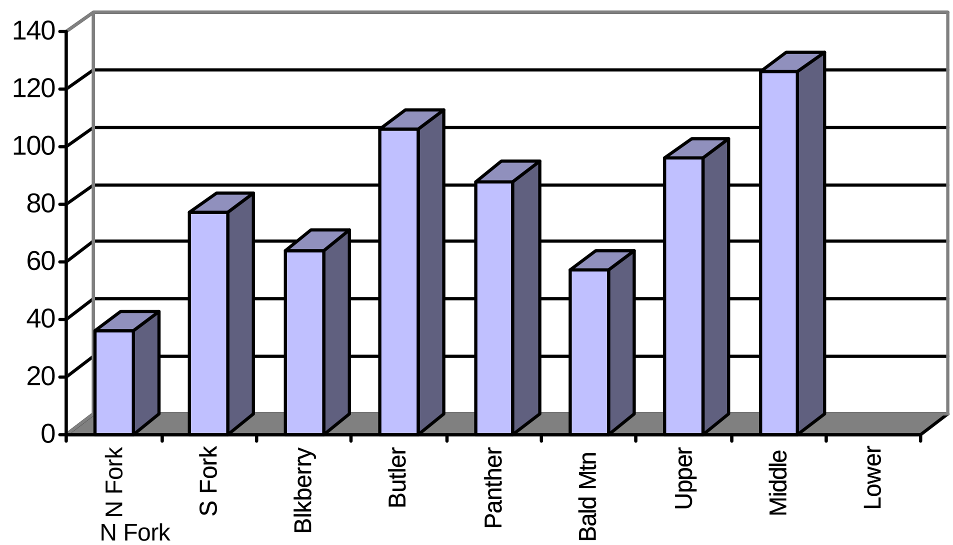



Map 15
TIMBER HARVEST BY HALF-DECADE
1955 - 59
1960 - 64
1965 - 69
1970 - 74
1975 - 79
1980 - 84
1985 - 89
1990 - 94
1995 - Present
Subwatersheds
National Forest Boundary
Note- this map includes BLM managed stands
N
W
E
S

Past harvest practices created patches, usually within the pioneer seral structure. These harvest related patch sizes vary from more than 120 acres to less than 50 acres depending upon the subwatershed. These harvest-related patch sizes were determined for Federal lands across the watershed. Information is incomplete for private lands in the Lower Mainstem and Bald Mountain Creek subwatersheds. This reflects clearly in Figure 9 where no information is available in the Lower Mainstem. The lack of information is less clear in Bald Mountain Creek. It is highly likely that when private information for Bald Mountain Creek is added that the average patch size will increase, with the addition of private timber harvest acres in the lower portion of the Bald Mountain Creek Subwatershed.

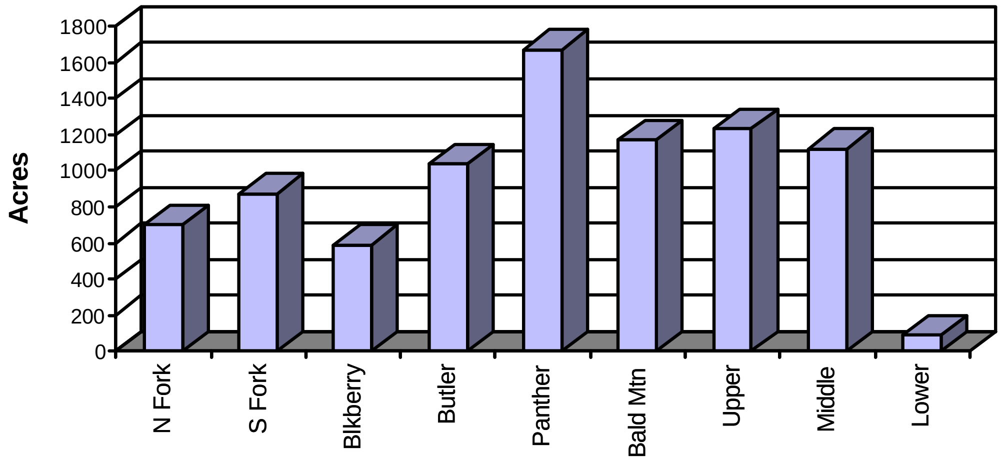
More information on natural disturbance patch size is available in a brief discussion earlier in this document (see Terrestrial Ecosystem: Disturbance Frequency) and in the Southern Oregon Late-Successional Reserve Assessment for the Northwest Coast Late-Successional Reserve.

Figure 9: Average Patch Size (Harvest-related) by Subwatershed on Federal Lands



Patches created as a result of timber harvest were historically replanted within the first year or two of harvest and burning. Although these units typically were planted primarily with Douglas-fir, the units may also include natural regeneration of western hemlock, Port-Orford-cedar, and tanoak. Another tree species commonly planted in small percentages was sugar pine, although this was not typically done during the 1960's and 1970's. Acres of stands in this condition are displayed in Figure 10.

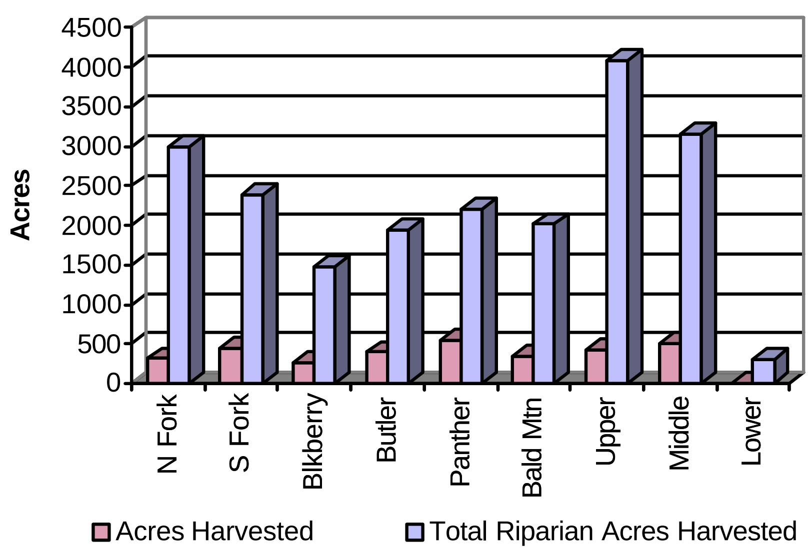
Figure 10: Total Timber Harvest by Subwatershed on Federal Lands


Acres
1800
1600
1400
1200
1000
800
600
400
200
0
N Fork
S Fork
Blkberry
Butler
Panther
Bald Mtn
Upper
Middle
Lower

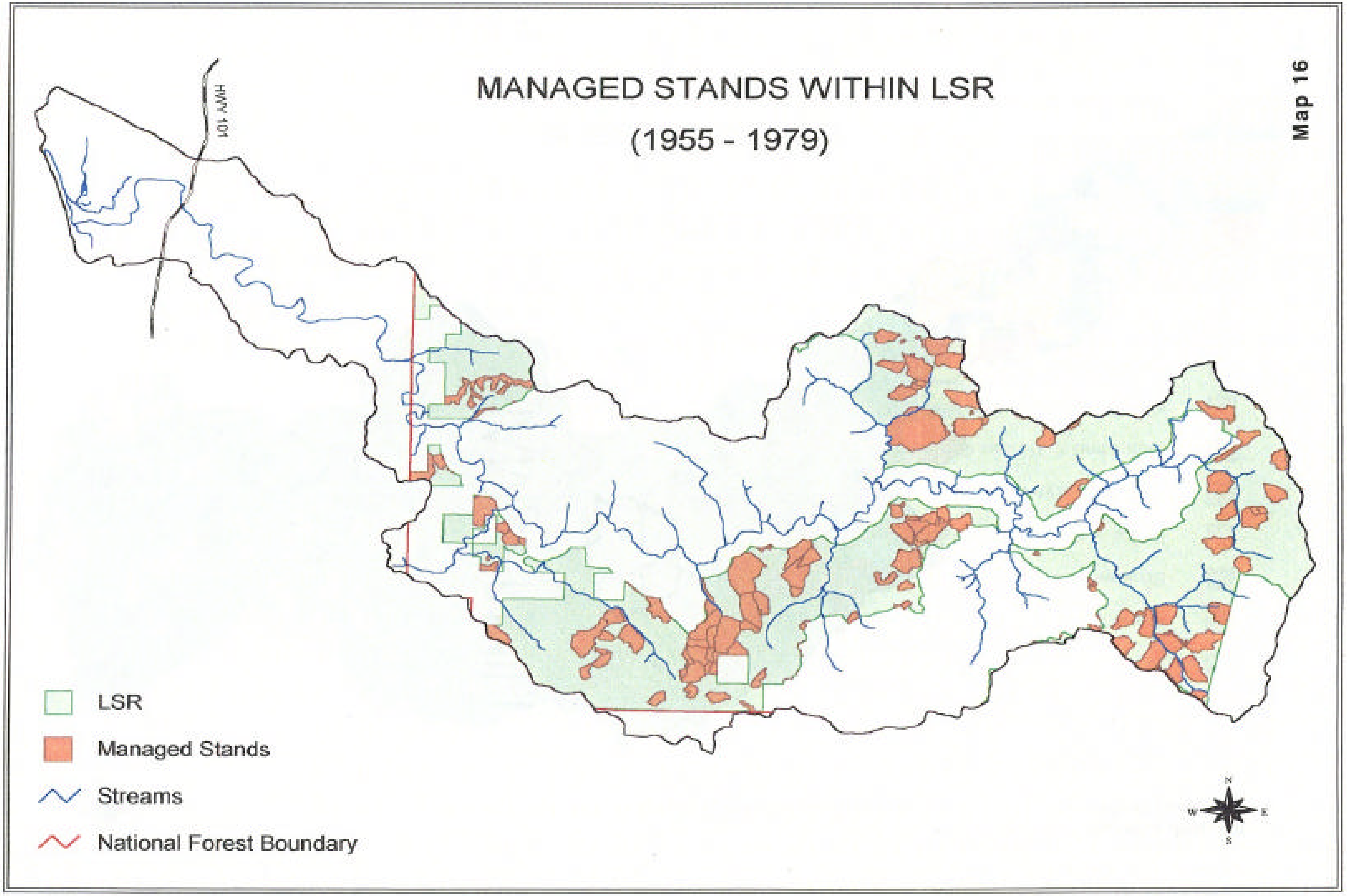
Many of the units harvested, planted, and silviculturally treated (manual released of competing vegetation and pre-commercial thinned), especially those harvested between 1955 and 1979 (see Map 16, Managed stands within LSR), would benefit from some form of commercial thinning to help aid the development toward late-successional habitat. Structure and composition characteristics include interior habitat, large trees, snags, large woody material, multistoried canopies, understory trees, canopy gaps, or patchy understories (LSRA - p.105).

On Federal lands past harvest practices frequently removed trees within riparian areas on intermittent streams. The NFP established Riparian Reserves for all streams. For this analysis a width of 200' on intermittent and non-fish bearing streams and 400' on fish bearing streams was used to determine acres. Figure 11 display's acres of Riparian Reserve treated within each subwatershed alongside total acres of riparian. Opportunities to enhance riparian vegetation may exist within these areas, although site visits are necessary prior to planning and implementing enhancement projects. Within these areas there may be opportunities to plant conifers to enhance stream shading, to contribute to downstream large wood recruitment and to serve as connection corridors for travel from riparian to upland terrestrial areas.

Figure 11: Total Riparian Acres Harvested within Managed Stands on Federal Lands

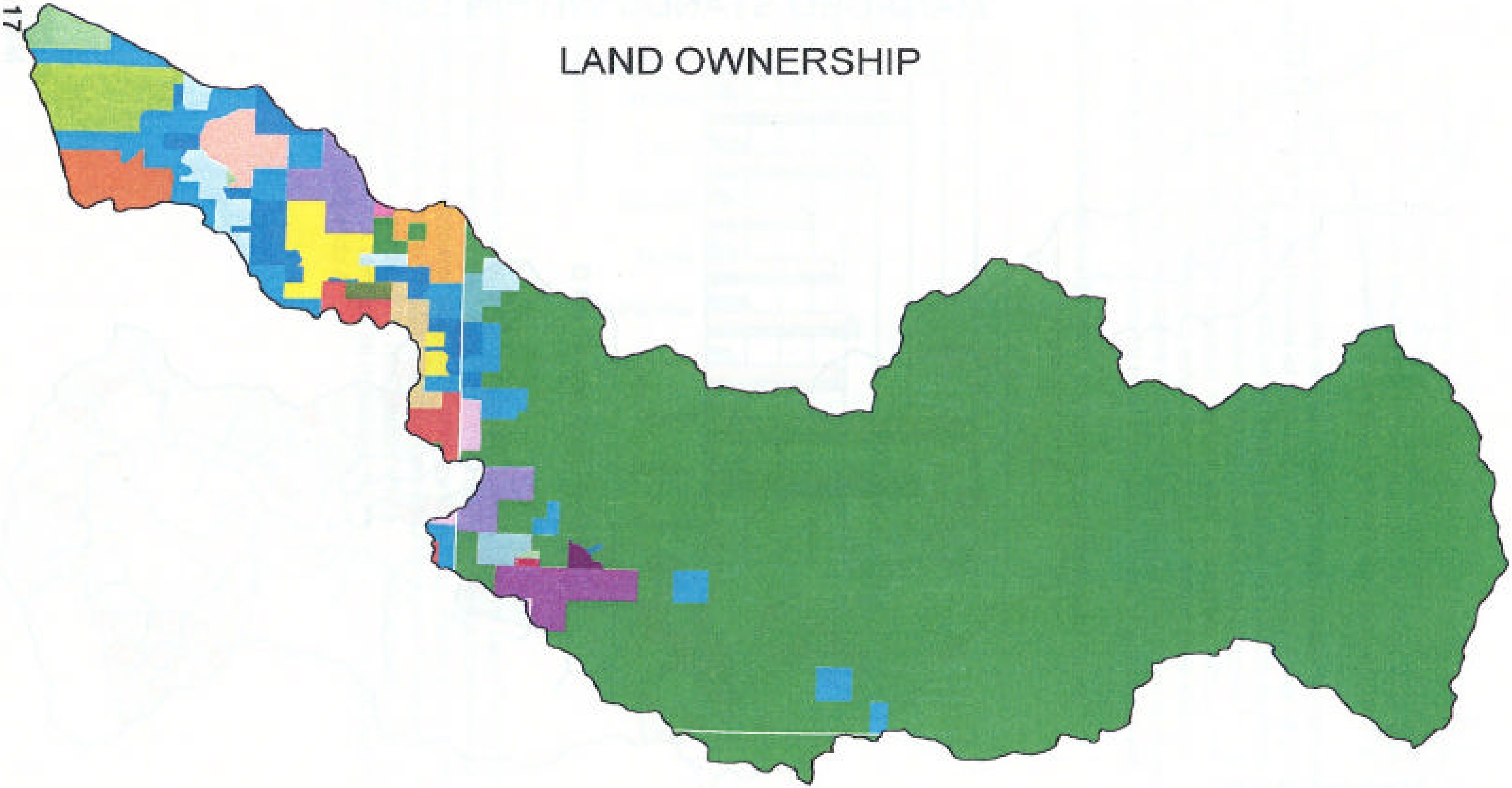


The Elk River watershed contains a myriad of landowners, (see Map 17, Elk River Land Ownership and Appendix D, Elk River Landownership acres). The management direction for individual private landowners is not clear, but is typically that of the homeowner and general farming and ranching. Private timber company direction is to best maximize growth and yield of timber to be produced. Management direction for the remainder of the watershed falls under the NFP. This direction will then depend on the land allocation for which it resides (see Figure 12). A complete list of land allocation acres across the entire watershed and subwatershed are listed in Appendix A.


MANAGED STANDS WITHIN LSR
(1955 - 1979)
Map 16
HWY 101
LSR
Managed Stands
Streams
National Forest Boundary
N
W
E
S

Map 17

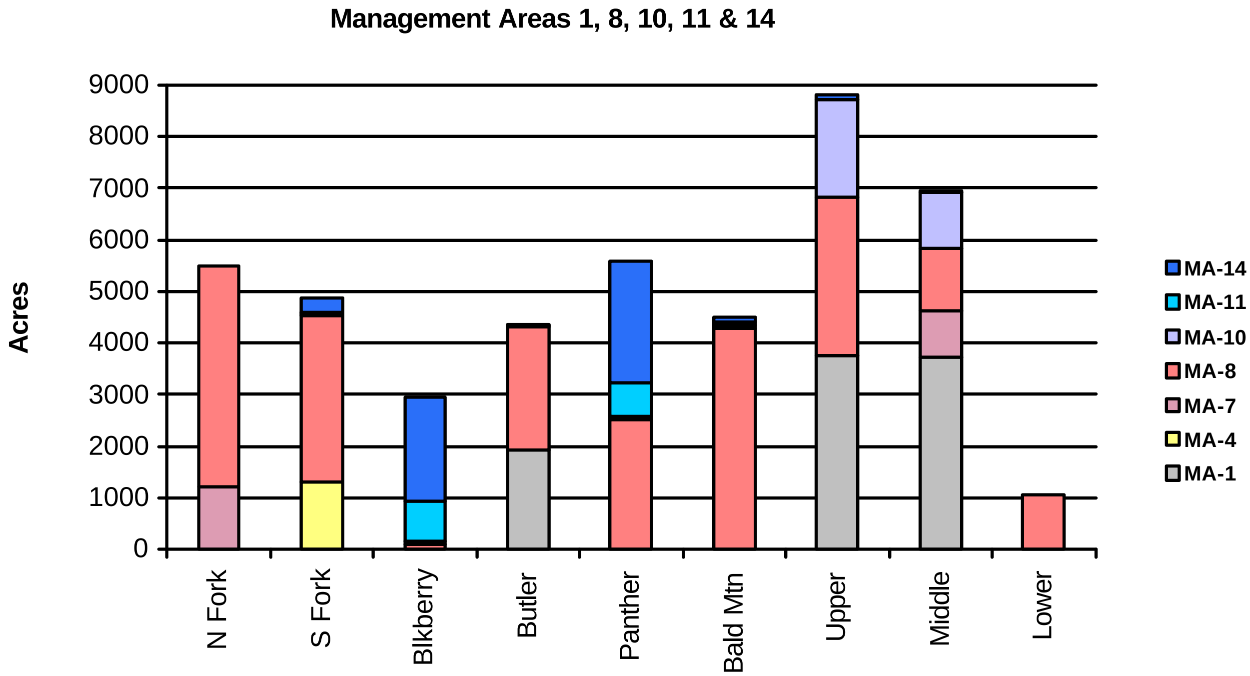
LAND OWNERSHIP

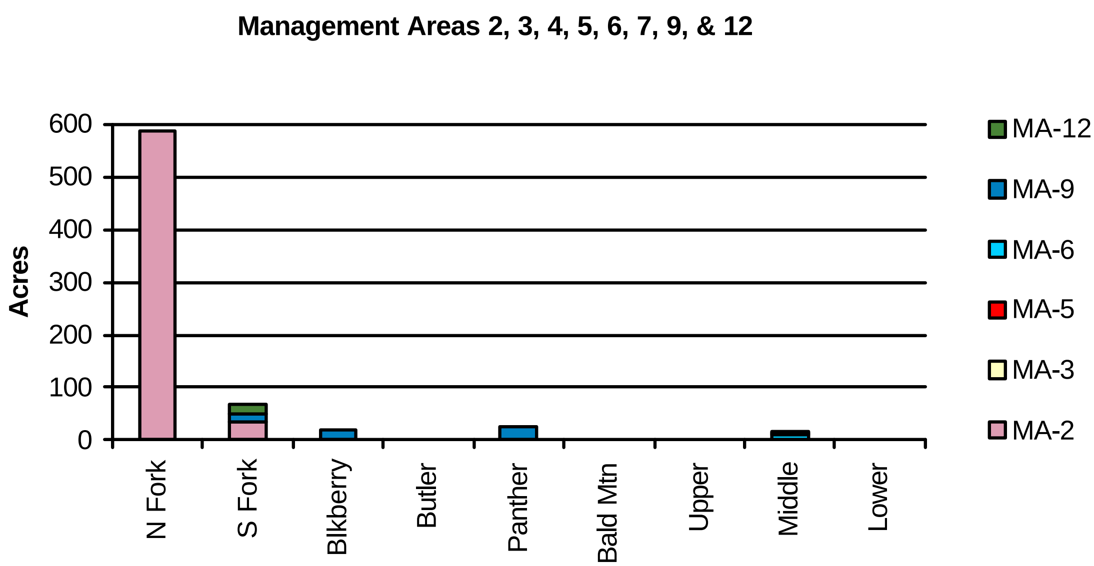


See next page
for map legend

Map 17 legend

Figure 12: Elk River Management Land Allocations on Federal Lands





TERRESTRIAL ECOSYSTEM - Individual Subwatershed Discussion

North Fork Elk River (31H)

The North Fork is approximately 6,072 acres in size. Elevations range from 4,000 feet along Iron Mountain to near 900 feet at the confluence of North Fork.

Timber harvest has occurred on 467 acres of the 6,072 acre subwatershed. An additional 235 acres of natural stands were manually released from competing hardwood and brush species. This total of 702 acres is displayed in Figure 10. These acres do not fairly represent the assumption that certain environmental effects assumed with a final removal are similar to those 235 acres receiving a manual release or thinning treatment, although the acres are tracked together as managed stands.

Natural disturbance patterns are evident throughout the North Fork where natural fire has replaced stands near the confluence of the North Fork as well as along the divide separating the North Fork of Elk River with the neighboring Sixes Watershed (see Map 18). In 1967 and 1968 manual releases of three large stands (69 - 87 acres in size) occurred in these naturally (fire) created stands. Historic records are vague as to the objectives for this treatment. The assumptions are that treatment was a form of "brush field conversion" in which hardwood species were treated (chemical/manual treatment) to release the conifer species.

The North Fork contains seven harvest units from the late 1960's and early 70's that are 40 to 60 acres in size. These units are islands of pioneer seral stage structure amidst mid to late seral stage structure, fragmenting (at a small scale) the structure of this particular subwatershed. The scale of fragmentation is relatively minimal as only 8% of the 6,000 acres subwatershed has been altered from mid to late seral structure to a pioneer structure size. Fragmentation and increased edges have been created from harvest activities, although very nominal in scale.

Windthrow, and related harvest of windthrow have historically been another disturbance agent across the entire Elk River watershed. Within the North Fork subwatershed windthrow and salvage has occurred across approximately nine acres. A small windthrow patch of nine acres, harvested in 1973, is a defining characteristic of the degree of windthrow effects in this subwatershed.

Current ownership within the subwatershed is 100% National Forest.

South Fork Elk River (31I)

The South Fork Elk River is approximately 4,927 acres in size. The elevations range from 4,000 feet in the headwaters along Iron Mountain to near 1,000 feet at the confluence of South Fork Elk and the Elk River.

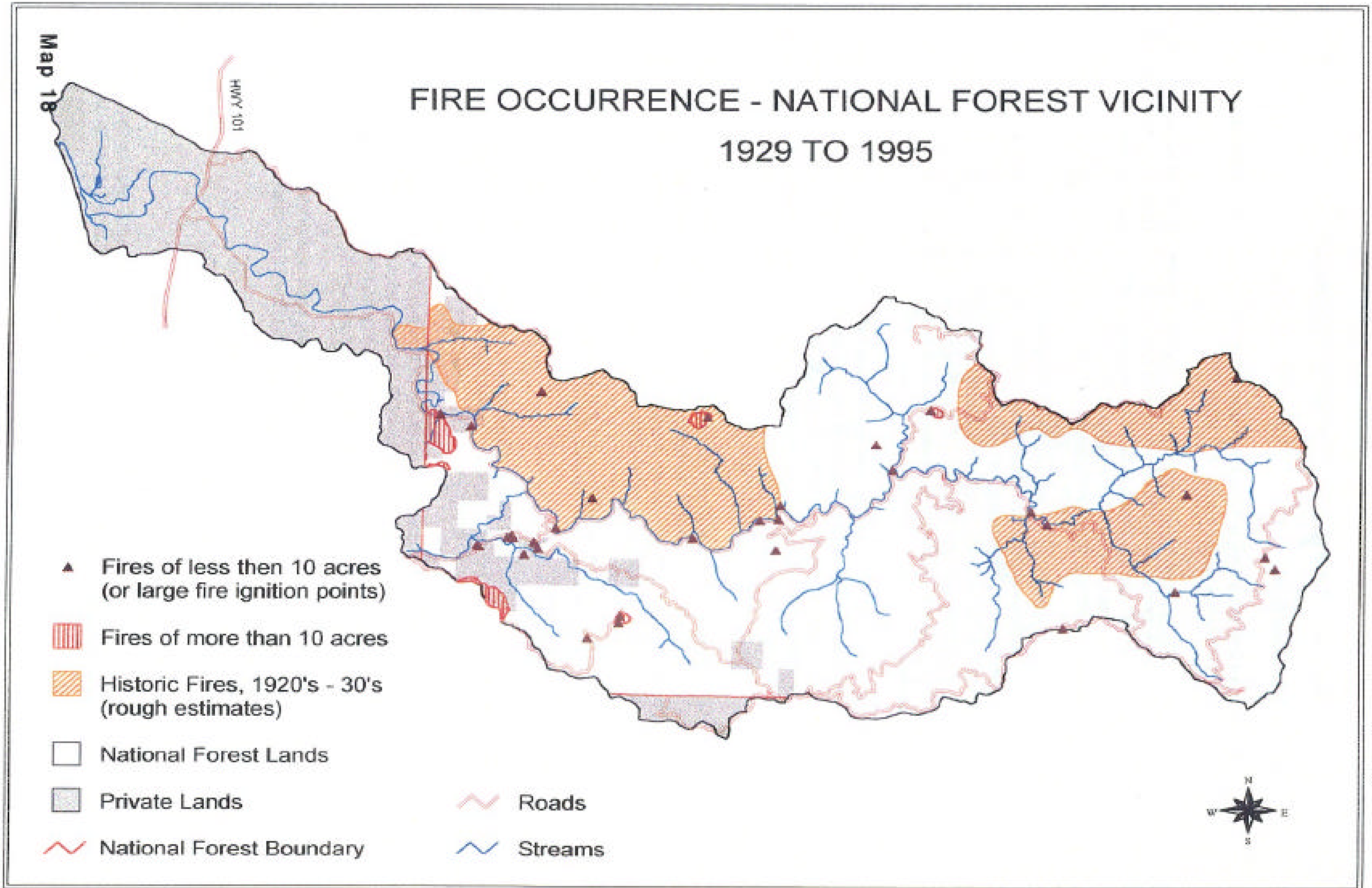
Natural disturbances that have lead to the current vegetative makeup have been natural fire and windthrow. These two natural disturbances have not been major disturbance agents in this particular subwatershed. A stand replacing fire in the early 1900's burned across the lower portion of the subwatershed near the confluence of the South and North Fork (see Map 18, Fire Occurrence Map).

Windthrow, and related harvest of windthrow have historically been another relatively significant disturbance across the entire Elk River watershed. Within the South Fork subwatershed windthrow and salvage has not occurred.

Current ownership within the subwatershed is 100% Federal.

Blackberry Creek (31G)

Blackberry Creek is approximately 2,960 acres in size. Blackberry Creek has two branches, known as the east and west forks. The elevations range from 2,900 feet at Toast Camp to near 750 feet at the confluence of Blackberry Creek and the Elk River.


Map 18
FIRE OCCURRENCE - NATIONAL FOREST VICINITY
1929 TO 1995
HWY 101
Fires of less then 10 acres
(or large fire ignition points)
Fires of more than 10 acres
Historic Fires, 1920's - 30's
(rough estimates)
National Forest Lands
Private Lands
National Forest Boundary
Roads
Streams
N
W
E
S

Other disturbances that have lead to the current vegetative makeup have been natural fire and windthrow. These two natural disturbances have not been major disturbance agents in this particular subwatershed. A historical fire occurring at the turn-of-the century replaced the previous mature stands into younger, single structured species of Douglas-fir around the confluence and east fork of Blackberry Creek (see Map 18, Fire Occurrence Map).

Windthrow, and related harvest of windthrow have historically been another relatively significant disturbance across the entire Elk River watershed. Within the Blackberry Creek subwatershed windthrow and salvage has occurred across approximately 78 acres.

Current Ownership within the subwatershed is 100% Federal.

Butler Creek (31F)

Butler Creek is approximately 4,334 acres in size. The elevations range from 2,600 feet at Mount Butler to near 1,000 feet along Butler Creek.

Timber harvest has occurred on approximately 1,042 acres within the 4,334 acre subwatershed. Where past harvest had occurred, it tended to occur in close association with other harvest units to form contiguous blocks. In the western part of the subwatershed, in what is now the Grassy Knob Wilderness, is a 360 acre harvest unit cut in 1961. It was harvested prior to its establishment as public lands and subsequent Wilderness designation. Approximately 90 acres of the 360 acre harvest is within this subwatershed. The remaining acres are within the Sixes Watershed. The eastern part of the subwatershed harbors nearly all the timber harvest units in which patch sizes range from one acre to 334 acres (average 106 acres). A large percent of the disturbance occurred during the half-decade of 1960-64, as shown in Figure 8.

Other disturbances that have lead to the current vegetative makeup have been natural fire and windthrow. These two natural disturbances have not been major disturbance agents in this particular subwatershed. A natural fire did occur in the early 1900's in the eastern portion of the watershed (see Map 18, Fire Occurrence Map).

Windthrow, and related harvest of windthrow have historically been another relatively significant disturbance across the subwatershed. Within Butler Creek windthrow and salvage has occurred across approximately 76 acres. Generally windthrow occurred in small patches. However, a relatively large patch of 69 acres was salvaged under the Butler Mountain BD sale name.

Current ownership within the subwatershed is 100% Federal.

Panther Creek (31E)

Panther Creek is approximately 5,805 acres in size. The elevations range from 3,000 feet in the headwaters of Panther to near 500 feet at the confluence of Panther and the Elk River.

Timber harvest has occurred on 1,607 acres of the 5,805 acre subwatershed, an additional 64 acres of natural stands were manually released (23 acres) from competing vegetation or commercially thinned (41 acres). Figure 10 includes the 64 acres, along with the 1,607 acres of final removal.

Other disturbances that have lead to the current vegetative makeup have been natural fires and windthrow events. A natural fire may have been an agent in producing a younger vegetation type in the vicinity of the middle fork of Panther Creek. Vegetation size, composition, and pattern provide some suspicion that it was perhaps a natural fire fueled by east winds near the turn of the century. Although this is only aerial photo interpretation and not field verified, the time period does correlate with neighboring subwatersheds with a history of a large stand replacing fire(s).

Panther Creek contains 12 harvest units from the 1960's, 1970's and 1980's that are 15 to 35 acres in size. These units are islands of pioneer seral stage structure amidst early, mid to late seral stage structure, fragmenting (at a small scale) the structure of this particular subwatershed. The scale of fragmentation is fairly high as 26% of the 5,805 acre subwatershed has been altered from early, mid, and late seral structure to a pioneer structure size. Fragmentation and increased edges have been created from these harvest activities.

Windthrow, and related harvest of windthrow have historically been another relatively significant disturbance across the entire Elk River watershed. Within the Panther Creek subwatershed windthrow and salvage has occurred across approximately 203 acres, primarily during the mid-to-late 1960's. Generally windthrow occurred in small patches. Within this subwatershed salvage of windthrow ranged from two acres to 88 acres in size. The large patch of 88 acres was salvaged under the Victoria Salvage BD sale name.

Current ownership within the subwatershed is 97% National Forest.

Bald Mountain Creek (31D)

Bald Mountain Creek is approximately 6,724 acres in size. The elevations range from 3,000 feet at Rocky Peak to near 200 feet at the mouth of Bald Mountain Creek.

Timber harvest has occurred on approximately 1,087 of the 6,724 acre subwatershed (including Bureau of Land Management) and assuming an additional 1,200 acres of private timber company lands as well. An additional 86 acres were manually released from competing hardwood and brush species in naturally (fire) created stands during 1964 and 1968. Figure 10 includes the 86 acres of this particular type of treatment along with the 1,087 acres of final removal.

Other disturbances that have lead to the current vegetative makeup have been natural fire and windthrow. These two natural disturbances have not been major disturbance agents in this particular subwatershed. Fire has occurred on a very minor scale in relation to other subwatersheds in the Elk River. Records for National Forest land show two fires of relative recent occurrence (1929 - 1995). However, vegetative evidence suggests stand replacing fires along Bald Mountain Ridge and Salal Springs at the headwaters of Bald Mountain Creek (see Map 18, Fire Occurrence Map).

Windthrow, and related harvest of windthrow have historically been another disturbance agent across the entire Elk River watershed. Within the Bald Mountain Creek subwatershed windthrow and salvage has not been significant and has occurred across approximately 15 acres in 1963.

Current ownership within the subwatershed is 76% Federal.

Upper Mainstem Elk River (31C)

The Upper Mainstem is approximately 8,795 acres in size. The elevations range from 2,500' at the headwaters (Bungalow Creek) to 500' where Sunshine Creek enters the Elk River.

Timber harvest has occurred on approximately 1,231 of the 8,795 acre subwatershed (see Figure 10).

Other disturbances that have lead to the current vegetative makeup have been natural fire and windthrow. These two natural disturbances have not been major disturbance agents in this particular subwatershed. Fire has occurred on a very minor scale in relation to other subwatersheds in the Elk River. Records for National Forest land show several small fires of relative recent occurrence (1929 - 1995) and a large stand replacing fire occurring at the turn-of-the-century in what is now the Grassy Knob Wilderness (see Map 18, Fire Occurrence Map).

Windthrow, and related harvest of windthrow have historically been another disturbance agent across the entire Elk River watershed. Within the Upper Mainstem Subwatershed windthrow and salvage has been relatively significant occurring across approximately 173 acres in 1962, 1963, and 1972.

Current ownership is 100% Federal.

Middle Mainstem Elk River (31B)

The Middle Mainstem is approximately 7,345 acres in size. The elevations range from 2,450' at Anvil Mountain to 400' along the river corridor.

Timber harvest has occurred on approximately 897 of the 7,345 acre subwatershed. An additional 226 acres were manually released from competing hardwood and brush species in naturally (fire) created stands during 1964. Figure 10 includes the 226 acres of this particular type of treatment along with the 897 acres of final removal.

Other disturbances that have lead to the current vegetative makeup have been natural fire and windthrow. These two natural disturbances have not been major disturbance agents in this particular subwatershed. Fire has occurred on a very minor scale in relation to other subwatersheds in the Elk River. Records for National Forest land show several small fires of relative recent occurrence (1929 - 1995) and a large stand replacing fire occurring at the turn-of-the-century in what is now the Grassy Knob Wilderness (see Map 18, Fire Occurrence Map).

Windthrow, and related harvest of windthrow have historically been another disturbance agent across the entire Elk River watershed. Within the Middle Mainstem Subwatershed windthrow and salvage has been relatively significant occurring across approximately 149 acres in 1963, 1964, and 1966.

Current ownership is 95% Federal.

Lower Mainstem Elk River (31A)

The Lower Mainstem is approximately 11,426 acres in size. The elevations range from 900' to sea level where the Elk River enters the Pacific Ocean.

Current ownership is 11% Federal.

TERRESTRIAL ECOSYSTEM - Wildlife Processes

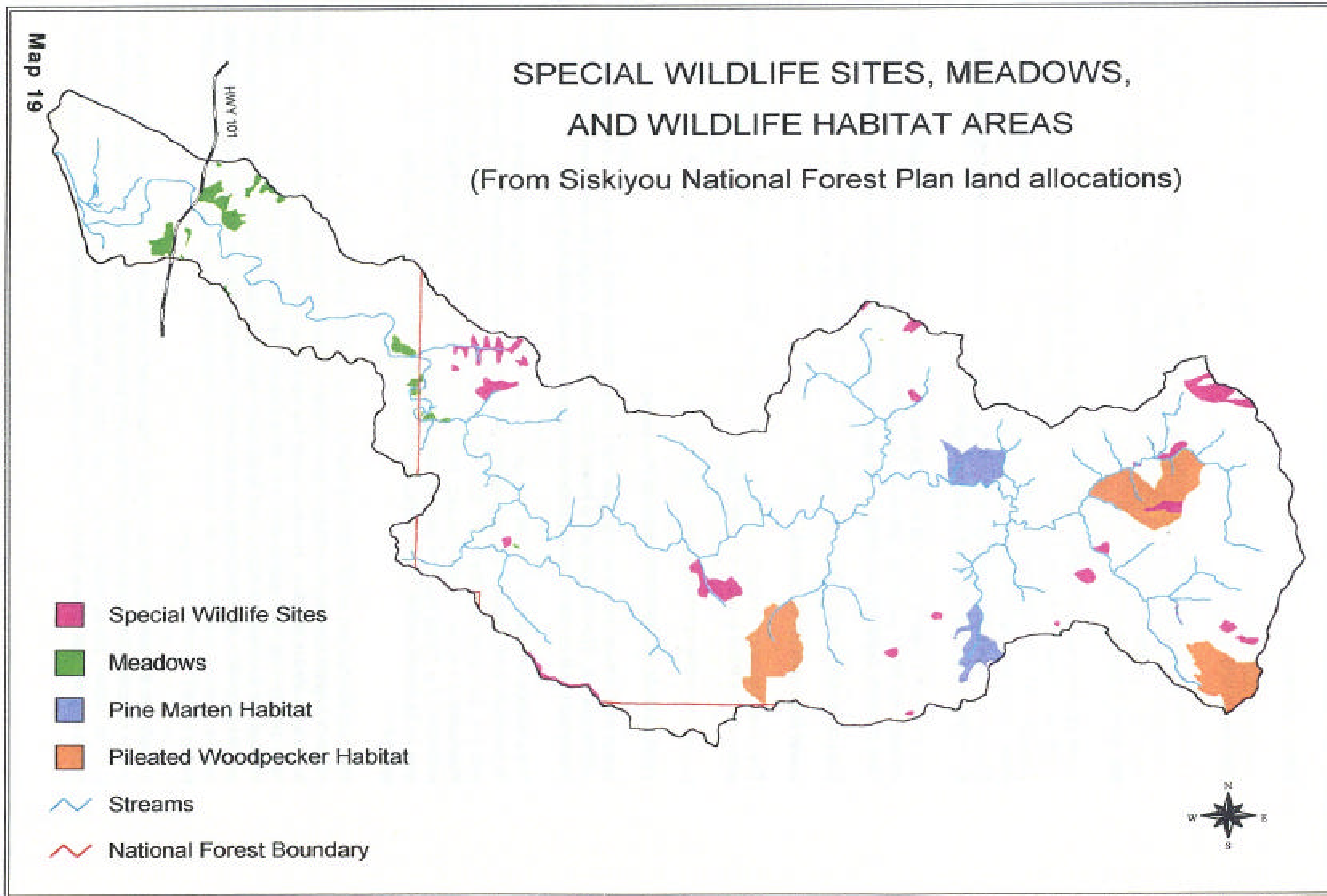
Within the Elk River watershed there are many varied habitats which support an abundance of different wildlife species. The influence of the Pacific Ocean has greatly shaped the vegetation found in the watershed and thus, the mammals, birds, amphibians, and reptiles found there.

The presence or absence of wildlife species in a given area is a direct result of habitat types available. All mammals, birds, reptiles, and amphibians need certain types of ecosystems, and sometimes more than one, during a normal life cycle. Species presence and distribution will change as a result of habitat modifications, natural or human-caused. In maintaining the viability of all resident wildlife species in a watershed, it is critical that a range of habitat conditions are conserved. It is not possible to evaluate an area for its overall wildlife “value” because species' needs are very different and often quite in opposition.

The most obvious and rapidly occurring change in the Elk River has been the replacement of mature coniferous forest ecosystems with early seral habitats. These changes are natural ecological processes and are not always negative. However, within the last century, the frequency at which the communities have changed has had negative effects on some species. Intensive timber harvest in the Elk River watershed has reduced late successional habitat (see Seral Stage maps) and this has had a greater impact on those species dependent on older forests such as northern spotted owls and marbled murrelets. In contrast, however, species such as deer, elk, bluebirds, and bobcats that are more adaptable to early vegetative stages benefit from these changes.

In addition to the predominant habitat type of mature hemlock/Douglas-fir temperate forest, smaller, more unique habitats will affect distribution and breeding success of different species. Sites such as cliffs and scabrock slopes, ponds, meadows and small openings, hardwood stands, and riparian zones provide habitat diversity that allow a variety of species to coexist. These constitute macro scale type habitats.

Map 19


SPECIAL WILDLIFE SITES, MEADOWS,
AND WILDLIFE HABITAT AREAS
(From Siskiyou National Forest Plan land allocations)
HWY 101
Special Wildlife Sites
Meadows
Pine Marten Habitat
Pileated Woodpecker Habitat
Streams
National Forest Boundary
N
W
E
S

Additionally, microsite conditions such as amount of snags, downed wood, and patches of hardwoods within meadows, will provide necessary breeding, resting, and foraging sites. One example is that of stands of red alder in riparian zones providing critical nesting habitat for many neotropical migrant bird species.

The behavior of wildlife species is also an important process in terms of where particular animals are found, which sites are more important and which areas receive little use. Seasonal migration patterns are significant and may be altitudinal such as with deer and elk, north-south as with neotropical songbirds, or east-west as with bald eagles and marbled murrelets. Previous human activities in Elk River such as road building and the alteration of forest stands result in direct mortality of some individuals, isolation of others, increased harassment due to improved public access, and displacement and avoidance (Evink et al. 1996).

Wildlife Species

Personal communication with local residents has helped to document past populations of wildlife species in the watershed and can be used as a comparison with present day populations. For a complete list of all wildlife species in the watershed, see Appendix E.

Historically, the Elk River watershed was dominated by western hemlock-Douglas-fir late seral habitats. South facing slopes were interspersed with hardwood stands, primarily tanoak-Port-Orford-cedar and tanoak-western hemlock. Riparian areas were a combination of evergreen trees and hardwoods such as red alder. Special wildlife habitats such as meadows and other openings, ponds and lakes, talus slopes, and cliffs were never abundant in the drainage but did occur (see Map 19, Special Wildlife Habitat). Riparian areas along the Elk River and all the associated tributaries provided abundant riverine habitat. Wildlife diversity, distribution, and abundance has varied since early times as these habitats underwent changes, natural and human caused.

Mammals: Approximately 60 species of mammals are presently found in the watershed (Webb and Shea 1990), including estuarine marine mammals such as harbor seals and sea lions. Carnivore species which were present historically and which are still common include bobcat (Lynx rufus), coyote (Canis latrans), river otter (Lutra canadensis), mink (Mustela vison), and raccoon (Procyon lotor). There are also many black bears (Ursus americanus) (Shea 1995) in the watershed as they utilize the widespread early seral vegetation for feeding. The other large, solitary predator of the watershed is the mountain lion (Felis concolor), of which sightings are rare. Likewise, herbivores found historically and presently in good numbers include different squirrel species, mountain beaver (Aplodontia rufa), and beaver (Castor canadensis). Uncommon or occasional species include seals and sea lions, muskrat (Ondatra zibethica), ringtail (Bassariscus astutus), which has been observed near human dwellings (Rogers 1996, personal communication), Virginia opossum (Didelphis marsupialis), and porcupine (Erethizon dorsatum). American martens (Martes americana) and gray foxes (Urocyon cinereoargenteus) are typically uncommon, however, both have been sighted somewhat regularly in recent years on Iron Mountain. Lynx (Lynx canadensis) are not found in the drainage. Sea otters (Enhydra lutris) were historically common, however, presently there are none along the entire Oregon coast (Nowak 1991). The Pacific fisher (Martes pennanti pacifica) occurs in the watershed but are uncommon. Additional carnivores such as the gray wolf (Canis lupus) and grizzly bear (Ursus horribilis) were present in historical times but have not been recorded in several decades.

Roosevelt elk (Cervus canadensis) have never been abundant in the watershed despite the naming of the area. Accounts from the mid-1800s indicated healthy elk populations in the lower river areas as European settlers began to move along the southern Oregon coast and into the river valleys. Elk were never abundant in the upper drainages. By the late 1800s and early 1900s, however, elk numbers had drastically declined due to the appearance of hide hunters throughout the Elk River and surrounding areas. From 1965 to 1970, elk were transplanted to the Mt. Wells area by the Oregon Department of Fish & Wildlife (ODFW) from private lands outside of Coos Bay. During 1966-67 eight elk were released in the South Fork of Elk River; 1967-68, 18 elk went to the mainstem; 1970-71, 26 elk went to the area around Iron Mountain (Toman 1997). From the early 1970s to 1985, elk were regularly observed in small numbers. Fourteen more were released in December 1987 on Milbury Mountain, 12 being fitted with blue visual collars and two with radio collars. These animals quickly moved south to the Gold Beach Ranger District.

There have always been good numbers of black-tailed deer (Odocoileus hemionus) present in the watershed.

Non-native Mammals: The only exotic mammal known with certainty to be present in the watershed is the Virginia opossum (Didelphis virginiana), which is common in the lower river. This mammal is a native of the eastern United States and was introduced into Northwestern Oregon in the 1940s (Maser et al. 1981). The nutria (Myocastor coypus) has not yet been observed in Elk River but has made it at least as far south as Lake Tahkenitch (Hopp 1997, personal communication), having been introduced to the Willamette Valley during the mid part of this century. Additionally, it is quite likely that house mice (Mus musculus) and black (Rattus rattus) and/or Norway rats (Rattus norvegicus) inhabit the watershed. These species occur primarily around human dwellings or structures, so would likely be found only in the lower river.

Birds: Approximately 150 bird species reside in the watershed (Webb and Shea 1991). Birds commonly found historically and presently include blue (Dendragapus obscurus) and ruffed grouse (Bonasa umbellus), California (Callipepla californica) and mountain quail (Oreortyx pictus), great horned (Bubo virginianus), western screech (Otus kennicottii), and saw-whet owls (Aegolius acadicus), Steller's jay (Cyanocitta stelleri), and many other songbird species. Peregrine falcon (Falco peregrinus) are not common in the watershed and have not been known to be nesting, but they have been observed. Bald eagles (Haliaeetus leucocephalus) can generally be seen in the autumn feeding on salmon, however, no nests have been located. Northern spotted owls (Strix occidentalis caurina) and marbled murrelets (Brachyramphus marmoratus) have been documented in several areas throughout the watershed, including some nesting locations . Given these two species' dependence on late seral coniferous habitat, it is surmised that historical populations were larger. Golden eagles (Aquila chrysaetos) are seen occasionally in different parts of the watershed and have nested in the past on Mt. Butler. There are no known nests at present. Barred owls (Strix varia) are present but not common. There are unconfirmed sightings of northern goshawk (Accipiter gentilis). Black-shouldered kites (Elanus caeruleus) are typically found in the lower river and one brown pelican (Pelecanus occidentalis) was discovered at the mouth of Anvil Creek (Rogers 1996, personal communication). Snowy plover (Charadrius alexandrinus) are present along shoreline areas that have open, sandy beach. Given this species' present “Threatened” status, historical populations were higher. Osprey (Pandion haliaetus) are regularly seen on the west end of the watershed, flying upriver. At least two pairs in the lower part of the river, west of the National Forest boundary, are established (Rogers 1996, personal communication). Acorn woodpeckers (Melanerpes formicivorus) are present in Elk River. Band-tailed pigeon (Columba fasciata) populations appear to be decreasing in general (Shea 1996, personal communication), however, sightings of flocks on the west side of Iron Mountain in the last two years have been numerous.

Non-native Birds: Wild turkeys (Meleagris gallopavo) have never been released in the watershed by the ODFW, nor are there any documented sightings (Toman 1997, personal communication). There are likely European starlings (Sturnus vulgaris), European house sparrows (Passer domesticus), and rock doves (Columbal ivia) residing in the areas of human habitation, primarily in the lower river, off National Forest land.

Reptiles and Amphibians: Historical reptile and amphibian populations are assumed similar to the present, though there is a lack of information for many species. There are the usual garter snakes and lizards as well as different frog species and terrestrial and aquatic salamanders. Bullfrogs (Rana catesbeiana), the only possible exotic species, have not been observed in the watershed.

Proposed, Endangered, Threatened, Sensitive (PETS), and Rare Species

The following table illustrates the status of the proposed, endangered, threatened, sensitive (PETS), and rare species that exist in the Elk River watershed.

Figure 13: Status of Elk River PETS and Rare Species

Species	ESA Federal Listing ***	Oregon State Listing****	USDA Region 6 Sensitive	Survey & Manage Component 2**
Peregrine Falcon	Endangered (1970)	Endangered		
Bald Eagle	Threatened (1978)	Threatened		
Northern Spotted Owl	Threatened (1990)	Threatened		
Marbled Murrelet	Threatened (1992)	Sensitive		
Western Snowy Plover	Threatened (1993)	Threatened		
Pacific Western Big-Eared Bat	Species of Concern*	Sensitive	Sensitive	
White-Footed Vole	Species of Concern	Sensitive	Sensitive	
Northwestern Pond Turtle	Species of Concern	Sensitive	Sensitive	
Northern red-legged Frog	Species of Concern	Sensitive		
American marten		Sensitive		
Pacific Fisher	Species of Concern	Sensitive		
Northern Goshawk	Species of Concern	Sensitive		
Del Norte Salamander	Species of Concern	Sensitive		Component 2
Red Tree Vole				Component 2
Foothill yellow-legged Frog	Species of Concern	Sensitive		
Southern Torrent Salamander	Species of Concern			
Tailed Frog	Species of Concern	Sensitive		
Burnell's False Water Penny Beetle	Species of Concern		Sensitive	
Newcomb's Littorine Snail	Species of Concern			
California Floater (mussel)	Species of Concern			

* Species of Concern: Taxa whose conservation status is of concern to the U.S. Fish & Wildlife Service (many previously known as Category 2 candidates), but for which further information is still needed.

** Component 2: Need to survey prior to ground disturbing activities and manage known sites (FEMAT 1993).

*** Updated List, September 1997

**** List from January 1996

Threatened and Endangered Species

American Peregrine Falcon (__Falco__ __peregrinus__ __anatum__): The American peregrine falcon was federally listed as an endangered species in 1970 under the Endangered Species Act, due to population declines caused primarily from the fatal effects of chemical poisoning (DDT). A recovery plan was approved for the Pacific States in 1982 by the U.S. Fish & Wildlife Service, which designates management units that have individual objectives that must be met in all areas before the species may be reclassified to threatened status. The Elk River is a part of a management unit (see Appendix F) which requires there to be a minimum of 10 nesting pairs producing an average of 1.5 young/year over a five-year period. Recovery Plan objectives for peregrine falcon are outlined in Appendix F. At present, at least 10 nesting pairs have been documented in the recovery zone. These birds have not, however, met the production objectives (currently the average is .9 young/nest/year), and egg shell thinning continues to be higher than in other zones (Pagel 1998, personal communication). Contaminants may be continuing to cause low production, though that has not been proven. The peregrine falcon is also state-listed as endangered.

Peregrine falcons are addressed in the Siskiyou Land and Resource Management Plan (1989) on page IV-29. Specifically, the objectives include that "sufficient existing nesting and feeding habitat shall be protected to meet the objectives of the Pacific Coast Recovery Plan", and that "all existing nest sites and any new nests shall be protected, and feeding areas may be enhanced."

From 1989 to 1991 habitat managed by the Coos Bay District of the Bureau of Land Management, Siskiyou National Forest, and private land in Southwest Oregon was surveyed to document presence and/or potential occupation by breeding peregrine falcons (Pagel 1991). Many cliffs (>70) were aerial and ground surveyed for falcon presence and overall habitat suitability. No sites within the Elk River watershed were surveyed, however, 3 miles to the west of the southern boundary is Humbug Mountain. This site is rated as having medium to high potential as habitat for peregrines. It was surveyed in 1989, 1990, and 1991 with negative results. The Oregon Department of Fish & Wildlife (ODFW) conducted aerial surveys in 1982 and 1987 (Collins 1982 and 1987) and again, many cliffs were examined in Southwest Oregon, however, none in the Elk River watershed.

One peregrine falcon observation record exists for the Elk River watershed. They are rarely seen inland, but are frequently observed on the coast during the winter months (Rogers 1996, personal communication).

Peregrine falcon require cliffs > 30 meters in height and near forested habitat, cliff complexes within 400 to 1,000 meters of perennial or ephemeral water, nest ledges inaccessible to predators, an avian prey base, and little or no human disturbance (Pagel 1995). Such habitat exists along the main Elk River road and further north into the interior of Grassy Knob Wilderness. Disturbance may be too high along Elk River due to vehicle traffic, however, a complete survey for peregrine falcon has not been done in the watershed.

Bald Eagle (__Haliaeetus__ __leucocephalus__): In February 1978, the bald eagle was federally listed as an endangered species in all of the continental United States except Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it was classified as threatened. This listing came due to declining populations caused from the fatal effects of chemical poisoning, poaching of birds, and loss of habitat. The Pacific Bald Eagle Recovery Plan was completed in 1986 by the U.S. Fish & Wildlife Service for a 7-state Pacific Recovery Area, which includes Idaho, Nevada, California, Oregon, Washingtion, Montana, and Wyoming. The recovery plan outlines the steps needed for recovery and maintenance of bald eagle populations (see Appendix G). The eagle is also state-listed as threatened.

The Elk River watershed is a part of Zone 23, the California/Oregon Coast area of the plan, which includes Southwest Oregon east to the Rogue Valley and the northern California coast south to San Francisco (see Appendix H, shows zone for Oregon only). The nearest key area to Elk River designated in the plan is the Sixes watershed to the north. A "key area" is defined in the Recovery Plan as an "area that contains important habitat for eagles" (page 28). The Elk River is not a key area, however, it is listed in the Working Implementation Plan for Bald Eagle Recovery in Oregon and Washington (1990) as a "Potential Territory" for one pair .

Bald eagles are addressed in the Siskiyou Land and Resource Management Plan (1989). The Forest Standards and Guidelines (page IV-28) apply in the event a nest site is found. They include:

- Bald eagle nest sites shall be protected, including existing active and inactive nest sites, and designated recovery (potential) sites. Primary and secondary zones should be established by actual use observations and site-specific information.
- Regularly used feeding and roost sites (including wintering habitat) shall be protected.

There are three documented bald eagle sightings for the Elk River. In May 1997, the District conducted an aerial survey of the Elk River corridor. No birds or nests were observed at that time, however, later in the month, Jim Heaney of the Coos Bay BLM office did find an active nest in the Coquille drainage (Heaney 1997, personal communication), approximately 12 air miles to the northeast of the main Elk River. The Elk River is large enough to support nesting bald eagles in terms of available prey base and suitable nest trees. A detailed survey of the river corridor is critical.

Northern Spotted Owl (Strix occidentalis caurina): In June 1990, the U.S. Fish & Wildlife Service listed the northern spotted owl as a threatened subspecies throughout its range. The owl's population decline is a result of loss of breeding and dispersal habitat. In April 1994, the FEIS on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (NFP) was completed as an amendment to Forest Service and Bureau of Land Management planning documents. This effort designated Late-Successional Reserves, designed over time, to sustain old-growth dependent species. The northern spotted owl is also state-listed as threatened.

Surveys for northern spotted owls on the Powers Ranger District began in the mid-1970s. Prior to 1990, all surveys were conducted by Forest Service personnel and primarily focused on planned project areas (almost exclusively timber sales). Beginning in 1991, the Siskiyou National Forest began contracting these surveys, again in project areas. In the Elk River watershed, surveys have been done since 1974. Approximately 50% of the watershed has been surveyed (see Map 20). With the implementation of the NFP, there have not been any surveys done in the Elk River watershed since 1993 (except for surveys at specific activity centers). Approximately 89% of Federal lands in the watershed is protected as Late-Successional Reserve or Wilderness (or other categories, see Map 3). Approximately 11% is designated Matrix where "most timber harvest and other silvicultural activities would be conducted in that portion of the Matrix with suitable forest lands, according to standards and guidelines" (ROD, page C-39). The few projects in LSR (eg. potential thinnings) and projects in Matrix lands are surveyed for northern spotted owl, and in the event that a nest, pair, or resident single bird is discovered, the Siskiyou Forest Plan Standards and Guidelines would be implemented, which include a 300-foot buffer zone around the nest tree or roost site.

The information from the surveys was reviewed in March 1996 and areas where pairs or territorial single owls were located were designated as " northern spotted owl activity centers." The Elk River watershed has six activity centers, three of which were most recently surveyed in April and May 1997. Northern spotted owls were heard at night at two of the sights but could not be located during the daytime follow-ups. The third activity center had no responses during the night. A history of the six centers is displayed in Figure 14.

Map 20

SPOTTED OWL SURVEY STATIONS

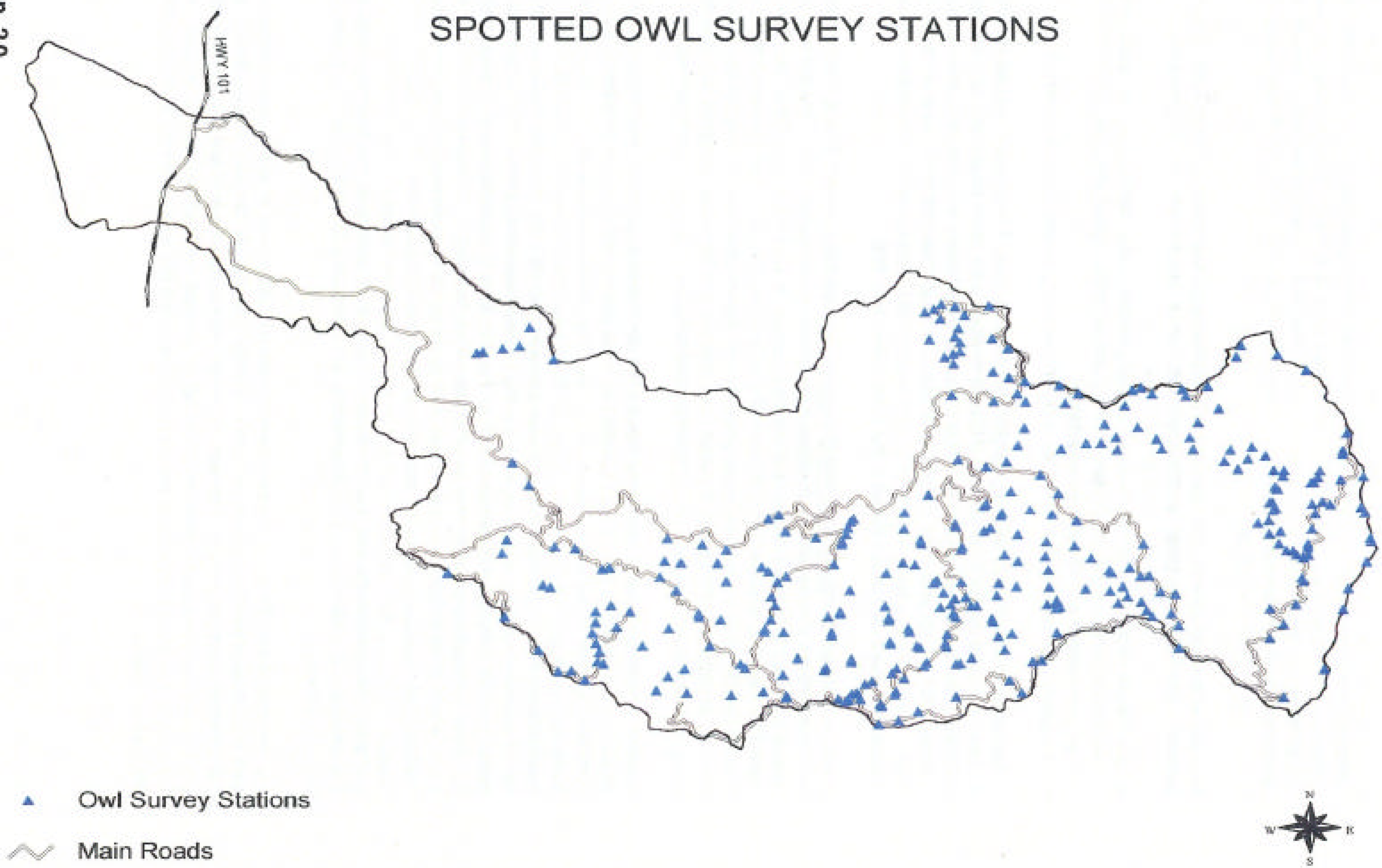


Figure 14: Elk River Northern Spotted Owl Activity Centers

	Activity Center					
	76	140	155	267	349	353
Land Designation	Wilderness	LSR	LSR	LSR	LSR	LSR
Suitable Habitat	<30%	>40%	>40%	30-40%	>40%	<30%
1974	Pair					
1975	Single					
1976	Pair/Nest tree					
1979	Single					
1981	Pair					
1983	Single					
1986	No response					
1987		Single				
1988	Pair		Single			
1989	Pair with two young		Single			
1990		Single	Single	Single		
1991	Single					
1992		Single		Pair	Pair/Nest Tree	Single
1993				Single	Single	
1995		Single				
1997	Single	No Response			Single	

Blank spaces indicate years with no survey data.

“Suitable” and “Dispersal” Habitat for Northern Spotted Owls

Suitable northern spotted owl habitat in the Elk River consists of those stands with old-growth forest structural components. Owls consistently concentrate foraging and roosting activities in old-growth or mixed-age stands of mature and old-growth trees (ISC Report, 1990). Nest sites are primarily old-growth trees in old-growth stands or in remnant old-growth patches. The two historical nest trees in Elk River are both broken top, Douglas-fir trees, 48” and 51” dbh, 100’ and 85’ tall, respectively. Both nests were at the top of the trees and one had several branches protecting the cavity.

Dispersal northern spotted owl habitat needs to be distributed across the landscape between designated areas managed primarily for northern spotted owl habitat (Hutchins 1992). Thomas, et al. described necessary dispersal habitat conditions in the 1990 Report on A Conservation Strategy for the Northern Spotted Owl (ISC Report). Their recommendations became known as the “50-11-40 rule”: 50% of the landbase in a regulated forest would have stands of timber with 40% canopy closure and trees of 11 inch average dbh (ISC Report 1990).

Information on northern spotted owls, marbled murrelets, and suitable and dispersal habitat is displayed in Figure 15. “Suitable” and “dispersal” habitat acres were determined by early, mid, and late seral acreages, as shown in the table. A map of the distribution of habitats can be seen on the current seral stage map (Map 11).

Marbled Murrelet (Brachyramphus marmoratus): The Washington, Oregon and California populations of the marbled murrelet were federally listed as threatened in September 1992. Population declines are the result of loss of breeding habitat and threats from potential oil spills and gill netting practices. In July 1995, the Draft Marbled Murrelet Recovery Plan was completed by the U.S. Fish & Wildlife Service. The Final is expected to be done in October 1997 (Miller 1997, personal communication). It is also state-listed as sensitive in Oregon.

All of the Elk River watershed is within Zone 1 (within 35 miles of the Pacific Ocean) of the bird's range, which requires two years of surveys to be completed for any proposed project that would remove murrelet habitat.

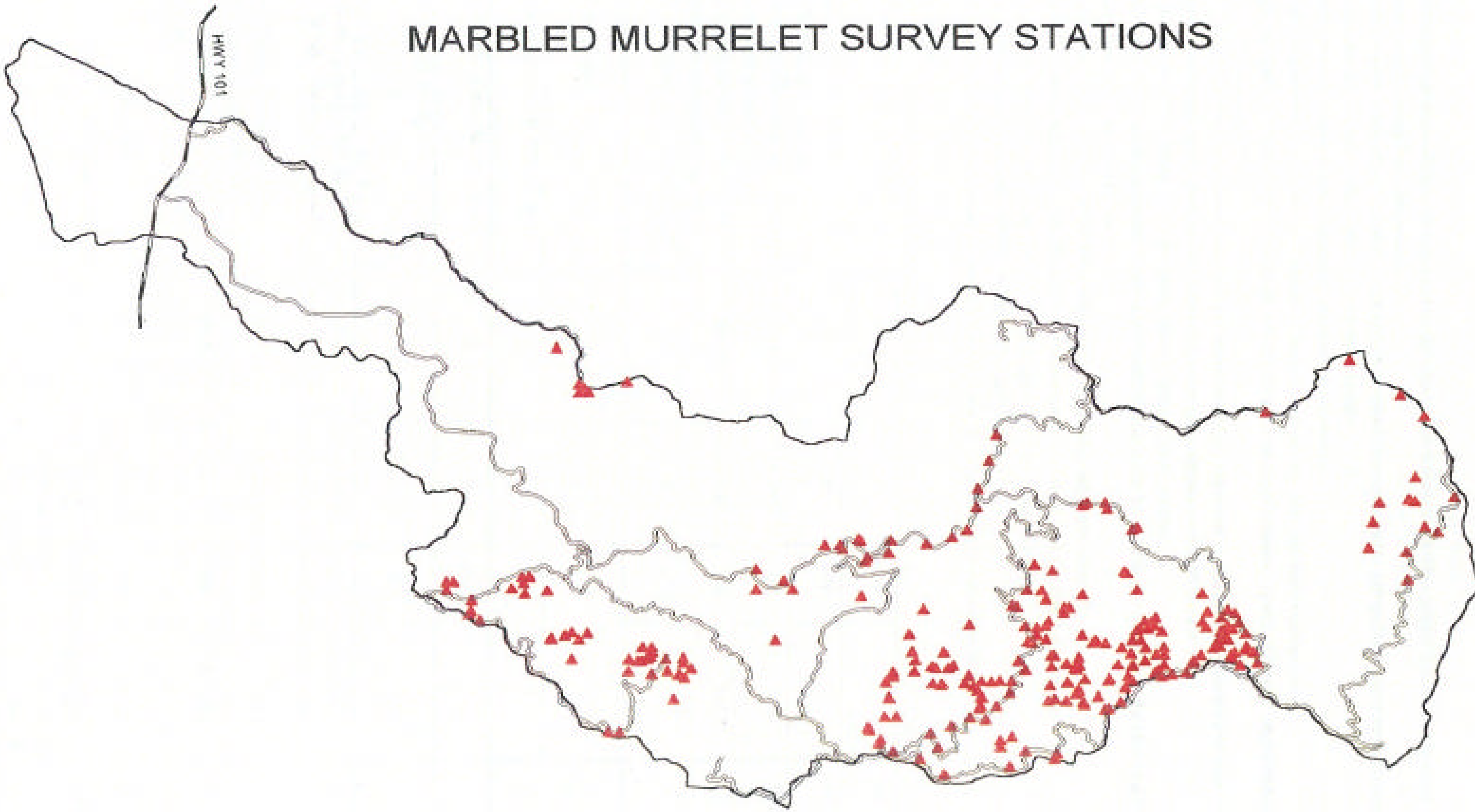
Surveys for the marbled murrelet began in the watershed in 1989, when Oregon State University did "general" surveys throughout the District. A general survey consisted of a transect method that is designed to determine the geographic distribution over large areas (e.g., state, county, watershed). General surveys cannot be used to establish that murrelets are absent from a stand and are not recommended for use with specific projects (Ralph et al. 1993). For this reason, "intensive" surveys were begun in 1991, which focused on one station per morning of survey. These surveys provide information such as presence, probable absence, or occupancy of a specific stand; murrelet activity levels at specific stands; and murrelet use patterns. From 1990-1992, the District did the murrelet survey work with Forest Service personnel trained in marbled murrelet survey techniques, or certified . In 1993, contracting with certified private individuals and companies was begun. Approximately 30% of National Forest land in the watershed has been surveyed (see Map 21).

The early general surveys indicated high activity levels of birds flying in the main river corridor. Two transects located along Elk River road showed that daily, during the breeding season, many birds were using the river as a travel corridor. With more specific, intensive surveys in recent years, occupied behavior has been observed at several locations, both along the main river and tributaries. The Elk River watershed also has the only two known marbled murrelet nests on the Forest.

Occupied murrelet locations in the Elk River Matrix will be designated as protected habitat with "all contiguous existing and recruitment habitat for marbled murrelets (i.e., stands that are capable of becoming marbled murrelet habitat within 25 years) within a 0.5-mile radius being protected" (ROD, pg. C-10). At present, there are three occupied sites that fall partially or completely within Matrix. Suitable habitat and habitat that will become suitable within 25 years will be protected within a .5 mile radius either around the behavior indicating occupation, or within .5 mile of the location of the behavior, whichever maximizes interior old-growth habitat (ROD, page C-10).

MARBLED MURRELET SURVEY STATIONS

Map 21



▲ Murrelet Survey Stations

Main Roads

Note- map shows sites used through 1996

Figure 15: Status of Northern Spotted Owls, Murrelets, and their Habitats within the Watershed.

	Total Acreage/Sites	Total Protected (% of Total) # Acres	%	Total Unprotected (% of Total) # Acres	%
Total Acreage within the Watershed	58,388	40,384	69	17,954	31
Total Forest-capable Acreage within the Watershed	54,402	40,280	74	14,122	26
Forest-Capable Acreage in Federal Ownership within the watershed*	45,073	40,280	89	4,793	11
Total Suitable northern spotted Owl Habitat (NRF) (Late seral)	13,157	11,843	90	1,314	10
Total northern spotted Owl Dispersal Habitat (Early and mid seral)	26,838	24,246	90	2,592	10
Total northern spotted owl sites	6	6	100	-	-
Northern spotted owl sites (>40%)	3	3	100	-	-
Northern spotted owl sites (30-40%)	1	1	100	-	-
Northern spotted owl sites (<30%)	2	2	100	-	-
Total murrelet suitable habitat (late and mid seral, 80-200 yrs)	30,466	27,150	89	3,316	11
Total murrelet suitable habitat (late seral, old-growth, >200 yrs)	13,157	11,843	90	1,314	10
Total number of murrelet detections	65	36	55	29	45
Total occupied murrelet sites	12	9	75	3	25

Table Definitions:

Total acreage within the watershed boundary, including all ownerships (ie. all Federal, state and private lands).

Forest-capable acres are those acres capable of producing forested habitat

Acreage of Federal Ownership: Acres capable of producing forested habitat on Federal lands.

*All information in this row and below refer only to National Forest lands. BLM lands total 766 acres, all in Matrix.

Protected Acreage: Acres in LSR's and congressionally and administratively withdrawn lands.

Unprotected Acreage: Acres in Matrix lands.

Total Suitable Northern Spotted Owl Habitat: Total nesting, roosting, and foraging habitat (NRF). Defined as late seral habitats.

Total Northern Spotted Owl Dispersal Habitat. Defined as early and mid seral habitats.

Total Northern Spotted Owl Sites: Total pair and territorial single northern spotted owl activity centers.

Northern Spotted Owl Sites >40%: Northern Spotted owl activity areas (1/5 mile radius circles) containing greater than 40% mature conifer forest (mature =>18" dbh)

Northern Spotted Owl Sites 30-40%: Northern Spotted owl activity areas containing between 30 and 40 percent mature conifer forest.

Northern Spotted Owl Sites <30%: Northern Spotted owl activity areas with less than 30% mature conifer forest.

Total Marbled Murrelet Suitable Habitat. Defined as late and mid seral habitats.

Total Marbled Murrelet Suitable Habitat. Defined as late seral habitats.

Total Marbled Murrelet Detections: as defined by Pacific Seabird Group protocol surveys - including all auditory and visual detections (number of detections including occupied behaviors).

Total occupied Marbled Murrelet Sites: as defined by Pacific Seabird Group protocol surveys - circling, diving and subcanopy behaviors.

“Critical Habitat” for Northern Spotted Owls and Marbled Murrelets

In January 1992, the U.S. Fish & Wildlife Service determined what lands within the range of the northern spotted owl comprise critical habitat, defined as “the specific areas within the geographic area occupied by the owl on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection; and, specific areas outside the geographic area occupied by the owl, when it is determined that such areas are essential for the conservation of the species” (Federal Register 1992). In May 1996, the final critical habitat for marbled murrelet was issued. See Critical Habitat Map (Map 22) for designated land in the Elk River watershed. Additionally, critical habitat has been proposed for the western snowy plover (1995), however none presently exists in the Elk River watershed (Phillips 1997, personal communication).

Western Snowy Plover (Charadrius alexandrinus nivosus): Concern for western snowy plover among Oregon State wildlife agencies began in the early 1970s. In 1975, the Oregon Fish and Wildlife Commission listed the plover as threatened, status which was reaffirmed under the Oregon Endangered Species Act in 1989. The coastal population of the western snowy plover was listed as threatened by the U.S. Fish & Wildlife Service in March, 1993. Population declines are attributed to the loss and disturbance of nesting sites throughout the range of the coastal population, the establishment of European beachgrass, human development and disturbance, and nest predation. The Draft Recovery plan is expected spring 1998 (Pratt 1997, personal communication). The snowy plover is also state-listed as threatened.

The southern Oregon coast has several areas designated as suitable snowy plover habitat, which include tracts of open, sandy beach. The Oregon Department of Fish & Wildlife conducts annual breeding counts for plovers and in 1995 began a transect from Port Orford to Elk River. There were no birds observed in 1995 or 1996, nor along a transect done from Cape Blanco to Elk River in spring 1997.

The breeding population of plovers along the Oregon coast has shown a 7 percent per annum decline between 1981-1992 (ODFW 1994). The stretch of beach within the Elk River watershed contains excellent potential habitat, particularly since the winter storms of 1996/1997 washed out large amounts of vegetation (Van Dyke 1997, personal communication). Additionally, a scarcity of insect life has been observed in the past and may contribute to lack of plovers.

Sensitive Species

The Regional Forester's list of sensitive species includes the following for the Elk River watershed:

Pacific western big-eared bat (Plecotus townsendii townsendii)
White-footed vole (Arborimus albipes)
Northwestern pond turtle (Clemmys marmorata marmorata)

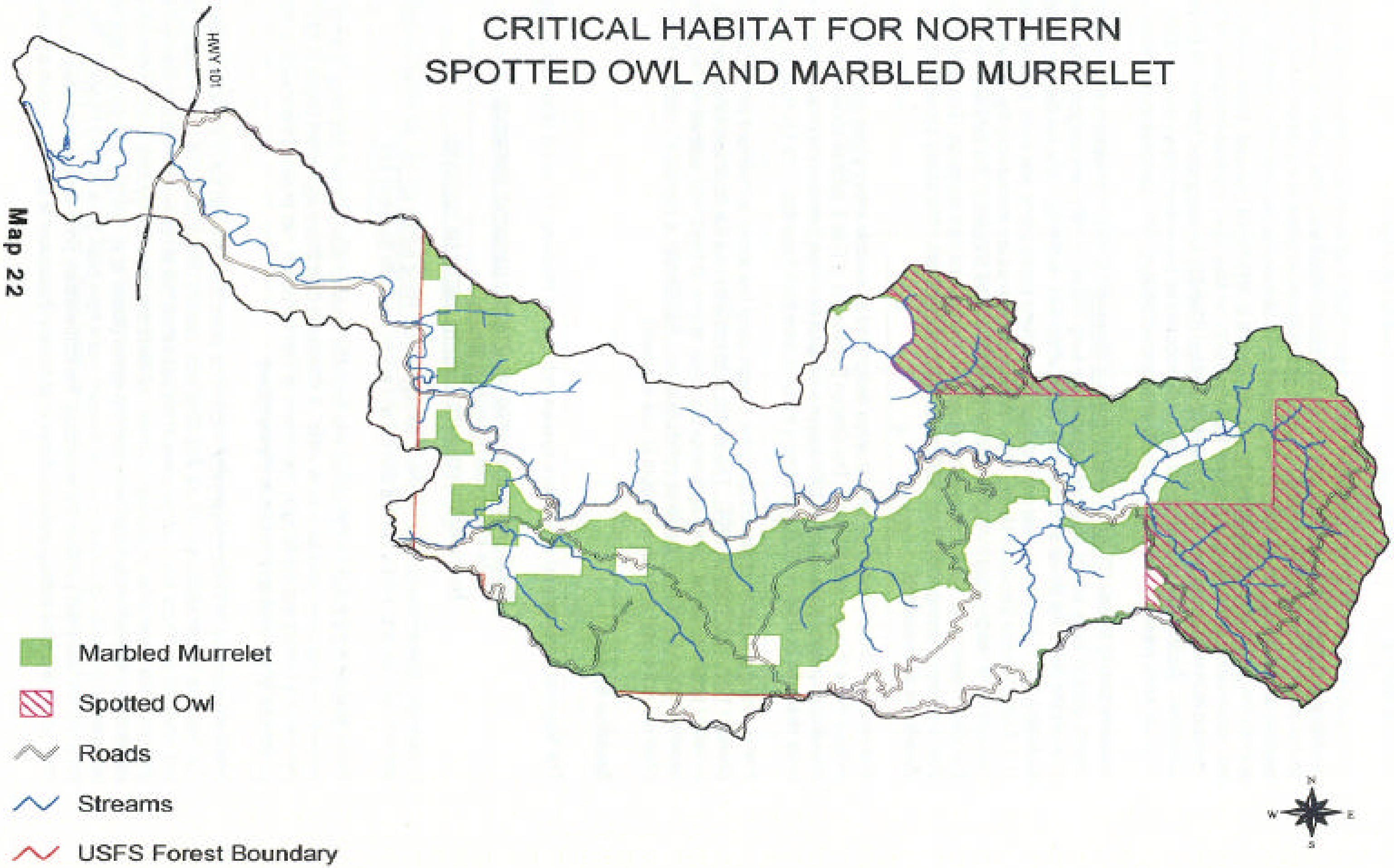
Additionally, these three plus the northern red-legged frog (Rana aurora aurora) are listed as species of concern with the U.S. Fish & Wildlife Service and are on the State Sensitive List.

These species are surveyed for presence and probable absence during project planning. Formal surveys have not been done for bats or voles. A Challenge Cost Share agreement begun in 1995, between the District and the Oregon Department of Fish & Wildlife, has provided the means to complete surveys for amphibians and reptiles in the watershed.

There are currently no District observation records for either the big-eared bat or the white-footed vole. The bats use human structures, caves, and deep rock crevices (Maser et al. 1981) for breeding, roosting, and hibernating. There are no large caves in the watershed, but structures in the lower river and rock crevices in the upper provide abundant habitat. White-footed voles are typically found in riparian alder stands within approximately 15 air miles from the ocean (Maser et al. 1981). Pitfall survey traps are the best method presently to survey for voles, however, none have been done in the watershed. Though there are few lakes and ponds in the watershed, the Northwestern pond turtle also inhabits moderately deep ponds and slow moving portions of creeks and rivers (Nussbaum et al. 1983), which are abundant. Map 22

Map 22

CRITICAL HABITAT FOR NORTHERN SPOTTED OWL AND MARBLED MURRELET



Pond turtles have not been reported previously in Elk River, however, three individuals were released into one of the smaller ponds in the watershed in October, 1995, one of which was observed again in March, 1996. Red-legged frogs inhabit moist forest and valley riparian habitats along pond edges and slow-moving water, and during the non-breeding season may occur up to 1,000 feet from water in moist woods (Nussbaum et al. 1983). Three ponds in the watershed contain red-legged frog individuals.

Management Indicator Species (MIS)

The 1989 Siskiyou Land and Resource Management Plan considers certain groups of species that have special habitat needs. These groups include: 1) species dependent on specialized habitat conditions, such as cavity nesters; 2) species requiring early, mature, or old-growth forest conditions for optimum habitat; 3) popular game species; and 4) Endangered, Threatened, and Sensitive species (FEIS, pg. III-101). The Forest has selected eight wildlife species to be management indicator species for these groups.

The **bald eagle** and **northern spotted owl** were selected to represent the needs of species that use 1) habitat corridors along major rivers and 2) old-growth forest, respectively. The **osprey** was selected as a species that uses habitat corridors along large creeks and rivers. In the Elk River watershed there are no known nests on National Forest land, however, at least two pairs are established on the lower river. The **pileated woodpecker** (Dryocopus pileatus) (state sensitive) represents the needs of cavity nesters in mature forest. No formal surveys have been done for pileateds in the watershed, however, they appear to exist in good numbers (Howell, personal observation). The **American marten** represents the needs of secretive species, such as smaller forest carnivores, that use mature forest. No remote camera surveys have been done yet in the Elk River watershed for this group of species. **Woodpeckers** represent all wildlife species which use cavities for nesting or denning. Specifically, the five woodpeckers represented are the downy (Picoides pubescens), hairy (Picoides villosus), pileated, red-breasted sapsucker (Sphyrapicus ruber) , and Northern flicker (Colaptes auratus) . Again, no specific surveys for these birds have been done, but they presumably exist in good numbers. Last, the **black-tailed deer** and **Roosevelt elk** represent species that use early successional forest stages as well as those species commonly hunted. Elk have been censused aerially in previous years and are not abundant in the watershed. Black-tailed deer are very abundant.

Additional Species of Interest and Concern

Small Forest Carnivores: One of the most sensitive measurements of the integrity of natural ecosystems is the health of the carnivores of an area. Carnivores, such as the wolf, grizzly bear, and mountain lion have been studied extensively in the past. The smaller forest carnivores such as the American marten, fisher, lynx, and wolverine (Gulo gulo) have not been studied much and during this century the populations have shrunk considerably across their ranges. Habitat loss, residential development, increased back country roading, trapping pressure, and sensitivity to humans have all contributed to the decline (Zielinski and Kucera 1995).

Several petitions have been submitted in recent years to the U.S. Fish & Wildlife Service to list three of these four (fisher, lynx, and wolverine) as threatened or endangered under the Endangered Species Act. All have been denied. Different state and federal agencies have designated the four as management indicators, sensitive, and species of special concern. In Oregon, at present, the wolverine is the only one listed under the Regional Forester's sensitive species list, and also is on the Oregon Department of Fish & Wildlife's state threatened & endangered list as threatened. In Oregon, the lynx is considered extirpated and is designated as a furbearer with a closed season. Neither lynx nor wolverine are considered residents of the Elk River presently though interviews with local people and previous Forest Service employees indicate that, at least historically, lynx were present in some areas on Galice District and Powers (Ford 1993, personal communication and Hofsess 1996, personal communication). The Pacific fisher is a species of concern with the U.S. Fish & Wildlife Service. The American marten and Pacific fisher are listed in Oregon on the Oregon Department of Fish & Wildlife's sensitive species list and interestingly, they are also listed in the Oregon Furbearer Trapping and Hunting Regulations (July 1, 1996-June 30, 1998).

The fisher has a closed season the entire year and the marten may be trapped west of highway 97 from November 1 through January 31. Furtakers are requested to submit date, location, sex, and carcass to the local Oregon Department of Fish & Wildlife office before March 1. This information is considered critical to successful future management of American marten.

Of the species proposed for listing, the Pacific fisher is the only one potentially residing in the watershed. In December, 1994, a petition was submitted to the U.S. Fish & Wildlife Service to list two fisher populations in the western United States as threatened. The petition came from the Director for the Biodiversity Legal Foundation, Boulder, Colorado. The explanation in the Federal Register for the service's negative finding is "...the Service finds that the petition does not present substantial information indicating that the fishers in the Pacific Coast and Rocky Mountain areas of the of the western United States are distinct vertebrate population segments listable under the Act" (Federal Register 1996). Additionally, however, the Service also states that "because available information indicates fishers have experienced declines in the past, and may be vulnerable to the removal and fragmentation of mature/old-growth habitat and incidental trapping pressure, the Service will continue to treat the entire fisher species as a species of concern." The background information of the finding states that little is known on fisher status in Oregon, though in 1994, fishers were documented on the west side of the Cascades in the southern part of the state.

Both fisher and marten inhabit mature coniferous forest and have been sighted in the Elk River watershed, specifically, a sighting for fisher is recorded for the Blackberry Creek subwatershed (unverified). In the past, it has been extremely difficult to survey for these species due to their secretive nature, their tendency to leave little visible sign of their presence, being nocturnal and naturally very shy of humans, and occurring at low densities. In recent years, however, with the use of remote camera stations, track plate devices, and snow tracking, it is possible to collect data on presence and probable absence for a specific area.

Powers has been doing camera surveys since 1991, however, none have been done in the Elk River watershed. This has largely been due to long travel distances. Sightings and habitat in Elk River, however, are indicators of a need for such surveys.

Northern Goshawk: The Northern Goshawk (Accipiter gentilis), the largest accipiter in North America, has become a species of concern since the early 1990s. It is listed as a species of concern with the U.S. Fish & Wildlife Service and in Oregon, and as a management indicator species on some National Forests, though not on the Siskiyou. The U.S. Fish & Wildlife Service announced in September 1997 that it will review the status of the northern goshawk and a decision will come in one year. The status review will cover the range of the species. The primary reason for concern is loss of the goshawk's preferred breeding habitat, old-growth forest, as well as the loss of open understory for foraging. Fire exclusion may be partially responsible for the lack of an open understory and although planned harvests could potentially provide these forage areas, they grow over too quickly in the Elk River to provide any long term utility (Stravers and Barna, personal communication).

Northern goshawk surveys were begun at Powers in 1996. Transect and scan surveys were completed in some areas of the Elk River watershed during the breeding seasons of 1996 and 1997. No goshawks were detected during either year, however, historical, though unconfirmed, sightings have been documented. The Elk River appears to have little suitable foraging habitat for goshawks. From the 1997 survey report, resurveying the South Fork of Bald Mt. Creek and Bald Mt. Meadows was recommended. The surveyors deemed the South Fork to have “the most suitable habitat in the Elk River” (Stravers and Barna 1997). Additionally, more historical information is needed on goshawk occurrence in previous decades.

Survey and Manage Species

A species viability analysis completed in the document, Forest Ecosystem Management: An Ecological, Economic, and Social Assessment (1993) identified approximately 400 species that had unsatisfactory viability ratings. That is to say, over the next 100 years, it is unlikely that these species, which includes birds, mammals, lichens, mollusks, bryophytes, vascular plants, and amphibians, will be able to continually persist well distributed throughout their range on Federal lands with the range of the northern spotted owl (FEMAT, pg. IV-40). The goal of management is to have satisfactory viability ratings for all species, thus approximately 30 mitigation measures were developed to mitigate.

One measure included the formation of a "survey and manage" list of species that are to be protected through survey and management standards and guidelines (ROD, pg. C-49). Many fungi, lichens, bryophytes, mollusks, vascular plants, and arthropods are included on this list, for which very little work has been done. Additionally, for the Powers Ranger District, Del Norte salamander (Plethodon elongatus) and red tree vole (Arborimus longicaudus) are listed.

Del Norte salamander: The Del Norte salamander is a survey and manage component 2 species, state listed as sensitive, and a species of concern with U.S. Fish & Wildlife Service. It is a relatively rare, endemic species with a very restricted range. The Del Norte is strongly associated with late-successional forest, interior forest microhabitat and microclimate conditions, and talus substrates (Olson 1996).

Surveys conducted for Del Norte salamander during 1995 in the Elk River documented no individuals, however, during March 1996 one adult was found. At this site, a buffer of one site-potential tree (or 100-feet horizontal distance, whichever is greater, surrounding the location) is retained (ROD, pg. C-28). The location of this Del Norte observation is within a Riparian Reserve and is not mapped separately. Conservative measures are recommended when dealing with this type of rare endemic vertebrate species (Olson 1996).

Additionally, just south of the Elk River watershed, Del Nortes have been located in the North Fork Lobster Creek drainage and Euchre Creek on the Gold Beach Ranger District. For this reason, Elk River is an area in which to focus future surveys. Specific areas include slopes with moist, talus substrates.

Red tree vole: The only designation for red tree vole presently is that of a survey and manage species. The red tree vole is an arboreal species which may spend its entire life in trees, moving from one to another through the canopy (Carey 1991). They are most commonly found in Douglas-fir stands of all seral stages, though tend to be significantly more abundant in mature and old-growth forests (Corn and Bury 1986). The voles build conspicuous nests usually in Douglas-fir trees wherever there is a suitable foundation and readily accessible food supply (Carey 1991).

Red tree vole surveys have not been done in the Elk River watershed. In November 1996, interim guidance for red tree vole stated that habitat would be analyzed at the landscape level to ensure habitat availability through the year 2000, and to determine opportunities to maintain populations which can utilize that habitat and be able to disperse to Late-Successional Reserves or other suitable habitats nearby. Fifth field watersheds with > 10% Federal lands were evaluated for the following conditions: a minimum of 40% of the Federal land is forested and 1) has approximately 60% crown closure or greater, and 2) has an average conifer tree DBH of approximately 10 inches or greater, and 3) this closure and diameter can be maintained through the end of the year 2000. In the Elk River watershed, all 5th field watersheds have above 40% suitable habitat. Thus, surveys are not required before implementation of project activities, though should be conducted whenever possible. When one or more populations (a population is defined as "two or more active nest trees spaced no more than 100 m-330' apart) are documented, certain management strategies should be considered (see Management Recommendations section).

Foothill yellow-legged frog (Rana boylii): The foothill yellow-legged frog is a species of concern with the U.S. Fish & Wildlife Service and is listed as state sensitive. This frog is closely confined to the vicinity of permanent streams and is most common in a near streams with rocky, gravelly, or sandy bottoms (Leonard et al. 1993). There are documented sightings of foothill yellow-legged frog in the Elk River mainstem and some tributaries. Details of this species' life history and ecology are not well known for Oregon populations. Once considered abundant in southwestern Oregon, there is evidence that some populations are greatly reduced (Leonard et al. 1993).

Southern torrent salamander (Rhyacotriton variegatus): The southern torrent salamander is a species of concern with the U.S. Fish & Wildlife Service. This salamander inhabits cold, clear streams and is often found in the "splash zone", where a thin film of water runs between or under rocks (Leonard et al. 1993). There are two sightings for this species in Elk River, one along the mainstem and one along a tributary.

Tailed Frog (Ascaphus truei): The tailed frog is a species of concern with the U.S. Fish & Wildlife Service and on the Oregon Department of Fish & Wildlife sensitive species list. The tailed frog is a stream dweller and does not inhabit ponds or lakes (Leonard et al. 1993). There are no documented sightings for tailed frog in the Elk River watershed. Research on tailed frog in other areas has shown that the species may be severely reduced or eliminated in some locations as a result of timber harvest and road building. Sedimentation of streams and increased stream temperatures are likely causes (Leonard et al. 1993).

Invertebrates: The following invertebrates are all listed as species of concern with the U.S. Fish & Wildlife Service and the penny beetle is also on the Regional Forester's sensitive species list. Very little is known about any of these and there have not been any surveys done for them in the Elk River watershed.

Burnell's false water penny beetle (Acneus burnelli)
Newcomb's littorine snail (Algamorda newcombiana)
California floater (mussel) (Anodonta californiensis)

Neotropical Migrant Bird Species: Concern for bird species that breed in the United States and winter in Central and South America has been mounting for the past several decades. In order to better understand observed fluctuations in bird populations and possible causes, the U.S. Fish & Wildlife Service began the Breeding Bird Survey in 1965 in Maryland and Delaware. Since then, the survey has expanded to most areas of the United States and Canada. Because the survey routes have been run for many years, it is possible to observe long-term trends, map accurately the ranges of species, and determine the relative breeding densities.

Powers has one official breeding bird survey route which begins in the South Fork Coquille Watershed and ends in Elk River on the south end of Iron Mountain. There are a total of 50 survey stations along a 25 mile route, 18 of which are in the Elk River (see Map 23). This survey route, begun in 1992, is run in June to document presence of breeding bird populations and in January to document winter bird populations. All survey data are mailed to the Breeding Bird Survey office in Laurel, Maryland for nationwide compilation of trends. Figure 16 displays individuals heard or observed for the 18 stations of the route which are in the Elk River watershed.

BREEDING BIRD SURVEY ROUTES

Map 23

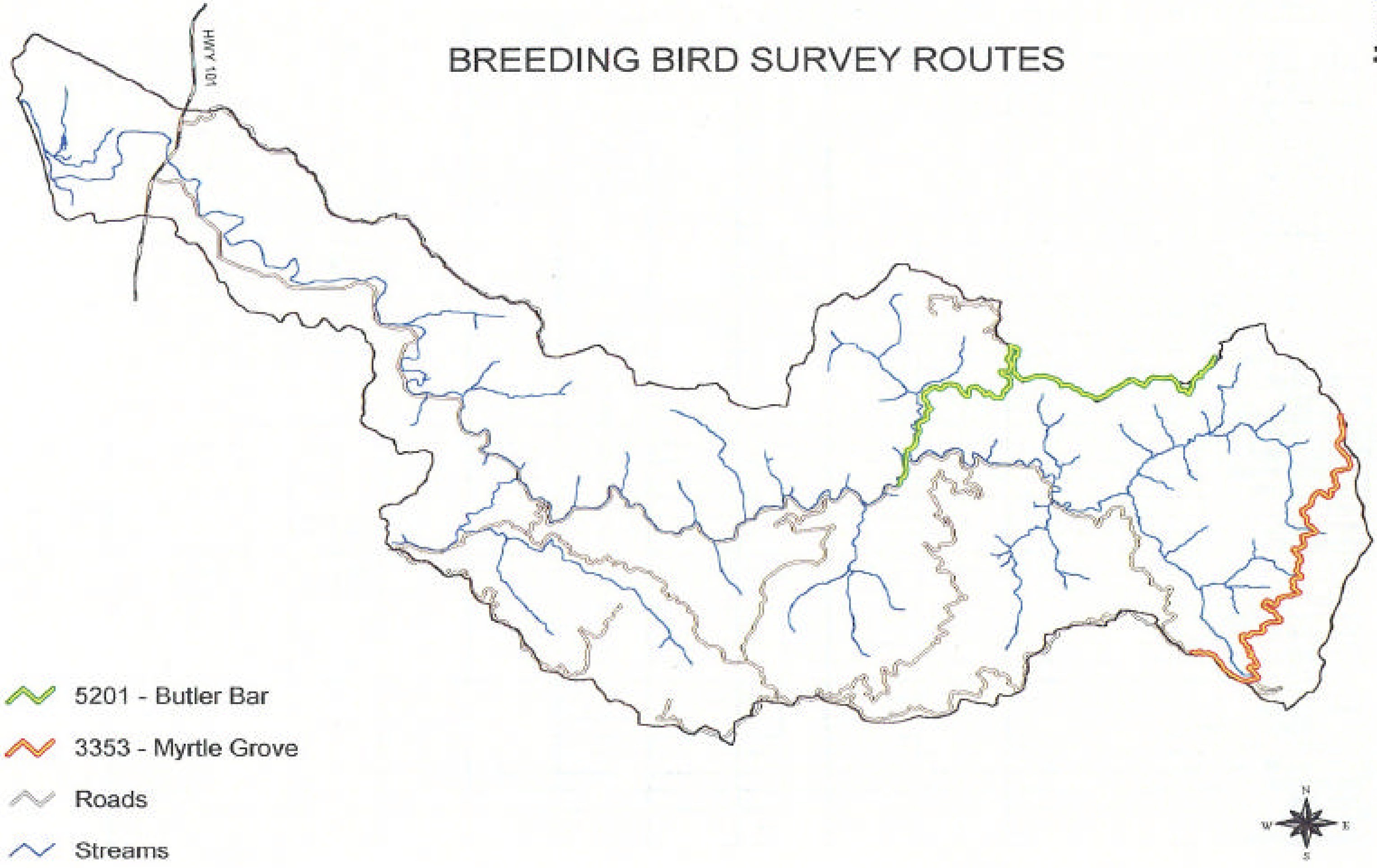


Figure 16: Breeding and Winter Bird Survey Data For Elk River, 1992-1997

Species	1992		1993	1994	1995		1996		1997	
	Breed	Winter	Breed	Breed	Breed	Winter	Breed	Winter	Breed	Winter
Turkey vulture			1	1	1					
Mountain quail	1									
Band-tailed pigeon			1						2	
Rufous hummingbird	1		2	2	1		3			
Hairy woodpecker	1				2				1	
Pileated woodpecker	1	1	2		1			1		
Northern flicker	1		1	2	1		5		2	
Western wood peewee	1		4		1				2	
Olive-sided flycatcher	6			6	5				4	
Hammond’s flycatcher				1	1		2			
Western flycatcher			2		1		1			
Steller’s jay	7	1	15	13	8	1	11	3	15	1
Common raven	2									1
Black-capped chickadee			2		1					
Chestnut-backed chickadee	3	2	1						1	4
Bushtit									1	
Red-breasted nuthatch	1		3	5	7		4		6	
Brown creeper	1									
Winter wren	2			2	2		1	4	1	
Golden-crowned kinglet	5	10	2	5	2	2	1	1		15
Ruby-crowned kinglet	1									
Western bluebird					1					
Townsend’s solitaire	2			1	2		2		1	
Swainson thrush	2		3	1	3		9		6	
Hermit thrush	7		16	12	15		19		13	
Varied thrush	6		2	2	1			1	3	
American robin	1						1		1	
Wrentit	3	1	5	4	8		8		5	
Hutton’s vireo	3	2	2	3	2		1	3		2
Warbling vireo							2		2	
Orange-crowned warbler	2		9	7	5		2		3	
Black-throated gray warbler	2								1	
Hermit warbler	1		4	1	2		4		1	
MacGillivray’s warbler			2	4	3		3			
Wilson’s warbler	13		15	7	11		17		11	
Western tanager			1	1						
Black-headed grosbeak	1		2				2		3	
Rufous-sided towhee									1	
White-crowned sparrow							2			
Dark-eyed junco	4	13	1	2	2	6	1	6	3	2
Purple finch			2					2		
Red crossbill	1								4	

Evening grosbeak				3						

Winter bird surveys were not done for 1993 and 1994. With only six years of data for a small portion of the watershed, any observed changes should be interpreted with caution and only in the context of trends obtained over longer periods of time. Large differences in individuals from one year to the next are likely the result of abrupt weather changes. Of the species displayed in the figure, the following are experiencing significant or near significant declines in populations throughout their range: olive-sided flycatcher (Contopus borealis), western wood-pewee (Contopus sordidulus), Hammond's flycatcher (Empidonax hammondii), swainson's thrush (Catharus ustulatus), band-tailed pigeon, and rufous hummingbird (Selasphorus rufus) (Sharp 1992). In the Elk River, the numbers are low for band-tailed pigeon and Hammond's flycatcher, somewhat higher for rufous hummingbird and western wood-pewee, and the highest for olive-sided flycatcher, and swainson's thrush. Again, it's difficult to make any conclusions except the need to continue with the surveys and to begin additional surveys in other parts of the watershed.

A portion of an unofficial breeding bird survey route (not registered with the Maryland office) lies in the northeast part of the watershed (see Map 23). This is a shorter route, 15 miles as opposed to the standard 25, and 22 stations fall in the watershed. Thus far, one year of data has been obtained (breeding data from June, 1996). November 1996 storms washed out road access and this route has not been run since.

Exotic Species

It is difficult to quantify the impacts that the resident exotic species, the Virginia opossum, black and Norway rats, European starlings, European house sparrows, and pigeons may be having on local, indigenous wildlife. Very little information is available on present distribution of exotic species in Oregon (Farrell 1997, personal communication). The impact of wild turkeys on native wildlife, should they ever become established in the watershed, would likely be small, though in some cases there may be competition for acorns. In some cases, starlings may establish wild populations and aggressively compete with native cavity nesters, particularly tree swallows (Tachycineta bicolor), western bluebirds (Sialia sialis), and some woodpeckers (Scott 1983).

If the nutria were to become established in the watershed, the impact could be high for resident muskrat populations. Nutria are larger mammals and are very aggressive in competing for shared food resources (Burt and Grossenheider 1976).

Additionally, the possible use of rodenticides in the lower river is a concern for impacts upon non-target species.

Influences of Human Activities on Wildlife Populations & Habitat

The influences of human activity in the watershed can be divided into four groups: roads, habitat removal, direct mortality, and harassment.

Roads: All types of roads and associated construction work affect wildlife by directly removing habitat, increasing human access, fragmenting habitats, and causing displacement and avoidance for some species (Evink et al. 1996). Certain species such as deer or elk may use roads as travel routes, however, during specific seasons (eg. calving season for elk) disturbance may still be high. For other species, such as amphibians, reptiles, and smaller mammals, a road can be a significant barrier. Negative effects can occur with birds also. A recent study on northern spotted owls (Wassar et al. 1997) found that owls whose home range was centered within .25 miles of a major logging road had double the amount of physiological stress than did owls whose home range was centered 1.8 miles from the road. Many old growth insect groups are flightless and live on the forest floor and roads will act as barriers for their dispersal (NFP, Vol. 1 1994). The construction of a road directly removes habitat and, depending on the proposed management of the road, can result in permanent access for humans. This in turn may result in direct mortality or displacement and avoidance of the road and corridor.

The type of road does influence the degree of impact placed on wildlife. For approximately 114 miles of road in Elk River on National Forest land, 94.2 miles are aggregate, 11.33 miles are paved (Elk River road), and approximately 4 miles, native surfaces. Paved surfaces have the most long term impact in terms of their permanence and increased usability. Native and gravel roads are more temporary and may be closed after projects are completed.

Road density is a useful criteria to examine impacts on wildlife. However, because species respond differently, management recommendations may be complex. Also, studies on road density effects typically have focused on larger mammals. Work done by Van Dyke et al. (1986) on mountain lions showed that approximately 1.0 miles of road/square mile is the maximum to have a naturally functioning landscape containing sustained populations of large mammals. At present, the road density in the watershed is 2.26 miles of road/square mile of land (excluding acres designated Wilderness). All of the subwatersheds have densities higher than 1.0 miles/square mile. The subwatersheds with the highest densities are Bald Mountain Creek (3.05), Lower Mainstem (2.79-predominantly private land), Panther Creek (2.77), Upper Mainstem (2.75), Butler Creek (2.50), and Blackberry Creek (1.90). Increased traffic volume can disturb or harass deer and elk, increasing the use of energy reserves (Geist 1978) and reducing suitable feeding and resting areas (Lyon and Basile 1980). Work done in western Montana indicates that topography can ameliorate the effect of roads and disturbance on elk by using topographical features to separate roads from sensitive areas (Edge and Marcum 1991).

Habitat Removal: Since the early part of the century, approximately 8,900 acres in Elk River (on National Forest land) have been managed. This reduction in mature, coniferous forest to early seral habitats affects wildlife in similar ways as road construction because both activities generally take place at the same time and results are similar. Removing portions of habitat fragments larger portions, allows for edge species to move in to previously unoccupied territory, may increase surface temperatures and decrease relative humidity, and displace resident wildlife. The size and location of interior habitats of late-successional forest need to be analyzed as well as patch sizes of different habitat types. Priority subwatersheds include Bald Mountain Creek, Panther Creek, Upper Mainstem, Butler Creek,, and Blackberry Creek.

Direct Mortality/Harassment: Increased access for forest users can result in increased direct mortality for certain species, particularly those hunted or trapped. Additionally, nontarget species caught in traps or killed on roadways occur more frequently with an increase of road densities. Harassment affects species differently. Constant, predictable vehicle traffic or use of an area can be adapted to by many wildlife. Others will leave the area altogether. Infrequent, unpredictable use may prove the most stressful for others, and stress will increase on these animals or they also will leave a site. Wildlife species most affected by direct mortality along roads include western screech owls (Otus kennicottii), snakes, rough-skinned newts (Taricha granulosa), raccoons, and spotted skunks (Spilogale putorius). In Elk River, this primarily occurs along the main, paved Elk River road (#5325) which averages 35 vehicles/day in winter and 100 or more during the summer.

Wildlife Habitats

The predominant habitat in the watershed is the mature hemlock/Douglas-fir temperate forest. In small amounts, other habitats exist including ponds, meadows, hardwood stands, and talus areas. These have been mapped as Special Wildlife Sites (Map 19) in the Siskiyou Forest Plan, of which the management goal is "to protect or enhance these unique wildlife habitats" (pg. IV-114). Many of these areas, though quite small, provide critical sites for those species restricted to a single habitat. They provide necessary reproductive habitat, refugia from adverse weather conditions, and protection from predators (Herrington 1988). There are approximately 75 acres of small lake/pond habitat in four locations, 47 acres of meadows in two different sites, one swamp/bog (10 acres), and several dispersed stands of hardwoods. Additionally, there are many miles of river and stream habitat and associated upland sites which function as essential habitat for many species, and scattered, unmapped areas of talus slopes.

Small lakes/ponds: Panther Lake, Bluebird Lake, Laird Lake, and Mt. Wells all provide year-round water sources, though Panther Lake often becomes quite low. Amphibians and reptiles benefit greatly at these sites. Healthy red-legged frog populations occur at Bluebird Lake, Panther Lake, and Mt. Wells. Pacific tree frog (Pseudacris regilla) is also commonly found at Panther Lake. Pacific giant salamanders (Dicamptodon tenebrosus) are found in Laird Lake and slower portions of Bald Mountain Creek. Northwestern salamanders (Ambystoma gracile) are common in pumper fills and Bluebird Lake. Northwestern pond turtles have been planted in Bluebird Lake and are surviving. The ponds also provide important habitat for mammals, birds, and insects. Pond habitat has never been abundant in the watershed.

Meadows: There is one very small meadow (4 acres), McGribble Meadows, along Bald Mountain Creek, and one large meadow system, Bald Mt. Meadows, along the southern boundary of the watershed. Bald Mountain Meadows has an extensive history of recent management and will be discussed more in the habitat enhancement section. Deer, blue grouse, red-tailed hawks (Buteo jamaicensis), bluebirds, rabbits, and rodents use meadows extensively. Open areas, besides clearcuts, which actually brush in quite quickly, are very few on the district.

Swamp/bog: Toast Camp is the only mapped swampy, boggy site in Elk River. It is approximately 10 acres in size and though one boundary has existing clearcut units, most of the area is connected to mid to late seral habitat. (The other wildlife areas are surrounded by late seral habitat). This is very important for those species that need the habitat of small openings but are generally restricted to closed canopy forest.

Hardwoods: Hardwoods stands in Elk River are primarily tanoak, live oak, chinkapin species in upland areas and red alder and maple in riparian sites. The hardwood component of coniferous forests is extremely important and often overlooked. Both upland and riparian hardwood stands provide key habitats for breeding neotropical (and winter resident) songbirds. In 1982, an avian census was completed in 8 tanoak/mixed-stand sites, 6 of which had no overstory, the other two, large Douglas-fir (Werschkul and Swisher 1983). All were located on the western slope of the Siskiyou National Forest (similar studies have not been done specifically for the Elk River watershed). During the breeding season, forty-six species were observed. Tanoak habitats with and without overstories had the highest number of breeding birds, which primarily were insect gleaning canopy feeders. Larger, winter birds moved in during the autumn, such as the varied thrush (Ixoreus naevius) and American robin (Turdus migratorius), and fed on tanoak acorns and madrone seeds.

Riparian and Upland Areas: Riparian areas, streams and rivers, function as central and necessary components for most wildlife to survive. The streambed itself is critical for frogs and salamanders to breed as well as aquatic insects and fish species. Many bat species forage disproportionately in riparian areas and will roost more frequently there than in other nearby habitats (Cross 1988). Since 1.5 times more small mammals (shrews, moles, voles, and mice) are found in riparian habitat than in upland habitat (Cross 1980), harsh changes in the stream environment are known to profoundly affect populations of some small mammals species (Cross 1985). Because riparian corridors act as connections between pieces of habitat, are important travel corridors, and provide microclimatic refuge for hillslope animals during times of thermal stress, there has been much focus on their management and protection. Of equal importance, though much less understood and studied, are the upland habitats away from the immediate stream area and their function for wildlife during migration, summer dry periods, and winter, rainy periods.

In terms of amphibians, there are very few density estimates for upland habitats (Bury 1988). Although wildlife often use riparian zones and wetlands disproportionately more than upland areas, some species rely heavily on terrestrial habitats, including the clouded salamander (Aneides ferreus), ensatina (Ensatina eschscholtzii), western red-backed salamander (Plethodon vehiculum), and the western terrestrial garter snake (Thamnophis elegans). The three amphibian species spend some time in the riparian zone but are more dependent on upland sites for breeding and cover (Bury 1988). The clouded salamander has been found around Panther Lake, the ensatina at Bluebird Lake, in forested stands west of Laird Lake, and below the Bald Mountain pumper fill, and the western red-backed salamander along the Elk River road. The western terrestrical garter snake is common throughout the watershed. Most of the snakes and lizards use both riparian and upland habitats. Northwestern pond turtles may travel as much as .5 miles from and 300' above water for egg laying. Most nests, however, are within 90 meters of a water source (Storm and

Leonard 1995). Additionally, headwaters and smaller streams (sites where often there is a poorly developed or virtually no riparian area) are critical for amphibian survival in terms of maintaining populations that will recolonize sites post-harvest. Protection of these areas reduce sediments and fines potentially being added to the system (Bury and Corn 1988).

Riparian vegetation in the western United States provides habitat for more bird species during the breeding season and during migration than surrounding uplands (Knopf et al. 1988). However, as illustrated with the tanoak discussion, upland sites also play a very critical role in the survival of neotropical migrants. Large, mixed-species flocks will disperse upslope along riparian corridors from their nest locations to wet meadow/riparian-shrub habitats at higher elevations (Vroman 1994). The insect populations that help juveniles build fat reserves for migration are located along riparian corridors and the wet meadow/brushfield sites. Throughout riparian and upland sites, many neotropical migrant bird species use hardwood or deciduous brush species for nesting and foraging habitat.

A study in the central Oregon Coast Range (McGarigal 1992) comparing streamside breeding bird communities with upslope breeding bird communities indicated that streamsides were dramatically less important than upslope areas in contributing to the avifauna of mature, unmanaged forest stands. This contradicts what Knopf et al. determined, however, much of their work was in very dry, desert conditions where water is concentrated in only a few locations. In the Oregon coast range, where water is not a limiting factor, habitat use occurs across a broader array of habitats. Species diversity, richness, and total bird abundance was greater along upslope transects than along streams, and upslope areas accounted for 91% of the bird species as compared with 67% along streams. Strong association with uplands may have been a response to the greater number of snags and large conifers in upslope areas than along streams. The authors theorize that streamside protection alone may not be sufficient to meet the needs of the breeding avifauna, nor provide suitable travel and dispersal routes for species strongly associated with mature forests and upslope areas. Chestnut-backed chickadee (Parus rufescens) and golden-crowned kinglet (Regulus satrapa) species have experienced significant annual population declines in western Oregon and Washington over the past 20 years (Breeding Bird Survey data), and are strongly associated with mature forests and upslope areas. In the Elk River watershed, breeding numbers for chestnut-backed chickadee are low or zero during some years and only slightly higher for golden-crowned kinglets (see Figure 16).

Small mammal communities were surveyed at four sites in southwestern Oregon in mixed conifer habitat types (Cross 1985) (we have no data from the Elk River watershed). Specifically, small mammal abundance, species richness, and species diversity were analyzed via live and snap trapping in three zones: the immediate riparian zone, a transitional zone, and an upland zone. Small mammal abundance was twice as high in the riparian and transition zones as the upland zone. Species richness and diversity were greatest in the riparian zones. Riparian Reserves, as outlined in the NFP, appear to maintain riparian communities of small mammals at levels comparable to nearby undisturbed areas. However, given that small mammals are relatively sedentary, increased Riparian Reserve widths may be necessary to satisfy the requirements of permanent living space for more mobile species.

Though the data are few for the Elk River watershed, it is clear from studies in the Coast Range the importance for many wildlife species of areas upslope from the riparian corridor.

Late-Successional Forest: Late-successional, or old-growth, habitat is critical for many species of wildlife. That portion of the watershed designated as Late-Successional Reserve is to be managed specifically for late-successional species. The objective is to “protect and enhance conditions of late-successional and old-growth forest ecosystems...” (ROD, page C-9). A possible enhancement method involves thinning second growth stands within the LSR. At this writing, an analysis has not been completed to identify possible locations; this will be critical to any future habitat enhancement in LSR. This analysis should include, but is not limited to, examination of factors such as site indices, aspect, age, proximity to anadromous streams, habitat connections, and interior habitat.

Retention of old-growth fragments in certain locations, for example, around the marbled murrelet occupied sites (3 for the Elk River watershed in Matrix) and northern spotted owl activity centers (0 presently in the Matrix), will be critical for some species, particularly those that are locally endemic, only occur in certain forest conditions, or have limited dispersal capabilities (NFP, Vol.1 1994). The size of these fragments will vary with the species under consideration. Smaller patches (25 acres or less) may be sufficient to maintain populations of arthropods, fungi, lichens, bryophytes, vascular plants, and invertebrate animals.

Talus: Talus slopes, varying in rock size, aspect, and in the amount and type of vegetation present, are important areas for many amphibians, reptiles, and mammals. Though talus typically makes up only a small portion of the watershed, it functions critically for, 1) species that are restricted to talus slopes (in Elk River this would include the Del Norte salamander), 2) species that use talus to avoid potentially lethal temperature extremes, and 3) reproductive activities, particularly with live-bearing reptiles (Herrington 1988). Talus as denning and rearing habitat for mammals is common, particularly with predators (mountain lions, bobcats), including ringtails for which very little is known except that Powers Ranger District is the northern extreme of their range. Species emphasized earlier that require talus include fisher and to some degree, marten. Additionally, voles and mice are closely tied with talus (Brown 1985).

Landscape Habitat Arrangement

The primary wildlife habitat in Elk River is that of mature western hemlock/Douglas fir coniferous forest. Approximately, 8,900 of the total 46,000 National Forest acres have been harvested in the past 60 years. The units are at different stages of the successional stages and provide an element of diversity for wildlife. They are spread across the eastern two-thirds of the watershed in a mosaic pattern. The ponds and small lakes are close together, < 2 miles apart on average, along the southeast boundary. There also exist 15 created pumper fill sites spread across the entire watershed on National Forest land. Bald Mountain and McGribble Meadows are within 3 miles of each other along the southwest boundary. Hardwood stands and riparian areas are located throughout the watershed. There are no talus sights mapped but they do exist, at least as small areas.

The lower river and private portion of the watershed (approximately 12,000 acres) has a very different array of habitats. Very small, patchy stands of late-successional forest possibly remain in scattered clumps. The predominant ownerships are several timber companies (4,000 acres), private ranches (3,100 acres), and private individuals (4,860 acres). Much of the private timber land exists as inholdings within the National Forest boundary, creating open areas surrounded by early, mid, or late seral stands. The large ranches are off National Forest land and effectively serve as meadow habitat for many species, though the emphasis and how the land is managed focuses on raising domestic livestock. Land belonging to private individuals exists in a variety of successional stages.

Habitat Enhancement Projects

The types of habitat work done in the past include the following:

Wildlife Tree Topping: Removing the tops from wildlife trees left in clearcut harvest units began in the 1980s as an effective way to 1) reduce windthrow vulnerability, and 2) create snag habitat sooner than what would occur naturally. In the Elk River watershed 111 trees in 15 units have been topped since 1985 (see Appendix I). Additionally, in 1990, several trees were topped along the edges of the Bald Mt. Meadows.

In 1993, a monitoring program was begun to determine the fates of wildlife trees left in regeneration units, topped and not topped. Data was recorded such as history of the unit (burning, logging systems, etc) and photo points were taken. These units are being revisited in 1997 and the photographs will provide documentation on the survival rate. Units being examined in Elk River are Mt. Wells and one unit in Iron Sucker.

Aerial Forage Seeding: Aerial forage seeding has been used as a management tool for widespread application of a forage mix for deer and elk, and as an erosion control method. In Elk River, 294 acres have been treated since 1979 (see Appendix J). All treatment areas have been regeneration harvest units.

McGribble Meadows: In 1984, meadow restoration and enhancement was done on 4 acres in the McGribble Meadows, which included removal of encroaching conifers and creation of snags at the meadow edge.

Bald Mountain Meadows: In August 1990, the environmental assessment for Bald Mountain Meadows was completed per the Siskiyou Forest Plan. The EA addressed restoring the meadow system to its 1940 size via mechanical treatments and burning. The first burns in two of the meadows were completed in September 1990. From 1990 to 1995, various projects involving slashing of conifers were done and in September 1996, burning was done in three meadow areas. Some firewood was removed from this slash in 1992. Plans to burn again are in place for September 1998, weather conditions permitting.

The **AQUATIC ECOSYSTEM** of the watershed is discussed at two different scales:
the watershed scale addresses processes, conditions, and history for the entire watershed
the subwatershed scale discusses the smaller tributary watersheds and stream reaches.

AQUATIC ECOSYSTEM - Watershed Level

Landslides and Surface Erosion
Water Clarity
Large Wood Supply Affecting the Aquatic Ecosystem
Riparian Canopy Disturbance and Stream Water Temperature
Stream Flow
Channel Morphology
Stream Water Temperature and Stream Flow Effects on Fish
Productive Flats
Fish Habitat, Distribution, Populations

Landslides and Surface Erosion

Landslides and surface erosion are long-term processes of landscape formation and deliver sediment to stream channels.

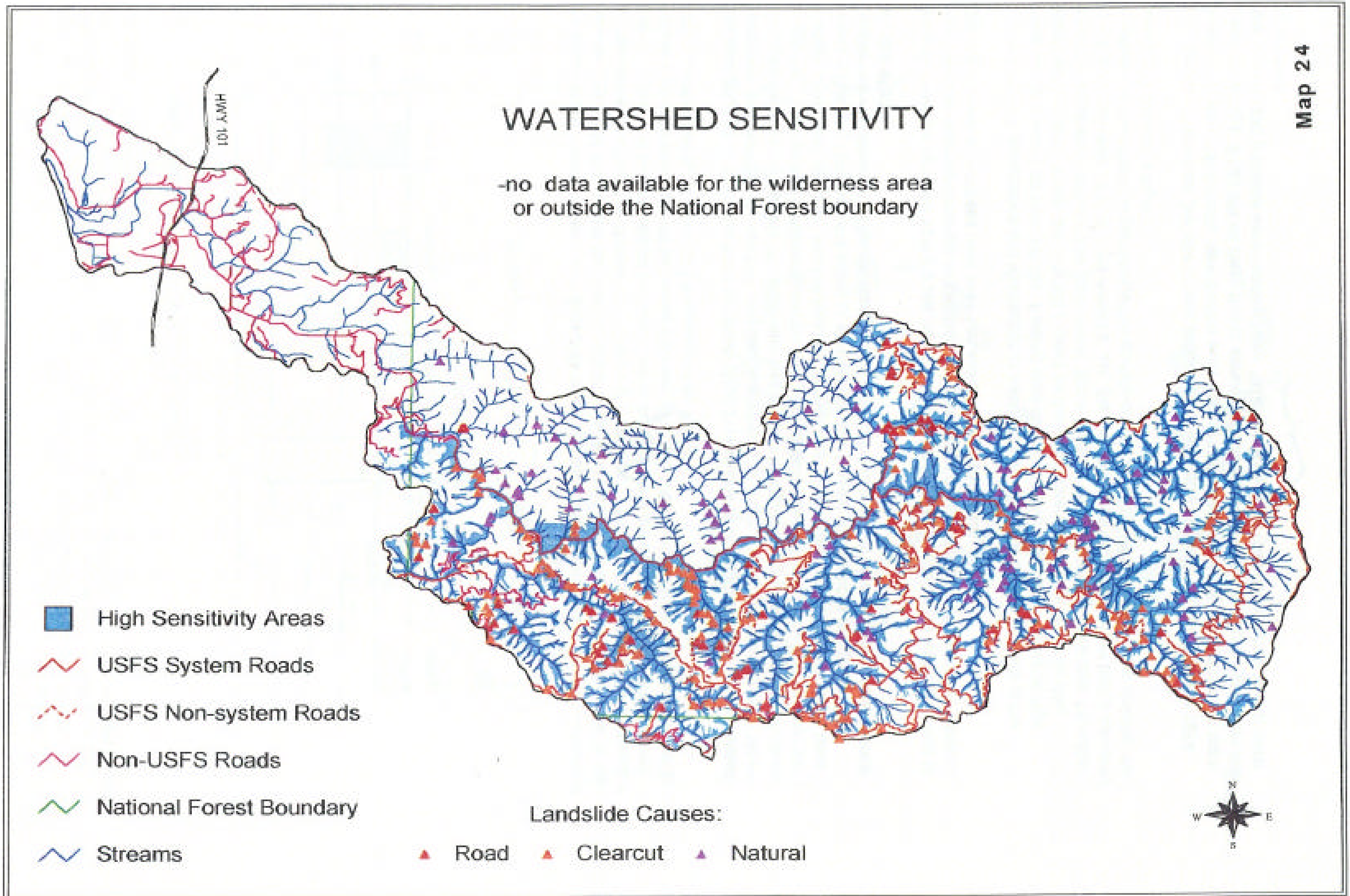
Landslides

Landslides in the Elk River watershed vary considerably in size and age, from large, ancient, inactive features to small, active slides. The ancient features are believed to have been active during a different climatic setting, such as a wet period following a glacial advance. Earthquakes may also trigger large landslides. A moderate sized landslide was apparently triggered by an earthquake centered off Crescent City, California, in October, 1980, onto a section of the Elk River road below Butler Bar.

Within the watershed, streamside debris slides and slumps are more abundant types of landslides than earthflows and debris flows (McHugh 1987, Ryan and Grant 1991). Debris slides and slumps deliver large wood and boulders directly to stream channels, providing habitat complexity (see Large Wood Supply and Channel Morphology). Deep, slow-moving earthflows deliver large wood and fine sediment via marginal gullies or slides from their toeslopes. Where soils are formed on highly sheared or carbonaceous shales of the Galice Formation, slopes are more prone to slumps, earthflows, and streamside debris slides (Map 5). Shallow, rapidly-moving debris flows scour through stream channels, moving large wood and uprooting riparian vegetation. Debris flows tend to be located on steeper slopes (Map 6) underlain by diorite or Cretaceous sandstones (McHugh 1987).

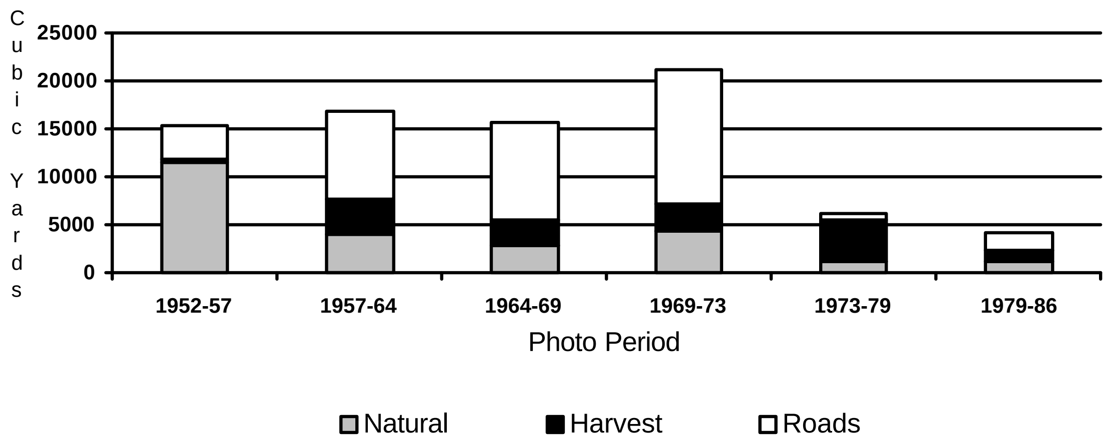
The relative probability of delivery from landslides was interpreted from 1986 aerial photographs (1:12,000 scale). Zones of high, moderate, and low "watershed sensitivity" were delineated based on slope angle, slope shape, geologic structure (faults), proximity to streams, and presence and types of landslides in similar terrain. The watershed sensitivity map is shown with the inventoried landslides that have been active within the period of air photo record (Map 24).

Map 24


Map 24
WATERSHED SENSITIVITY
-no data available for the wilderness area
or outside the National Forest boundary
HWY 101
High Sensitivity Areas
USFS System Roads
USFS Non-system Roads
Non-USFS Roads
National Forest Boundary
Streams
Landslide Causes:
Road
Clearcut
Natural
N
W
E
S

Landslide volumes were estimated using methods discussed in Appendix J: Data Used to Support Analysis. Figure 17 displays the natural, harvest-related, and road-related landslide volume rates, calculated as the volume of landslides per year. Natural landslides occurred at the highest rate during the time period which included the 1955 storm. Landslides triggered by the November 1996 storm have not yet been inventoried.

Figure 17: Landslides above Anvil Creek (cubic yards)



Road and timber harvest-related landslides differ from naturally-occurring processes in timing, amount of sediment delivered to a stream channel, amount of large wood included, and degree of disruption of the surface and subsurface flow of water. The history of road construction and timber harvest is illustrated in Map 25. Road and harvest-related landslides within the watershed delivered 2.2 times more sediment volume than naturally-occurring landslides between 1952 and 1986. Landslide sediment delivery within each subwatershed is displayed in the subwatershed section.

The area mapped as high watershed sensitivity (Map 24) includes all of the inventoried harvest-related landslides, and delineates areas that need field examination for slope stability prior to harvest. Where hillslopes are marginally stable, the short-term loss of tree root cohesion from timber harvest can cause landslides. Tree removal also decreases the volume of water removed from soils by evapotranspiration. In areas where soils are deep and fine-textured, groundwater levels may be elevated over time. Deep-seated slides may become more active or enlarge. Special harvest prescriptions (eg. partial cuts, modified harvest layout) may be necessary within the groundwater influence area to minimize potential adverse effects.

Because trees are removed from the site, harvest-related landslides have delivered less large wood to channels than naturally-occurring landslides. The percentage of sediment from landslides delivered to streams is higher where trees have been harvested from riparian areas.

Along roads, soil disturbance and interception of water flow can cause landslides on parts of the landscape that would not normally fail. Existing road-related slides are located primarily on high watershed sensitivity lands, but 25% are located on moderate watershed sensitivity lands (Map 24). The amount of large wood delivered by road-related slides depends on whether trees have been harvested from the slopes below. For all road-related slides, the average percentage of sediment that is delivered to streams is lower than the percentage for naturally-occurring slides. Where roads cross streams, the percentage delivery is higher.

The number of landslides per mile of road decreased considerably for roads constructed after 1974 (Figure 18). After 1974, roads were located away from streams, as indicated by the decrease in road-stream crossings. Road fills on steep slopes were end-hauled to more stable locations rather than side-cast. These road practices were improved after 1974, but 93% of the road network had already been constructed.

Map 25

ELK RIVER LAND USE HISTORY: TIMBER HARVEST AND ROADS

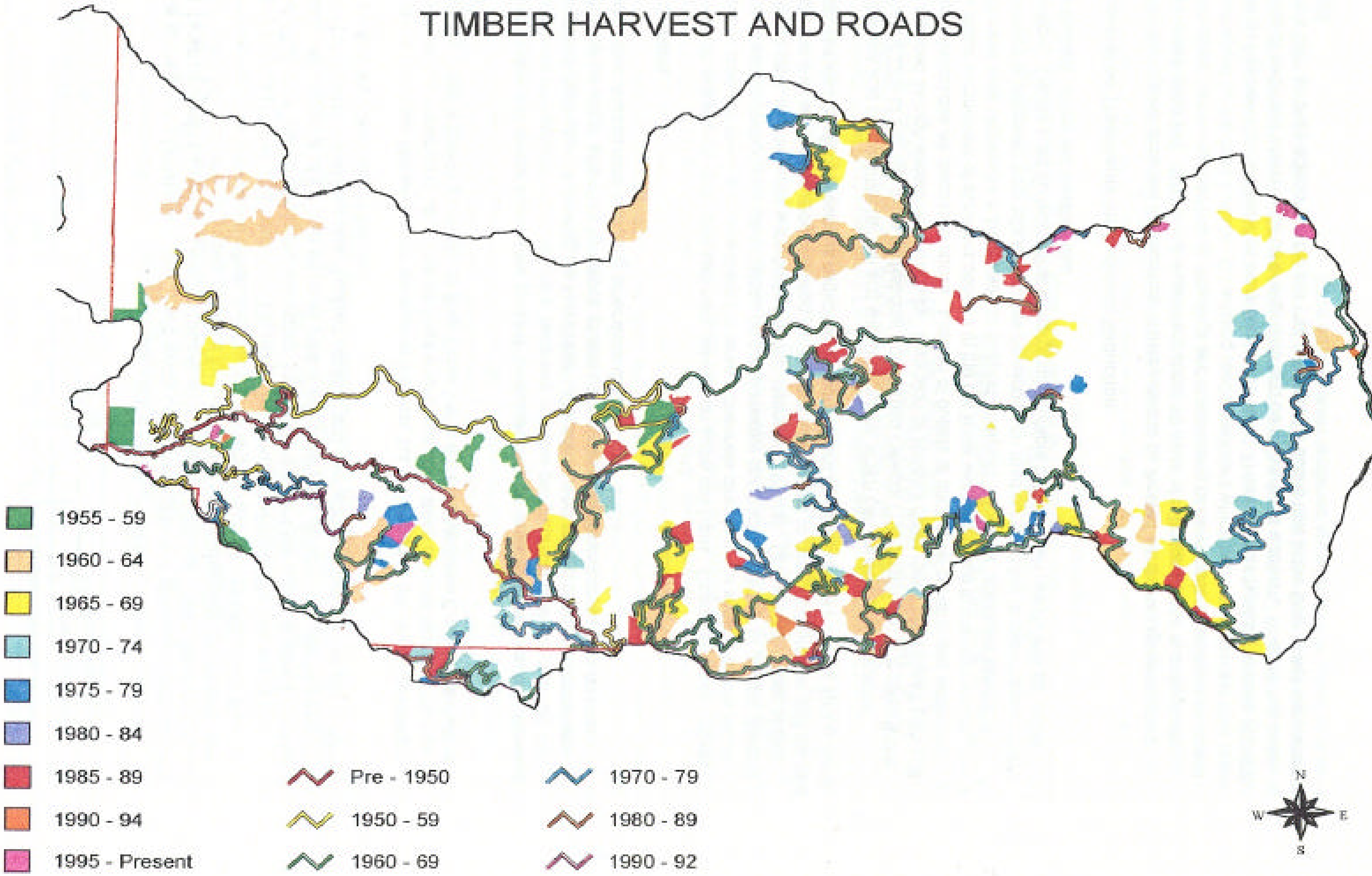


Figure 18: Frequency of Landslides/Mile of Road

	Stream Crossings/Mile of Road	Landslides/Mile of Road
Constructed Pre-1974	4.46 crossings/mile	1.21 landslides/mile
Constructed 1974-1986	2.80 crossings/mile	0.17 landslides/mile

The dominant mechanisms for road-related landslides in the Elk River watershed were not known in detail prior to the storm of November 1996. Field evidence is often subtle and disappears with age and road maintenance. Field surveys of damaged road-stream crossings (summer , 1997) have documented sites with inadequate drainage structures, potential for diversion of stream channels down roads, and interactions between harvest-related effects and roads. The largest road failures occurred in Panther Creek, North Fork Elk River, and South Fork Elk River. It is unknown whether the intensity of the November 1996 storm varied across the watershed, so that some potentially unstable sites did not fail. Interpretation and analysis of the post-storm air photos will identify any patterns that can help predict future road failure sites. Field surveys of culvert capacity and diversion potential are needed to identify crossings with a high likelihood of failure.

Failures of sidecast road fills were more common in the past, but uncompacted fills (that may contain woody material) will continue to cause debris flows where located in steep channel heads. This type of failure caused a debris flow in a tributary to Bear Creek within the Bald Mountain Creek watershed, in April 1993.

Where both roads and timber harvest are present, landslides may be larger or more frequent. However, quantifying these interactions would require a relatively complex geographical analysis, that has not been completed (data gap). Following the November 1996 storm, road-related channel erosion was observed to cause larger and more numerous stream bank slides in harvested areas (results from Preliminary Flood Assessment including other watersheds).

Surface Erosion

Surface erosion is a source of chronic sediment delivery on some soil types. Coarse sediment moves downslope by creep or ravel, and is delivered to stream channels directly or via shallow debris slides. Ravel occurs most commonly on steep slopes on conglomerate and fractured diorite or gabbro (Maps 5 and 6). In the past, harvest units were burned at high intensity in the fall. On extremely steep slopes where duff and litter were consumed, exposed mineral soil was subject to rainsplash erosion and the rate of ravel accelerated. Surface erosion is negligible on more recent low to moderate intensity spring burns.

Roads intercept and concentrate rainfall and subsurface flow, which can cause surface erosion. Approximately 22% of the 167 miles of National Forest road network (1993 estimate) is located within the area mapped as high watershed sensitivity. Diversion of streams down roads has caused both gully erosion and landslides as discussed above. Erosion of outlets of ditch relief culverts and waterbars is a relatively minor component of sediment delivery in the Elk River watershed due to the high rock fragment content of most soils (Appendix J: Data Used to Support Analysis). However, abundant sand and silt-sized sediment is delivered from rills and gullies developed on road cuts and fills in decomposed diorite (low cohesion). Diorite road surfacing that is marginally durable breaks down readily into abundant fines, particularly during wet weather use.

Road Restoration Treatments for Sediment Reduction

Roads with the highest potential for sediment delivery tend to be located within the high watershed sensitivity areas (Map 24). Within the watershed, about 10 miles of road have been hydrologically decommissioned; removing road fills at crossings and constructing closely-spaced waterbars to control water intercepted by the road surface. On existing roads, sediment which had been sidecast from roads and landings has been "pulled back" to more stable positions. These projects typically remove 200-800 cubic yards of sediment which might otherwise slide and be delivered to a stream. Road fill has been pulled back from an area adjacent to the site that generated a debris flow in the Bear Creek watershed in April, 1993.

Road Management Objectives (RMOs) have been developed for each system road on the District, using an inter-disciplinary team process. Roads are assigned a level (1 - 5), based partly on their expected use, with a level 1 road being the least used. All levels of roads are maintained on a regular schedule, with the lower levels receiving less frequent maintenance (every other year instead of every year). RMO's cover all aspects of the road and include potential concerns noted by the specialists, such as Port Orford Cedar concerns or other watershed concerns. These concerns are mitigated where possible during design if it is a new road, reconstruction if it is an existing road, or during restoration activities. The District annually reviews and updates the "Flood Emergency Road Management Plan" (FERM), which outlines patrol responsibilities, reporting, and monitoring of the road system during a major storm event. This plan is also used as an informal guide during lesser storm events.

Older non-system roads have revegetated, but may still have sites with potential to generate landslides. Field evaluations have been conducted on these roads in the Purple Mountain Creek and South Fork Elk River watersheds (Bakke, 1994 report and Weinhold, 1995 survey forms), but are needed for other roads, including some on private lands within the National Forest boundary.

Water Clarity

The water clarity of Elk River is outstanding, and is recognized as being a critical component of several river values. The striking blue-green color and crystalline water quality are exceptional. Water clarity affects recreational uses such as fishing, boating, rafting, and sight-seeing along the Elk River. The Oregon State Salmon Hatchery at Elk River uses this clear river water in their rearing ponds.

The water of the Elk River is clear most of the year, except during major winter storms when sediment from banks and slides can cloud the water for short periods. Sediment delivered to the Elk River has a high content of coarse grained material, which rapidly settles out of suspension. This reduces the potential effect on water clarity, and gives the river the ability to clear far more rapidly than other rivers. Soils with higher clay contents are more likely to produce turbid water when disturbed, but these soils are relatively uncommon in the watershed (Map 8). Turbidity is detected periodically from Bald Mountain Creek, where the toe of an earthflow is eroded by the stream (see subwatershed section).

Mining activities such as suction dredging during low flows can cloud the water for a short section below the mining activity. Elk River was withdrawn from mining activities on February 17, 1994, except for valid mining claims. There are two mining claims in Elk River, one which has been determined to be valid and the second which is currently being examined for validity. The Department of Environmental Quality (DEQ) reported no violations of Water Quality Standards from mining activity on lands managed by the Forest Service. Several violations were reported below the Forest boundary on lands managed by the Bureau of Land Management. None of the reported violations resulted in enforcement actions or penalties (Rubin Kretzschmar, DEQ, oral communication, 1997).

Large Wood Supply Affecting the Aquatic Ecosystem

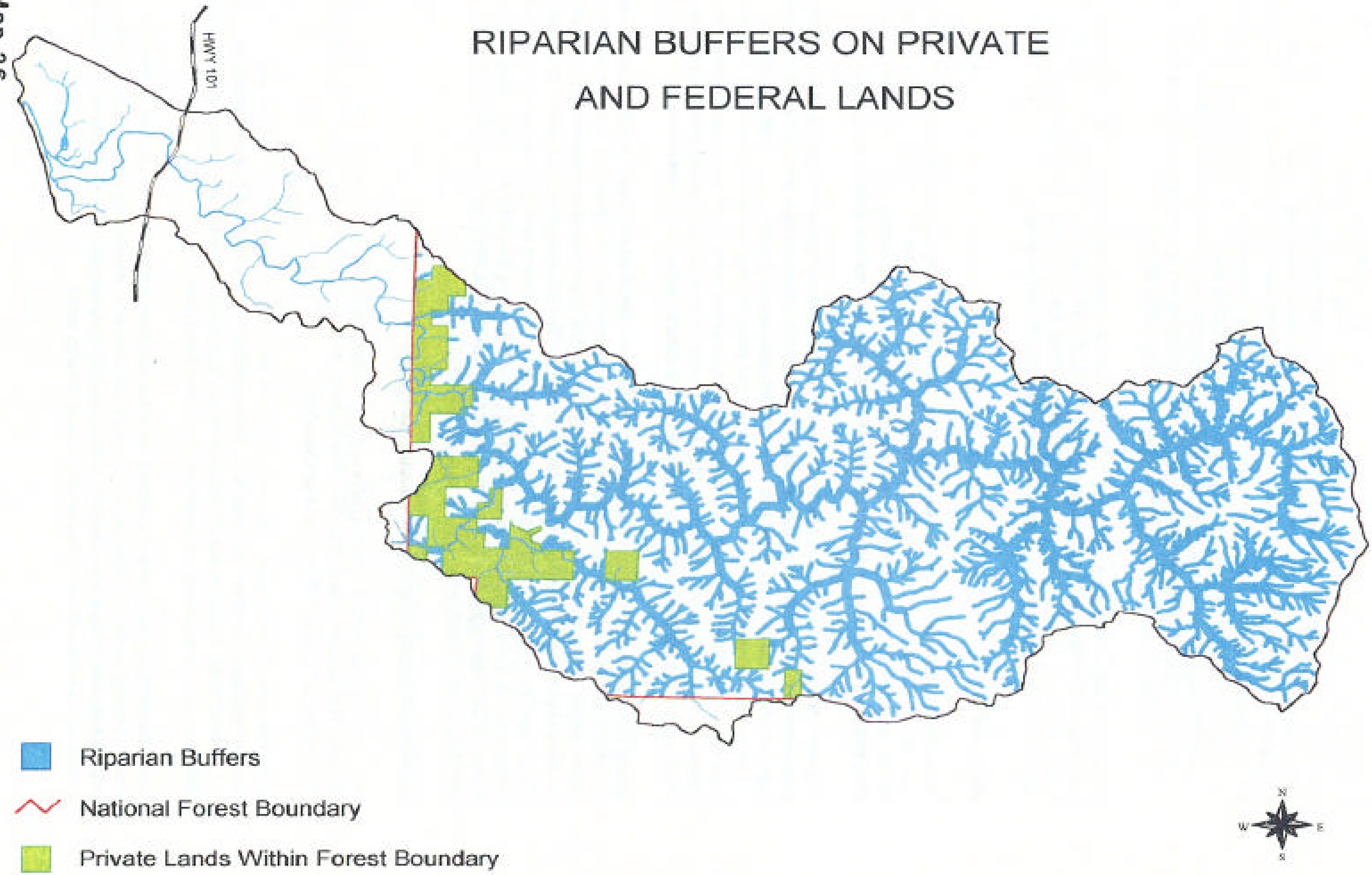
Large wood is delivered to stream channels by landslides, by falling from adjacent riparian areas, and by transport from upstream sites (Map 26). The importance of large wood for fish habitat is discussed in the Channel Morphology and Productive Flats sections.

Along the lower Elk River valley, land adjacent to the river has been cleared for pasture, and much of the riparian vegetation removed. In 1883, A. G. Walling noted that Elk River was used to transport up to 10,000 board feet of white cedar (Port-Orford-cedar) logs daily. It is likely that these log drives altered or destroyed riparian vegetation, and removed large wood and jams.

Above the hatchery, salvage and selective cedar harvest have removed some large wood from the stream. During the 1970's, large wood jams were removed from several tributaries because many scientists believed they created barriers to fish passage for spawning. This practice was discontinued as a result of research indicating the beneficial value of large wood.

Map 26

RIPARIAN BUFFERS ON PRIVATE AND FEDERAL LANDS



Areas delineated as high watershed sensitivity for delivery of sediment are also potential sources of large wood. Past harvest within these areas has reduced the potential supply of large wood to stream channels by 27 percent. While there is probably a sufficient supply of potential large wood within the watershed, specific areas may have been seriously depleted (see subwatershed section).

Riparian Canopy Disturbance and Stream Water Temperature

Stream temperature is a function of several factors including solar intensity, climate, channel morphology, vegetative/topographic shade, channel shape, and the amount of stream surface area exposed to solar radiation. Large storms and human activities, such as timber harvest, mining, and roads also have the potential to influence stream temperature by altering the amount of shade-producing vegetation and channel shape.

In 1940, riparian areas on the mainstem were well-vegetated with mature and old growth Douglas-fir and hardwoods. Aerial photographs reveal mature trees on the flood plains, indicating that major disturbances had not occurred in several decades.

There is not sufficient stream temperature data available prior to 1968 to assess the effects that the floods of 1955 and 1964 had on stream temperature. The effects of the 1955 and 1964 floods can only be estimated by comparing channel and vegetation changes on historic aerial photographs. Dramatic changes are evident by comparing the 1940 photos with those taken soon after the 1955 flood.

The Elk River road, which parallels the mainstem, was constructed in the riparian area on the south bank. The combination of road construction in 1954 followed by high flood flows in 1955, that caused massive road failures, resulted in a major loss of several miles of riparian vegetation on the south bank. Because the mainstem is primarily oriented east to west, the south bank can provide approximately 95 percent of the potential stream shade. Vegetation accounts for potentially 62 percent of the stream shade with topography providing the remaining shade. The loss of shade trees and channel changes probably resulted in increasing summer stream temperatures on the mainstem by several degrees. After the next major storm, in 1964, further changes were evident, but significantly fewer than occurred in 1955.

Today, the riparian area on the south bank remains altered from its pre-1955 condition. The riparian area below the road in several areas has a larger component of hardwoods and immature conifers and less mature conifers. Hardwoods are not sufficient in height to adequately shade the mainstem during the summer. As the conifers continue to grow, stream shade will increase.

Figure 19: Maximum Stream Temperature on the Mainstem at the Fish Hatchery

Year

1970	1974	1976	1984	1991	1992	1993	1994	1995	1996	1997
69.0 F	72.0 F	68.2 F	67.2 F	69.3 F	69.3 F	68.2 F	66.7 F	68.0 F	67.3 F	68.4 F
21.1 C	22.2 C	20.1 C	19.6 C	20.7 C	20.7 C	20.1 C	19.3 C	20.0 C	19.1 C	20.2 C

(Note: The average of the 7 consecutive day maximum temperature should be used for determining temperature trends. However only single day maximum temperatures are available from 1970 to 1984 so, maximum stream temperature was used).

The majority of the heating of the Elk River appears to be occurring in the upper reaches of the mainstem, below the confluence of the North and South Fork, and 4 to 5 miles below the Fish Hatchery. These high temperatures are presumably due to the wide channel and lack of shading vegetation (McSwain 1988). Mainstem maximum temperatures, 5 miles below the hatchery, were reported as being critical reaching 75 F (23.9 C) (Susac 1991, personal communication).

With the loss of some of the mainstem stream shade provided by conifers, tributaries with cool water are critical in helping to lower mainstem temperatures. Six of the tributaries -- North and South Fork, Red Cedar, Purple, Milbury and Blackberry Creeks -- have cool summer peak temperatures ranging from the high 50°F to low 60°F and help to lower mainstem temperatures. Three tributaries, Butler, Bald Mountain, and Panther Creeks, are warm with peak temperatures ranging from 66°F to 68°F . They have little or no effect on buffering mainstem temperatures. The higher stream temperature in these three tributaries is the result of timber harvest and road construction.

The 1994/1996 Clean Water Act Section 303 (d) list found the mainstem of Elk River water quality limited for summer stream temperature (refer to Clean Water Act Section 303 (d)).

Stream Flow

The average annual water yield is estimated to be 267,000 acre feet. Low mean monthly flows of 20-100 cubic feet per second (cfs) occur between June and October, and high flows of 1000-6000 cfs occur between November and April. Storms which caused high streamflows in the area can be determined from the USGS gauge on the South Fork of the Coquille River at Powers, Oregon. Peak flows of a magnitude greater than the 10-year return interval occurred in 1944, 1955, 1964, and 1971 (Ryan and Grant 1991), and 1982 (McSwain 1987). The December 1964 flow was estimated to have an 80-150 year return interval.

Aspects of streamflow that have the greatest effect on aquatic habitat are quantity, peak flows which affect channel morphology and fish, low flows which restrict migration and reduce available habitat, and the size and frequency of channel-forming events. All of these may be affected by timber harvest and road construction. However, studies quantifying the effects have found results varying from no effect to highly significant effects, depending on the characteristics of the watershed being studied. Because watershed characteristics in the Klamath Mountains/Siskiyou province are unique to this province, results of studies in other areas may not be applicable to the Elk River watershed. Therefore, some mechanisms that could contribute to effects on streamflow will be discussed in this section, but not specific effects or quantities.

Road surfaces and cutslopes intercept water, and road ditches act as intermittent streams, transporting water more rapidly than natural processes. These properties of roads combine to change the timing and increase the size of peak flows. The potential for effects from increased peak flows are the greatest in areas where road density is highest and stream banks are unstable. Potential effects include increased channel erosion and a decrease in spawning success of some fish species. The watershed area above the hatchery has an overall road density of 2.3 miles of road per square mile of land. This road density increases the stream channel network by less than five percent (Appendix J: Data Used to Support Analysis). The channel network expansion is greater in some subwatersheds; in Milbury Creek, the most densely roaded area at 5.1 miles per square mile, the channel network is expanded by approximately 25 percent. The magnitude of increased peak flows resulting from roads is unknown.

Harvested areas can increase snow accumulation and a rain on snow event can result in rapid melting of the snow, increasing peak flows (Harr 1976). Less than 5 percent of the total watershed area is in the transient snow zone, and only a small percentage of this area has been harvested. Consequently, it is not likely that peak flows have been affected by existing harvest activities in areas that may be susceptible to rain on snow events.

Channel Morphology

Water and sediment interact with landforms, bedrock, boulders, and large wood to shape the stream channel. Stream flows which are large enough to transport sediment in the stream bed can alter channel morphology. Sediment delivered to stream channels may be transported or stored, depending on the amount, particle size, and timing of the input. Increased sediment input may cause channel widening and braiding, increased frequency of bed sediment transport (increased mobility), and storage of sediment on floodplains, in gravel bars, and within the channel causing decreased pool area (Sullivan et al. 1987). These effects, known collectively as "aggradation", may be observed in channels with lower stream gradients, where velocities are infrequently high enough to transport the sediment. Sediment storage along channels may delay downstream effects of sediment transport, providing a "buffering" effect.

Changes in patterns of open riparian canopies are one indicator of channel response to disturbance. Ryan and Grant (1991) measured these patterns on six subwatersheds in Elk River on aerial photos from 1956 to 1979. This technique does not detect aggradation or degradation when streamside vegetation is not affected, or minor changes in channel location or geometry (Grant 1988).

Ryan and Grant (1991) found that the length of open riparian canopies along fourth- and fifth-order channels (class I) did not change appreciably from 1956-1979.

Open riparian canopies along first and second-order stream channels (class IV and III) increased 30-fold between 1956 and 1979, and were generally located along or near roaded or harvested sites. The greatest increase in openings was attributed to the 1964 storm. Overall, 73% of the landslides and all of the surface erosion were associated with roads or harvest. The Ryan and Grant (1991) analysis did not cover the effects of the 1955 flood. Additional measurements from the 1940 and 1956 aerial photographs would show the extent of riparian openings in small streams which results from stormflow under natural conditions.

Gravel bars were measured along the mainstem of Elk River on 1940-1986 aerial photos (Ryan and Grant 1991). The number of gravel bars increased by 77% overall. In the upper segment which is wider and lower gradient, gravel bars increased more in size than in number. In the lower segment which is narrower and steeper, a greater increase in the number of bars was observed. The most notable evidence of channel widening and an increase in the number and size of gravel bars occurred below the confluence with Purple Mountain Creek. This change can be attributed to sediment coming from Purple Mountain Creek following a period of poor timber harvest and road construction practices in the late 1950's-early 1960's.

There is increasing evidence that the 1955 flood had a greater effect on channel morphology than the 1964 flood for many coastal northern California and southern Oregon streams. The changes due to the 1955 flood may be attributed to decades without a major storm event. Aerial photography and oral history from Redwood Creek, California (Ricks 1985), Pistol River (oral communication), Shasta Costa Creek (Park 1990), and Elk River indicate that high flows eroded channel banks and riparian vegetation considerably. Interviews with Jim and Phyllis Woodward, long-time Elk River residents, indicate that substantial changes to the lower river morphology occurred as a result of the 1955 storm.

The adverse effects of the 1955 flood were probably heightened by the construction of the main access road (#5325) on the south side of Elk River in 1954. Comparison of aerial photos taken before and after this event shows that the road fill was placed within the portion of the stream channel subject to annual peak flows. This reduction in channel area confined the 1955 flood resulting in extensive scour of the north streambank and erosion of the road fill along the south. It is not known how much fill was lost from the road and deposited downstream in the lower-gradient channel below the National Forest boundary, but the amount was likely significant.

Below the National Forest boundary, comparisons of the Elk River channel from 1940-1986 aerial photos show increased numbers and sizes of gravel bars, loss of riparian forest, and increased widths of active channel bars (Ryan and Grant 1991). Where the channel is unconfined as it flows through the valley floor, the channel has shifted its location in some areas as much as 100 yards. In this low gradient valley floor, sediment was deposited changing pool geometry and frequency. Dramatic new flood plains were established. These changes in the lower valley were probably aided by the continual removal of streamside vegetation and large conifers during agricultural development. The observations are consistent with local accounts of decreased pool depths and increased bank erosion. Lifelong residents suggest that Elk River was too deep to cross in most places during the summer (G. Susac personal communication, interview with B. Marsh). Today most of the river is extremely shallow within the lower valley during low flow periods.

In 1994, landowners in Elk River formed the Elk River Watershed Council. The purpose of the council is for landowners to work in cooperative effort toward restoration of the watershed on private lands. The council works through a State grant program, personal donations and local volunteers to accomplish restoration projects. Projects include riparian planting of trees and shrubs, fencing to exclude grazing in riparian zones, streambank stabilization, and fish habitat enhancement.

Effects of Stream Water Temperature and Streamflow on Fish

Water temperature is a determining factor in the composition and productivity of the aquatic ecosystem in streams. Increased temperatures favor the introduction and proliferation of "warm water" species (e.g. sticklebacks) to the detriment of "cold water" salmonid species found in Elk River.

Increases in water temperature also directly affect fish stress levels. Higher water temperatures reduce water oxygen capacity, and this, combined with metabolic demands associated with increased temperature, leads to greater stress on fish. Sustained temperatures above 70^{o}F will result in mortality for anadromous salmonids. Availability of thermal refuges, such as cooler stratified layers in deep pools, tributaries or undergravel seeps, can partially compensate for such effects.

The present stream temperature of 68^{0}F - 70^{0}F on the mainstem at the forest boundary is less than optimum for fish survival and success. The stream temperature increases from 70^{0}F to 75^{0}F five miles below the Forest boundary. When under stress from water temperatures exceeding 70^{o}F, fish populations may have reduced fitness, greater susceptibility to disease, decreased growth, and changes in time of migration/reproduction. Growth begins to decline and eventually ceases as the water temperature approaches the upper lethal temperature of 75^{0} F for steelhead trout (Beschta et al. 1987).

The influence of natural variability in flow on fish in the Elk River have been documented (Reeves 1988). The spawning habitat accessible to migrating anadromous fish varies with the flow regime from year to year. For example, low flows during the fall drought of 1985 resulted in no chinook production in the upper river, because adults could not enter this part of the watershed. As a consequence, the fish spawned in the lower mainstem and juveniles had limited rearing habitat. A winter freshet in 1987 dislodged many of the eggs and resulted in high mortality and low juvenile populations the following year. Normally, higher fall/winter base flows ensure passage to smaller tributary streams which offer a refuge to egg and fry stages during large storms. Where structures like road culverts have limited juvenile migration, the effects of low flow spawning conditions are exacerbated.

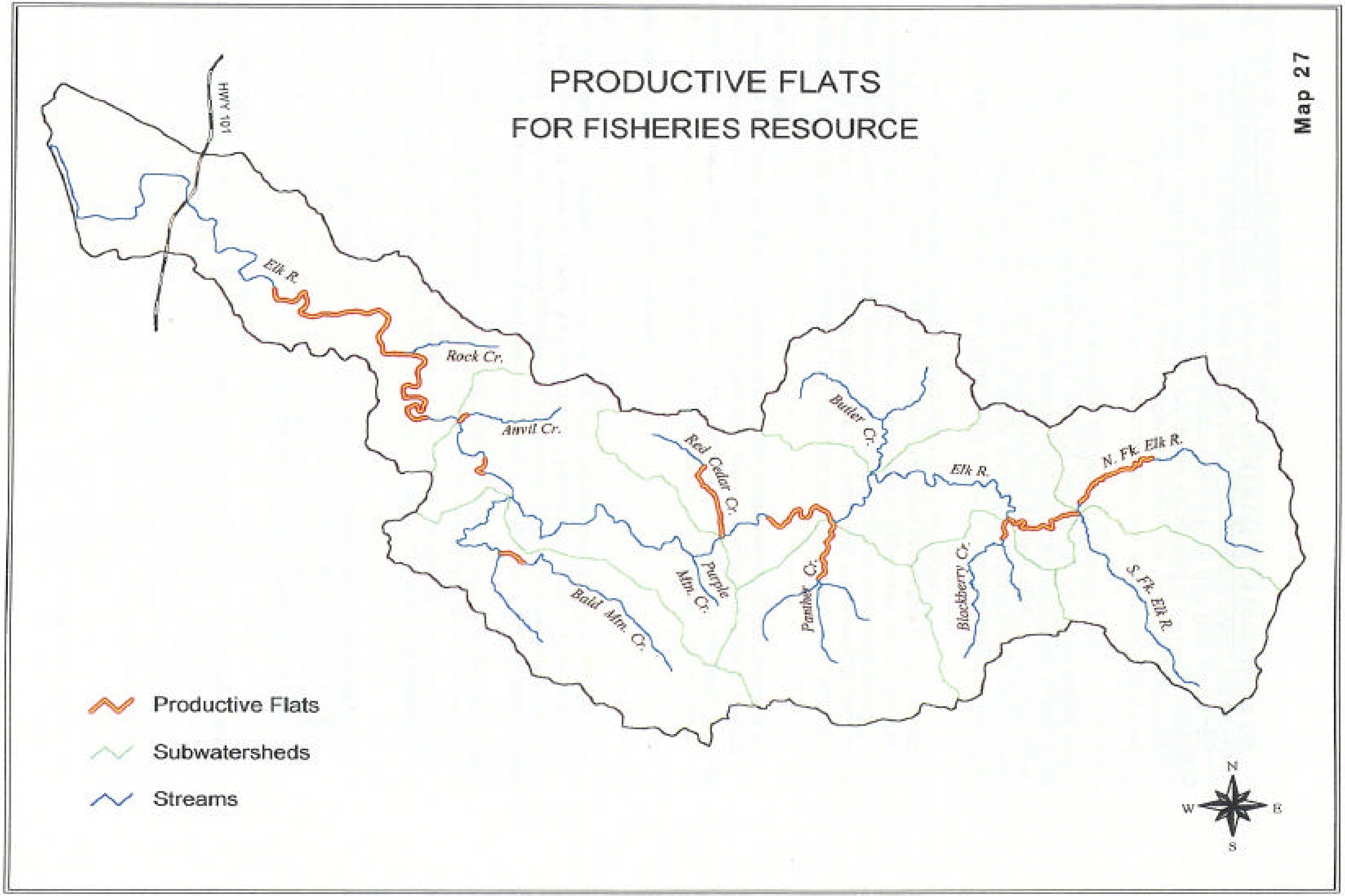
At this time, no dams or other flow-regulating devices are present on the Elk within the upper reaches. At the fish hatchery there is a constructed rock weir in the mainstem to help sustain flow into the hatchery. Below the Forest boundary, continual water withdrawal by private landholders for agricultural purposes may affect summer survival of salmonids rearing in this portion of the watershed. This particularly impacts rearing conditions for coho salmon and limits the acclimation zone for all downstream migrants to the ocean.

Productive Flats

Low-gradient reaches with high fish productivity and diversity are known as "productive flats". They are considered barometers for watershed health. Monitoring activities should be concentrated on flats to detect watershed trends in temperature, sediment, large woody material and fish populations. The locations of these flats within Elk River are displayed in Map 27. Flats are associated with soft (weak) rocks along the mainstem and on the lower reaches of tributaries such as Red Cedar Creek, Panther Creek, and the North Fork Elk River (Map 4). In the portion of Elk River above the hatchery, approximately 20% of the stream reaches have low-gradients and are relatively unconfined. These reaches are long-term sites of sediment deposition (McHugh 1987).

Reeves (1988) found that a number of flats support diverse populations of salmonids and account for a high percentage of the fish standing crop. Flats are sensitive to increased sediment and temperature, and decreased large wood supply.

Flats support a wide variety of habitat types. Sediment is stored in broad floodplains and river terraces within the wide valley floor. The channel often splits around vegetated islands or large wood jams, increasing the number of habitat units and total habitat area. Riparian vegetation provides organic


PRODUCTIVE FLATS
FOR FISHERIES RESOURCE
Map 27
HWY 101
Elk R.
Rock Cr.
Anvil Cr.
Red Cedar Cr.
Butler Cr.
Elk R.
N. Fk. Elk R.
Purple Mtn. Cr.
Bald Mtn. Cr.
Panther Cr.
Blackberry Cr.
S. Fk. Elk R.
Productive Flats
Subwatersheds
Streams
N
W
E
S

matter, nutrient storage, and low velocity areas, increasing levels of biological activity. Accumulations of large wood create complex habitat, scour pools, and provide abundant cover. Deep pools appear to be the major factor in supporting high fish densities and species diversity.

The variety of habitat types support a diverse assemblage of aquatic organisms. Low-velocity riffles and side channels are favored by post-emergent fry. Pools support a mixture of coho, chinook, steelhead fry and yearlings, and older age cutthroat trout. Different species and age classes occupy specific areas within the pools, thereby decreasing competition among species. Shallow riffles are occupied by young-of-the year trout and are sources of aquatic invertebrate drift forage. Higher-velocity, deeper riffles are used by yearling and older-age trout.

Winter habitat during high flows is crucial for salmonid species that reside in freshwater for more than one year, (i.e. coho salmon, steelhead, cutthroat trout, and resident trout). Well-vegetated floodplains disperse flow laterally and reduce velocities during high flow. Large wood, live vegetation, and split channels create quiet-water refuge habitat for juvenile salmonids. These factors minimize energy expenditures and, therefore increase winter survival.

Floodplain and river terrace vegetation provide organic matter. These nutrients become available to invertebrates within the channel following high flows which inundate the flats. At lower flows, organic matter trapped in low-gradient areas is available to instream organisms. Slower water velocities allow soluble aquatic nutrients to be retained longer for use by primary producers and secondary consumers.

Hyporheic zones (underground seeps) have been found along a number of the flats in Elk River (Gregory and Lombardi, unpublished). Instream productivity is enhanced by subsurface biological activity along unconfined reaches in hyporheic zones. Microbes fix carbon beneath apparently "dry" gravel bars. Intergravel flow carries nutrients from the microbes and from nitrogen-fixing alder root nodules to the stream channel.

Fish Habitat, Distribution, and Populations

Salmonid production can be viewed as the end product of energy that is routed through the stream ecosystem. Since land managers have no control over ocean conditions, this document will focus on the physical, chemical and biological components of freshwater systems. A significant cause of salmonid declines have been attributed to the degradation of freshwater and estuarine habitats (Spence et al. 1996 and FEMAT 1993).

All species of salmonids need quality spawning and rearing habitats. Temperature, cover, barriers, nutrient inputs, stream velocities and flow can limit distribution and density in freshwater habitats. Quality habitat components include cool summer stream temperatures (less than 64 degrees Fahrenheit), oxygenated water, deep pools, intact riparian zones, cover elements, large woody material, suitable substrates for spawning and access to refuge areas during floods and escape from predators. When these components become limited or stressed, salmonid production will decline.

Watershed salmonid fish production is driven largely by the production in tributary streams. Tributaries are particularly important for species such as coho salmon and steelhead trout whose life histories have evolved to avoid competition with other salmonid species by utilizing smaller streams. Tributaries serve as refuge for juvenile salmonids during high flow periods; young fish escape winter floods by seeking out protected side streams. Larger tributaries are also utilized by predominantly mainstream species such as chinook salmon, and thus add to the total watershed populations of these fish as well.

The Elk River supports one of the most important and valuable wild runs of anadromous fish in coastal Oregon. Factors attributed to this include the remarkable water quality, the relatively undeveloped and undisturbed watershed and the advanced hatchery and species management by the Oregon Department of Fish and Wildlife. Today, the major anadromous salmonid species found in Elk River are chinook salmon (Onchorhynchus tschawytscha), winter steelhead trout (Onchorhynchus mykiss), and sea-run cutthroat trout (Onchorhynchus clarki). However, at the turn of the century, the primary species may have been coho salmon (Onchorhynchus kisutch) (Figure 2).

The Elk River valley was one of the last areas to be settled along the Oregon Coast. A number of long-time residents interviewed stated that local residents preferred to fish the nearby Sixes River, instead of the Elk, because the Sixes had a substantial run of larger chinook salmon, whereas in the Elk, mostly coho salmon were caught. The lower river was well suited for coho salmon: heavily wooded with spruce and hardwoods, and having multiple channels, slow backwater pools, and numerous log jams.

Dramatic changes in habitat, particularly in the lower watershed, may have been a major cause for the change in dominant fish species from coho to chinook salmon. During the latter part of the 19th century, much of the lower mainstem was believed to be low lying swamp land. Decades of settlement and associated activities have altered this landscape considerably. The key habitat elements which are important for coho salmon no longer exist in the lower Elk. A combination of activities has contributed to these habitat changes. These activities include removal of in-channel wood due to log rafting operations, periodic clearing of wood to maintain drift boat fishing access, increased bedload sediment from upstream sources (generated by harvest and road-related landslides, and large natural storm events), draining, filling and channelizing of riparian areas to increase agricultural production, harvest of riparian vegetation, and similar riparian loss due to bank stabilization projects. At present, habitat conditions now favor chinook salmon and steelhead trout production.

Depletion of Pacific salmon stocks have been well documented (Ebel et al. 1989, Nehlsen et al. 1991, and Huntington et al. 1996). Many factors have been attributed to this decline including over exploitation, dams, disease, natural predation, artificial propagation, climatic variations and the destruction and alteration of habitat. Habitat loss and modification are believed to be the major factors determining the current status of salmonid populations (FEMAT, 1993). Elk River stocks of salmonids have not experienced the major habitat alterations that other coastal basins have received, and therefore, current populations are more robust than in other areas. With the exception of coho salmon, Elk River salmonid stocks are relatively stable. The potential for salmonid recovery in the Elk River is high. Management emphasis should be on preventing rather than mitigating damage to freshwater habitats. Current Federal, State and Regional status listing of Elk River stocks are displayed in Figure 20.

Figure 20: Status of Elk River Salmonid Stocks

Species	ESA Federal Listing	Oregon State Listing	USDA Region 6 Sensitive
Coho salmon	Threatened	Critical	Sensitive
Chinook salmon	Review	None	Sensitive
Winter steelhead	Proposed	None	None
Cutthroat trout	Review	None	Sensitive
Chum salmon	Review	Critical*****	Sensitive

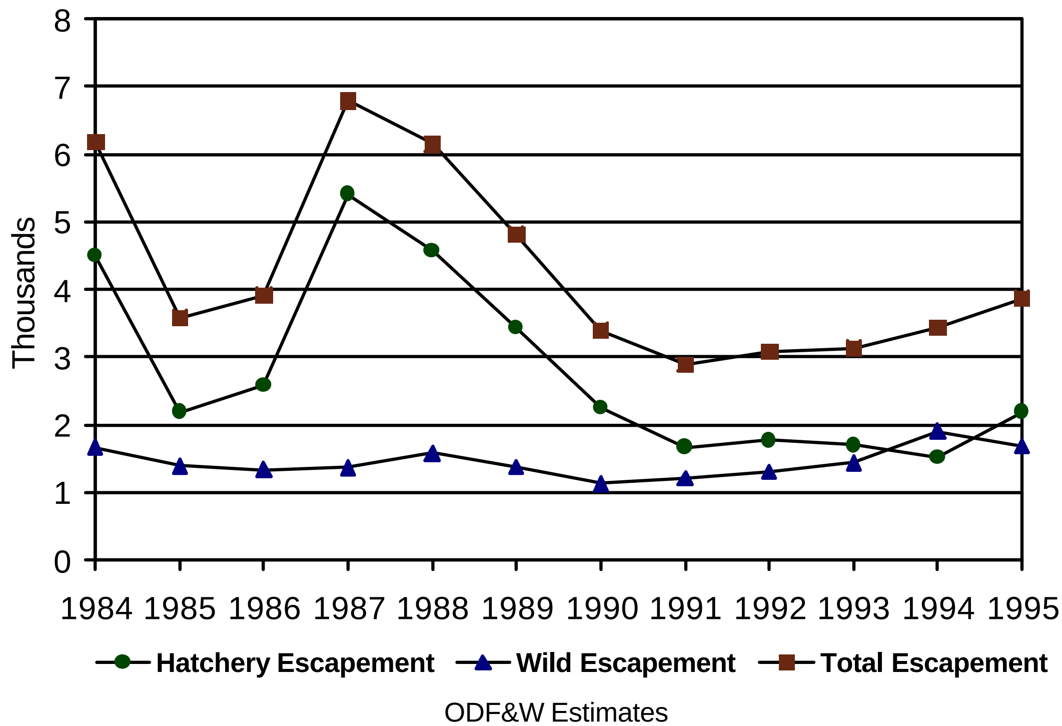
***** The ODFW does not acknowledge Elk River chum salmon as a viable remnant population.

Chum: The Elk River is near the southern extent of the range for chum salmon. For this reason, it is hypothesized the Elk River never supported large numbers of chum salmon. However, the 1927 commercial catch records for the lower Elk indicate approximately 187 chum salmon were caught (Figure 2). Recent yearly spawning surveys conducted by the Oregon Department of Fish and Wildlife have indicated minor numbers of chum salmon spawning in the lower mainstem (Susac 1997, personal communication). Since most chum salmon spawn in the lower reaches of streams (frequently within the tidal zone) and immediately migrate to the ocean after emergence, it is difficult to determine escapement and smolt output trends.

Chinook: Elk River chinook are an indicator stock for the ODFW's Ocean Salmon Management Department. Indicator stocks are used to index adult populations on Southern Oregon north migrating chinook by extrapolating data from a few rivers. Therefore, monitoring Elk River populations are a key component for setting ocean harvest limits. Of the 315,000 smolts released (yearly average) by the hatchery, 220,000 are fin marked and fitted with a coded wire tag. This information is used to determine and document age classes, ocean mortality, ocean and sport harvest levels, run returns, escapement, stray rates and wild to hatchery ratios on the spawning grounds. In addition to the coded wire tags, ODFW conducts spawning surveys on 18 miles of streams in the watershed, conducts creel surveys (estimating sport catch) and operates two smolt traps. This data is a critical component for monitoring long term trends within the population. Due to State and Federal budget cuts, sharing resources and personnel by utilizing Challenge Cost Share agreements should be pursued in order to continue this vital data collection.

For a watershed of its size, the Elk River is one of the highest producers of chinook salmon in the Pacific Northwest. The number of chinook produced from the upper reaches varies annually but is estimated at about 40% of the total system production. When only wild fish are considered, the upper reaches account for up to 80% of total wild fish production. This illustrates the importance of the upper mainstem for wild chinook production. Fluctuations in this production are primarily due to variations in flow during the fall/winter months (low flow limits access to the upper watershed and forces chinook to spawn in the mainstem below the hatchery), and sport/commercial fishery escapement (Reeves, 1989). Wild to hatchery ratios and escapement levels from 1984 to 1995 are illustrated in Figure 21.

Figure 21: Elk River Chinook Escapement 1984-1995



Chinook salmon utilize the 17 miles of the upper mainstem, the lower two miles of the North Fork Elk, 1.5 miles of Red Cedar Creek, two miles of Panther Creek, 0.5 miles of Anvil Creek, and approximately 1.5 miles of Butler Creek. Contribution from non-designated tributaries is estimated at 20 - 30% of the upper watershed chinook production (Susac, personal communication; unpublished ODFW data). A total of 24.5 miles in the upper and 10 miles of the lower watershed are utilized by chinook for both spawning and rearing.

Nicholas and Hankin (1988) describe the extended freshwater residency of juvenile chinook in the upper Elk River as an unusual occurrence for coastal Oregon stocks. This may be due in part to the presence of favorable water temperatures in the upper river, as well as the lack of a large estuary at the mouth. In most other systems, juveniles spend considerable time in the estuary, growing to the larger sizes that favor ocean survival.

Adult Elk River chinook salmon are characteristically three and four-year old fish which return primarily from November through January. This is a departure from many other coastal stocks, most of which return earlier in the fall. It is thought that the delay in adult spawning migration is an environmental adaptation to low-water conditions which persist on the southern Oregon coast during the fall months. The Elk also appears to be the southern boundary between north-migrating and south-migrating coastal chinook stocks (Nicolas and Hankin 1988).

Of concern in any watershed that contains mixed populations of native and hatchery salmonids are the potential effects on wild fish stocks resulting from hatchery supplementation. Spawning ground surveys conducted by ODFW indicate some cross breeding between wild and hatchery chinook (Figure 22). However, these figures are averages and some segregation does occur. As a general rule, higher concentrations of hatchery fish spawn in the lower mainstem (below the fish hatchery) and higher concentrations of wild fish spawn above the hatchery. Data from 1980 to 1993 indicate Elk River wild chinook populations tend to have a greater proportion of age 5 and 6 year old fish and less jacks (precocious males) than their hatchery counterparts (ODFW records). Long-term hatchery programs have been shown to alter stock characteristics of anadromous salmonids in the Pacific Northwest (Spence et al. 1996). In many watersheds today, fisheries scientists are attempting to rectify such problems and protect remaining stocks of wild fish.

Figure 22: Mainstem Elk, Spawning ground surveys, Wild to hatchery carcass ratios, 1988 - 1993.

Year	Wild	Hatchery
1988	69%	31%
1989	77%	23%
1990	74%	26%
1991	76%	24%
1992	65%	35%
1993	50%	50%

Chinook smolts typically migrate to the ocean from May through October. The State of Oregon's Department of Fish and Wildlife has operated a chinook salmon hatchery in the Elk River since 1968. Even before construction of the hatchery, far-sighted ODFW managers and scientists began to address the importance of understanding the characteristics of wild stocks, in particular, the value of genetic variability found in native fish. An intensive and unique research program was begun in the mid-1960's to study the life history of Elk River fall chinook salmon. Research results were instrumental in the development of the chinook hatchery program. Only Elk River fish were used for the broodstock program, a significant departure from other programs which used a single non-native stock to supplement a number of watersheds. Breeding followed a complex series of matings to maintain the genetic variability discovered in the life history research. Today, Elk River fall chinook stocks are healthy and its hatchery program is perhaps the best example in the Pacific Northwest of balancing supplementation while protecting wild stock integrity.

Steelhead: The Elk River steelhead are currently being reviewed for a listing of “Threatened” under the Endangered Species Act (1973). A decision from the National Marine Fisheries Service (NMFS) regarding the proposed listing is required by February 9th, 1998. Juvenile steelhead trout production within the upper reaches and tributaries accounts for an estimated 70-80% of all steelhead produced in the system (Reeves, unpublished data). Steelhead trout have the most ubiquitous distribution among the anadromous species; usage (by stream) include 2 miles on the North Fork, 0.5 miles on the South Fork, 2 miles of Butler Creek, 4.5 miles of Panther Creek, 5 miles of Bald Mountain Creek, 1 mile of Blackberry Creek, 1 mile in Anvil Creek, 1.5 miles of Red Cedar Creek, and a total of 1.5 miles in Slate, Sunshine, and Purple Mountain Creeks, as well as the 17 miles of the mainstem. One year, densities in the North Fork were estimated to be over 4,000 fish/1000 meters (PNW unpublished data). Total miles used within the upper watershed is 36.0.

A high percentage of extended-residence juvenile steelhead have been noted by ODFW researchers in the Elk River watershed. Typically, in most coastal systems, the majority of outmigrant steelhead smolts are 2 years old. Trap data indicates that 20-25% of Elk River steelhead do not smolt until 3 years in age (Susac unpublished data).

Cutthroat and Coho: On May 6th, 1997, NMFS declared Elk River stocks of coho salmon "Threatened" under the Endangered Species Act (1973). Current coho escapement levels have been estimated to be approximately 100 to 200 fish (Susac 1997, personal communication). Considering the 1927 commercial catch records (Figure 2) coho numbers are significantly depressed from historic levels. Protecting existing habitat is of critical importance for the viability of Elk River coho stocks. Restoring historical coho habitat, particularly in the lower mainstem, will be vital if recovery efforts are to be successful.

Sea-run cutthroat trout and coho salmon occur in various places and densities within the upper reaches of Elk River. Anadromous cutthroat have been found in all areas occupied by steelhead trout juveniles (36.0 total miles). Summer low-flow surveys by PNW and District crews have found that cutthroat may be relatively abundant (up to 30 per pool) and large in size (exceeding 24 inches in length). Very little quantifiable data exist on searun cutthroat populations within the Elk River. Coho salmon have been found primarily in the North Fork (Wild River segment), Red Cedar Creek, and Anvil Creek. The 1985 surveys conducted by PNW estimated that coho densities were as high as 0.61 fish/m^2 in the North Fork (Reeves 1987). During that year, coho were present in nearly all tributaries in the upper river. However, in subsequent years, coho densities have been much lower. Tributaries important for coho production are Red Cedar, the North Fork, Panther and Anvil creeks (Reeves et al. Unpublished data).These tributaries appear to account for most of the present coho production in the entire watershed.

Resident Fish: ODFW biologists have identified Elk River as one of the few coastal watersheds with remnant populations of non-anadromous rainbow trout (Reimers, personal communication). They are estimated to populate 27 miles within the mainstem Elk, the lower North Fork and the upper North Fork. Entirely pure resident rainbow populations exist above barriers on the North Fork, South Fork, Butler Creek and Bald Mountain Creek (Susac 1997, personal communication). Resident cutthroat are estimated to occupy 40 miles, including the mainstem areas and pure populations above barriers on Rock Creek, Anvil Creek and China Creek (Susac 1997, personal communication).

Clean Water Act Section 303(d)

The 1972 Clean Water Act requires each state to identify streams, rivers, lakes and estuaries (waterbodies) that do not meet water quality standards. Stream segments where data show standards are not met are referred to as "water quality limited" and placed on the 303 (d) list. The 1994/1996 Clean Water Act Section 303 (d) list found the following segments water quality limited:

Figure 23: Segments identified as Water Quality Limited

Name	Segment	Parameter
Elk River	Mouth to Anvil Creek Mouth to North/South Conflu	Habitat Modifications Temperature - Summer
Bald Mountain Creek	Mouth to RM 2	Habitat Modification Temperature - Summer
Butler Creek	Mouth to Headwaters Mouth to RM 1.25	Habitat Modification Temperature - Summer

Habitat Modification: Documented habitat conditions that are a significant limitation to fish or other aquatic life. Habitat conditions considered are represented by data that relate to channel morphology or in-stream habitat such as large woody material.

Temperature - Summer: The seven (7) day moving average of daily maximum temperature shall not exceed 64 degrees Fahrenheit.

November 18 & 19, 1996 Flood

On November 18, 1996, Elk River experienced a storm of major magnitude. The storm had a return interval of between a 50 and 75 year event (Map 28). It is characterized as a storm of high intensity and short duration. The majority of the rainfall occurred in a single day on November 19 (NOAA). It had the same magnitude as the 1955 storm which caused severe disturbance in the watershed (refer to Channel Morphology section). Only a limited amount of information on the flood effects is available for this iteration of the Elk River Watershed Analysis. When the collection of information on the flood is complete, the Watershed Analysis will be updated.

A USGS stream gage is located at the fish hatchery. The stage height reached at peak flow during the storm was 22.6 feet. The stream gage was damaged sometime before peak flow, so peak flow information is not available at this time.

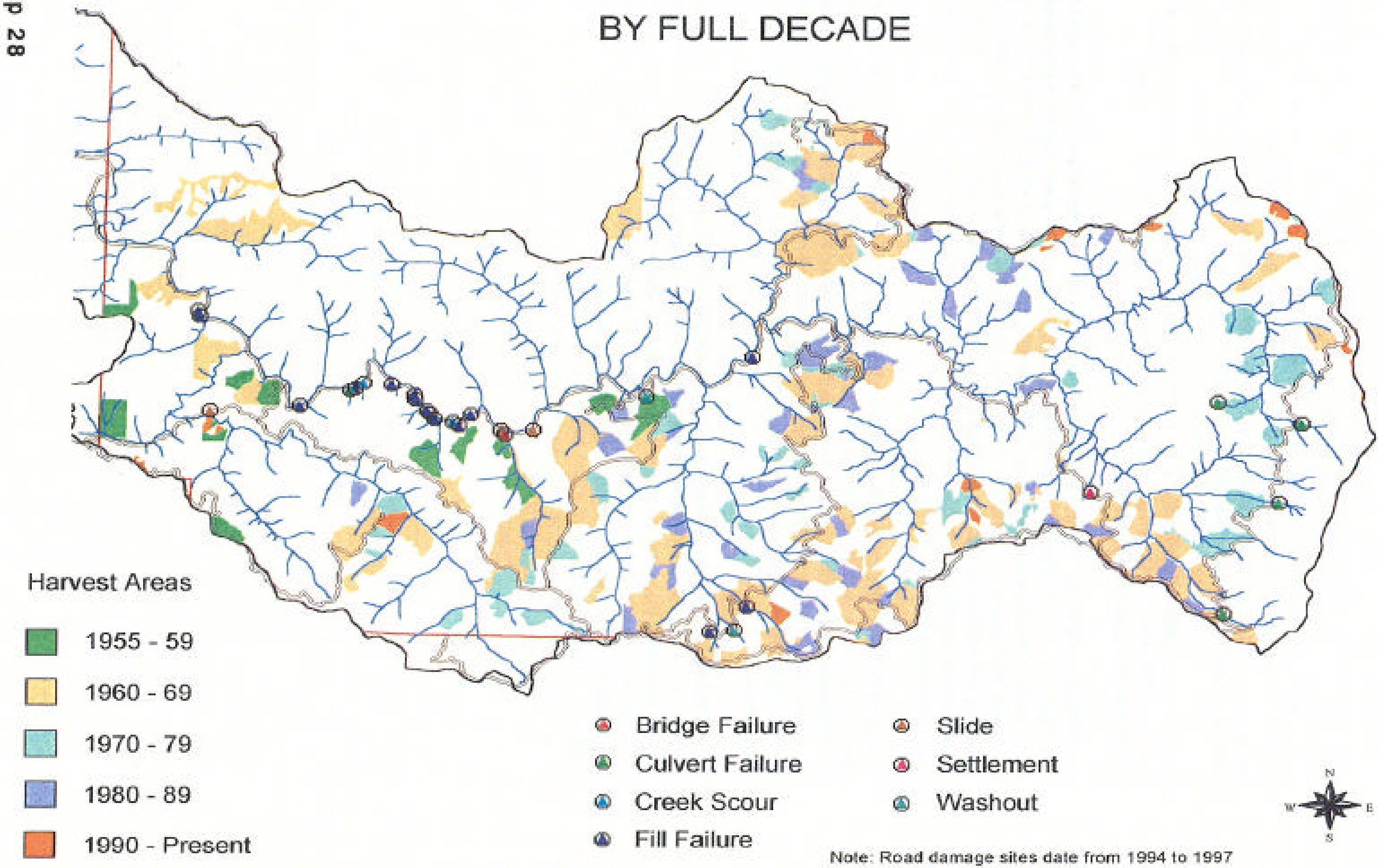
The damage to the stream channel and riparian vegetation in the watershed is similar to what occurred in 1955, but not as severe. The main access road (#5325) built in 1954, which placed road fill material within the flood prone area of the stream, experienced extensive fill failure during the 1955 storm. Road fill material that remained in the flood prone area continue to fail in the 1996 storm, but with less material remaining, the overall loss was not as great. Continued improvements in the road as the failures are repaired should significantly reduce the likelihood of road failure in the future, when a storm of this magnitude occurs again.

The two factors that have increased summer stream temperature in Elk River are loss of stream shade trees and excessive sediment in the channels causing them to become wider and shallower. The summer stream temperature in Elk River has been decreasing for the last two decades as trees that shade the stream lost in the 1955 and 1964 storm, and from timber harvest recover. The channel is also recovering from the large amount of sediment in the stream from that time period, helping to reduce stream temperature.

Many of the trees lost in the 1996 storm were hardwood and immature conifers that were growing back from the 1955 and 1964 storm. Because these trees were too short to provide significant stream shade to the wide mainstem, there may be little effect in increasing stream temperature. How much sediment was introduced into the stream from the storm and how it has effected the channel shape in not known at this time. Sediment plays a key role in how much, if any, summer stream temperature will increase from the 1996 storm in Elk River.

Map 28

FLOOD DAMAGE SITES AND TIMBER HARVEST AREAS BY FULL DECADE



AQUATIC ECOSYSTEM - Subwatershed Level

Some components of the aquatic ecosystem are best examined in finer detail by subwatershed. This section examines each subwatershed, describing its respective condition and unique characteristics.

- Landslides and Surface Erosion
- Large Wood Supply Affecting the Aquatic Ecosystem
- Channel Condition
- Fish Habitat, Distribution and Populations
- Subwatersheds
    - North Fork Elk River
    - Panther Creek
    - Bald Mountain Creek
    - Butler Creek
    - Blackberry Creek
    - South Fork Elk River
    - Smaller Tributaries

Tributaries help to maintain overall watershed fish production by distributing the effects of catastrophic, large-scale natural events. Natural events can affect different areas in the watershed at different times, and produce a mosaic of productivity with subwatersheds at various stages of recovery. Existing conditions are a product of past natural and human-caused events.

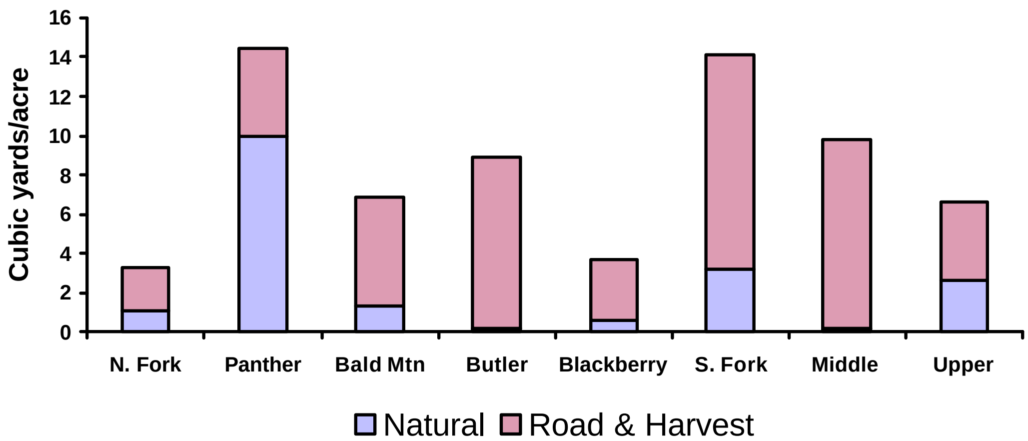
Data on existing conditions of landslide sediment yield, large wood supply, channel conditions, salmonid fish habitat, and salmonid fish species are summarized in the following subwatershed tables. Following the subwatershed tables, these data are integrated into the narrative descriptions of cause and effect for each subwatershed.

Landslides and Surface Erosion

Landslide sediment yield varies among the subwatersheds due to inherent slope stability and land use history. The total volume of delivered sediment has been divided by the area of the subwatershed to allow meaningful comparisons (Figure 24, except for Lower Elk with no data available. High yield areas may be concentrated within a single landslide (e.g. a large natural slide in the east fork of Panther Creek), or distributed across part of the watershed (e.g. harvest slides in the east fork of Butler Creek). Map 25 indicates the areas of greatest road and harvest disturbance. Within the Middle Area, sediment yield from road construction on high watershed sensitivity lands is concentrated in Purple Mountain Creek.

Where timing of landslide sediment delivery is relevant to current channel conditions and recovery rates, it is discussed in the narrative descriptions of the subwatersheds.

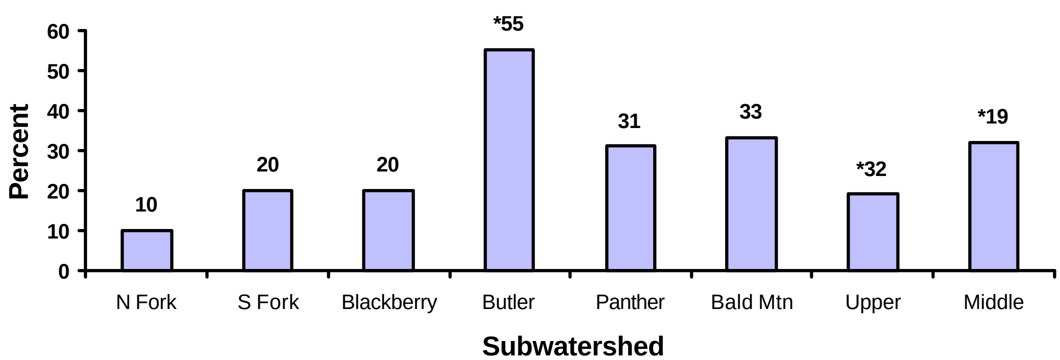
Figure 24: Landslide Sediment Yield for Elk River Subwatersheds, 1952-1986.



Large Wood Supply Affecting the Aquatic Ecosystem

The area mapped as high watershed sensitivity (Map 24) is a reasonable approximation of the area which can supply large wood to stream channels. Figure 25 gives the percentage of the area mapped as high watershed sensitivity which has been harvested. Some of these stands are now composed of hardwoods and will not provide large wood to channels until replaced by conifers.

Figure 25: Large Wood Supply, Percent Harvested from High Watershed Sensitivity Area
*Data for the portion of the subwatershed outside Grassy Knob Wilderness.



Channel Condition

Comparison of channel surveys, channel changes in historical aerial photographs, estimates of sediment delivery and the channel capacity to transport sediment indicate how the channel has responded to natural and human disturbance. Figure 26 summarizes those findings. Stream temperature can be affected by both removal of shade trees and excessive sediment loading which can cause the channel width to increase and depth to decrease.

Figure 26: Summary of Channel Condition by Subwatershed

	N Fork	Panther	Bald Mt	Butler	Blkbry	S Fork	Middle	Upper
Past Channel Effects From Sediment	Low	Mod	High	High	Low	Mod	High	Mod
Stream Temperature	Low	Mod	Mod	Mod/High	Low	Low	Low	Low
Drainage Area Acres	6107	5790	6788	4380	2985	4943	7321	8810
% gradient at Critical Reach	1.2	1.0*	0.8	0.8	2.0	0.8	NA	NA**

* Critical Reach is at Panther Forks, lower Panther gradient is 2.5%
** Red Cedar Creek gradient is 1.0%

Fish Habitat, Distribution and Populations

Watershed habitat and population data were generated from various stream surveys to interpret the resource values for watershed salmonid habitat. These surveys include those conducted by USFS PNW under the direction of Dr. Gordon Reeves (1985-1991) and are augmented by data from surveys conducted by the Powers Ranger District (1988-1991), which used increased sampling for fish (more time periods for sampling and more units sampled per effort). Figure 27 displays the factors used to develop these values. Values for Population Size, Contribution to Elk River, Habitat Ranking and Habitat Value are subjective. They were derived from professional judgement of District Fisheries Biologist utilizing data from the aforementioned surveys.

Figure 27: Assessment of Resource Value for Subwatershed Salmonid Habitat

		Fish Information			Current Habitat Conditions @ Low-Gradient Reach							
Tributary Watershed	Miles avail	Anad Species Present	Pop'n size	Contrib. To Elk River	P:R Ratio**	# pools	Large wood/pool	% pools >3' deep	Reach length (miles)	Winter habitat	Habitat Ranking	**HABITAT VALUE**
North Fork (to falls, 2 mi)	2	coho chinook steelhead cutthroat res trout	high high high high high*	high high high high high	0.73	44	(54/44)= 1.22	50%	1.25	exc	#1	HIGH
Panther Cr. (Incl. 3 forks)	5	coho chinook steelhead cutthroat res trout	mod* mod high mod mod*	mod high high high mod	0.68	18	(32/18)= 0.56	44%	1.00	exc	#2	HIGH
Bald Mt Creek (mainstem to falls)	7	coho chinook steelhead cutthroat res trout	low* low* high mod high	mod mod high mod high	0.64	77	(77/59)= 1.31	39%	0.50	exc	#4	MODERATE
Butler Cr (to forks)	2	coho chinook steelhead cutthroat res trout	mod low mod low low*	mod low mod low low	0.94	8	(6/8)= 0.75	13%	0.25	poor	#7	LOW
Blackberry Cr (above forks)	2	steelhead cutthroat res trout	mod low low	mod low low	0.50	4	(4/3) 1.33		0.75	fair	#3	MODERATE
South Fork (to Laird Lake side)	1.5	coho chinook steelhead cutthroat res trout	low low mod low mod*	low low mod low mod	0.30	33	(19/33)= 0.56	33%	0.50	fair	#5	MODERATE
Lower Mainstem	14	coho chinook chum steelhead cutthroat res trout	low* high low* mod low low	low high high mod low low	0.67	63	2.3	n/a	n/a	exc	#6	MODERATE
Middle face drainages	2.5	steelhead* cutthroat	low mod	low mod	n/a	n/a	n/a	n/a	0.50	poor	#8	LOW
Upper face drainages	1	steelhead cutthroat	low low	low low	n/a	n/a	n/a	n/a	0.25	poor	#9	LOW

* Historically present in greater abundance
**P:R, Pool to Riffle ratio
n/a = data not available

With the exception of young of the year steelhead in the mainstem, Elk River salmonids show a strong correlation (or preference) to rear in pool type habitats (Burnett 1997, unpublished data). Figure 28 displays by subwatersheds the average salmonid pool densities per square meter from 1988 to 1994 (Burnett 1997, unpublished data.). These numbers are calculated means over seven years and many variables exist. Fish habitat diversity and stream carrying capacities for salmonids are positively correlated with the frequency of high quality pools, therefore any reduction in pool depth or area would correspondingly reduce salmonid rearing potential (FEMAT 1993). Increased sedimentation from land management activities have been attributed to decreasing pool depths (Spence et al. 1996, FEMAT 1993, and Meehan 1991). Future management actions need to take measures to avoid, minimize or restore potential sediment sources.

Figure 28: Mean pool densities of salmonids per square meter in Elk River Subwatersheds from 1988 to 1994.

Subwatershed	Chinook*	Coho	1+ steelhead	Trout**	Cutthroat
Upper Mainstem	.067	.003	.082	.544	.006
Middle Mainstem	.180	.002	.099	.234	.004
Lower Mainstem	**.216**	.003	.029	.241	.001
North Fork	.026	.009	.113	.807	.008
South Fork	.000	<.001	.120	.759	.001
Butler	.001	.014	.036	**.958**	.002
Panther	.006	<.001	.063	.596	.007
Red Cedar	.023	.016	.035	.407	**.020**
Bald Mountain	.002	.002	**.157**	.565	.012
Anvil	.012	**.221**	.080	.541	.019

Data courtesy of Kelly Burnett

* Surveys done in August: Most chinook have migrated to salt water.

** Trout include steelhead, cutthroat and resident trout young of the year.

North Fork Elk River

The North Fork begins at approximately river mile 30. McHugh (1987) observed that the lower North Fork flows through an unconfined channel formed within a fold in the bedrock of the Rocky Point Formation. Large, ancient dip-slope failures have delivered debris to the wide axis of the fold. Sediment deposits form multiple terraces up to 10 meters (33 feet) above the current stream surface. The highest terraces may correspond to tectonically elevated Pleistocene marine terraces located 30 kilometers (19 miles) to the west. Extensive wildfire in the watershed has created even-age (80-90 years) stands; however, charred old-growth snags were noted on the terraces suggesting the higher terraces are more than several centuries old. Stream constrictions and related large wood accumulations are formed by reworked deposits from the ancient failures, or where more resistant rock types are exposed in the channel.

The earliest aerial photos show extensive areas of open canopy with multiple large wood jams and aggraded reaches. Historical aerial photos and stream deposits provide evidence that the North Fork has been subjected to numerous debris flows. Thick deposits exposed from downcutting of the stream occurred prior to 1910. Thick deposits exposed from downcutting of the stream have been dated as pre-1910. This large volume of sediment may have been deposited from transport of debris flows triggered by storms in the 1890's, following fires in 1868. These debris flows may have contributed to today's highly productive habitat by providing a source of wood for habitat structure and nutrients. The sediment fans at the mouths of the tributaries are chronic sediment sources for the North Fork.

Immediately upstream of the Rocky Point Formation (Map 5), the channel flows through Humbug Mountain Conglomerate, where it develops a steep gradient that is a barrier to anadromous fish (this includes the falls). Above the steep reach, more gentle hillslopes are underlain by Galice Formation.

Sediment quantities that exceed the stream channel's capacity to transport sediment can cause changes in channel geometry and streambed composition. Sediment from landslides related to roads and harvest primarily in 1970-72, has aggraded the stream channel of the upper reach. It is unknown how much of the sediment may have been transported through to the fish habitat of the lower North Fork.

Figure 29 estimates the lower North Fork's sediment transport capacity relative to sediment delivered from both natural and land use practices. Sediment delivery values used in the analysis may be an overestimate, since a proportion of the sediment delivered to the upper reach remains in storage. The sediment transport capacity of the lower North Fork was only exceeded for a brief period in the early

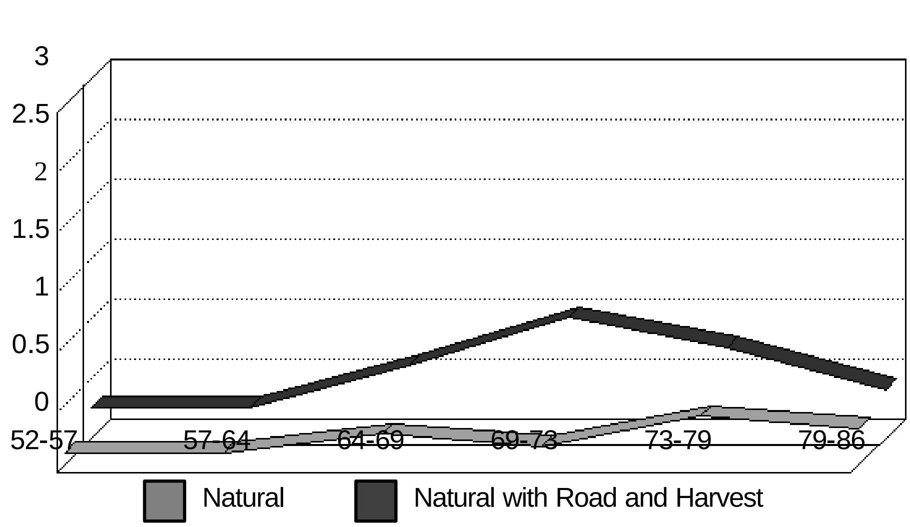
1970's. Based on these findings, it is speculated that land use practices have not adversely affected the lower reach. This is consistent with field observations which show the lower channel to be in excellent condition (Appendix J: Data Used to Support Analysis).

Summer stream temperature in the North Fork is excellent, with maximum temperatures in the low 60^{o} F.

The North Fork contains high quality salmonid fish habitat, and all salmonid species (except chum salmon) indigenous to the watershed are present in high numbers. The unconfined stream reach in the lower two miles (Map 27) is accessible to anadromous fish and exhibits all of the benefits to aquatic diversity associated with productive flats. This reach is particularly important for chinook and coho salmon production and winter steelhead rearing.

Figure 29: North Fork Elk River Channel Response to Sediment

Ratios greater than 1.0 indicate sediment supply exceeds stream transport capacity.
Ratios greater than 0.5 indicate possible effects on channel morphology.



South Fork Elk River

The South Fork Elk River begins at approximately river mile 30. In the South Fork, a large earthflow constricts the channel, providing a barrier to fish migration approximately one mile upstream from the mouth of the creek. The extensively aggraded reaches above this constriction are due to sedimentation from both natural sources such as the debris flow from the south side of Copper Mountain, and the intensive road and harvest disturbance in the subwatershed during 1964-69 (Map 25).

The earthflow deflects the South Fork channel from approximately ½ to one mile above the confluence with the mainstem. Sediment is delivered to the channel along the earthflow's active marginal gullies. This source of sediment will occasionally affect water clarity on the lower South Fork and upper mainstem of the Elk River.

The South Fork is exceptionally cool with summer peaks reaching only 57.4^{o}F.   The stream runs subsurface during the summer, through the aggraded reach, so it is not exposed to solar heating. This accounts for the unusually cool temperature.

The South Fork Elk River contains moderate numbers of steelhead and resident trout, with occasional presence of chinook and coho salmon. The south fork is an example where increases in sediment from both natural and management actions tend to favor steelhead production. Habitat is limited to the lower mile of the creek and nearly all steelhead rear in the lowest quarter-mile of this stream. The anadromous fish use is extremely limited due to steep gradients and numerous barriers. The contribution to Elk River steelhead population is rated as moderate.

Blackberry Creek

Blackberry Creek is a southern tributary located at approximately river mile 28. Blackberry Creek has two branches, known as the east and west forks. The effects of past road- and harvest-related disturbance in the upper east fork of Blackberry Creek are not evident in the stream reaches utilized by anadromous fish (particularly below the forks). There is little evidence of excessive coarse sediment aggradation or channel instability (the stream substrate is composed primarily of large rocks or boulders, with abundant growths of moss). Large wood is abundant, stable, and of natural origin. Streambanks along these reaches are also stable, much of it being composed of bedrock walls. Riparian areas are intact, with large alders, big leaf maple, and Douglas-fir providing 85-95 percent shading. The stream temperature is good ranging from the mid 50^{o} F in the upper reaches to the 60^{o}F at the mouth.

Stream surveys (USDA 1984) indicate that the only anadromous fish species which rear in Blackberry Creek are the steelhead trout and searun cutthroat. ODFW surveys have found few or no chinook salmon using Blackberry Creek as a spawning site (Susac, personal communication). The primary use by steelhead appears to be in the reach below the forks (stream mile 0.0 to 0.5). Anadromous fish access may have been restricted in the past by the culvert under Forest Service Road 5325. In 1985, fish passage was improved by installing weirs in the culvert to lower flow velocity and by raising the outlet pool to reduce the jump height. In 1998, two more weirs are going to be installed to improve access to the culvert pool. The restoration project will provide 1.5 miles of juvenile access to Blackberry Creek during high winter flows. It may also allow chinook and coho to utilize the portion below the forks. It will be important to monitor the results of this project to see if project objectives are being met. Blackberry Creek is considered of moderate importance to the Elk River steelhead population. Approximately one and a half miles are accessible to anadromy.

Butler Creek

Butler Creek is a northern tributary entering Elk River at approximately river mile 24. The west half of the Butler Creek watershed is within the Grassy Knob Wilderness. Butler Creek is underlain by steep slopes of the Humbug Mountain Conglomerate and Rocky Point Formations. Debris chutes deliver sediment containing the rounded gravels that are preferred for spawning substrate into Butler Creek and into the mainstem Elk River.

One of the most intense disturbances in the Elk River watershed occurred in the lower east fork of Butler Creek in 1961 (Map 25). Within a single harvest unit of 330 acres, trees were clearcut from unsuitable lands and from riparian areas, roads were constructed in midslope locations and within the east fork. A hot fire consumed the remaining ground cover. The resulting chronic ravel and debris avalanches buried the east fork channel. Ongoing ravel requires regular maintenance of the road ditches. McHugh (1987) observed that the east fork debris chutes correspond with the intersection of rock bedding and joint planes.

Periodic, less intense sediment delivery from road and harvest has continued to the present. Today, the primary sediment source of concern is the major access road from Butler Bar to the north, Road 5201. Ravel from the steep cutbanks and slides of unstable fillslopes will continue to be delivered to the mainstem of Butler Creek. Because lower Butler Creek is relatively confined, with higher gradient, sediment tends to be transported to the mainstem, rather than stored. The sediment load carried by Butler Creek to the mainstem of Elk River has created a large fan below the confluence.

Measured temperatures at the mouth of Butler Creek reach a summer peak of 68^{o}F. It is estimated that summer stream temperature at the mouth of Butler Creek has increased 7^{o} to 8^{o} F as result of timber harvest activities.

The primary source of heating in Butler Creek is the east fork located approximately 1 1/4 miles from the mouth. Water temperatures as high as 78^{o}F from the tributary mix with the mainstem of Butler increasing temperature from 59^{o}F above to 67^{o} below the tributary. The elevated temperatures within the tributary limit its value as fish habitat. Stream temperatures above the east fork are good for resident fish habitat ranging from the 55^{o}F to 59^{o}F.

Without further disturbance, estimates show that Butler Creek's stream temperature at the mouth is decreasing at a rate of 1.4^{o} F every 10 years. The recovery rate has been slowed by continued ravel and shallow failures from the large 1961 harvest unit along the east fork. Considering changes in stream flow and other variables that affect stream temperature, maximum stream temperatures on Butler Creek has been decreasing over the last two decades. Maximum stream temperature between 1976 and 1978 was 70.0 F compared to 66.0 between 1995 and 1996 or about a 4 degree decrease in two decades.

Figure 30: Maximum Stream Temperature at the mouth of Butler Creek

Year

1976	1978	1984	1992	1993	1994	1995	1996
69.1 F	71.0 F	67.8 F	68.4 F	66.4 F	65.3 F	65.5 F	66.9 F
20.6 C	21.7 C	19.9 C	20.2 C	19.1 C	18.5 C	18.6 C	19.4 C

(Note: The average of the 7 consecutive day maximum temperature should be used for determining temperature trends. However only single day maximum temperatures are available from 1974 to 1984 so, maximum stream temperature was used).

Butler contains primarily steelhead, searun cutthroat and resident trout. Due to the amount of past disturbance, it has a low habitat value and low contribution to chinook salmon and trout populations. It has a moderate contribution to the coho salmon and steelhead population. There are approximately 2.4 miles of low gradient habitat present in Butler Creek. Of the major tributaries to Elk River, Butler Creek has the lowest habitat ranking. However, it also has the greatest potential for recovery efforts. Planting and releasing native vegetation (e.g. conifers and willows) would help accelerate recovery by reducing surface and bank erosion, cooling stream temperatures and by adding long term structure elements to the aquatic system.

Panther Creek

Panther Creek is a southern tributary which enters Elk River at approximately river mile 23. McHugh (1987) observed that the mainstem of Panther Creek follows a major fault (Map 5). Sediment from large ancient slumps and slides has created multiple, historically long-term terrace deposits bordering a wide flood plain. The terraces are well vegetated with older stands of trees. The stream flows in a sinuous pattern, deflected between the terraces and resistant bedrock, and is characterized by shallow glides and riffles. Lateral scour pools are shallow; lateral and mid-stream gravel bars are common. Near the mouth of the stream is a faulted contact between the Galice and Humbug Mountain Formations. As the stream flows through the more resistant conglomerate, the bedrock channel is constricted and develops a bouldery, stepped gradient.

The East Fork of Panther Creek flows through the Galice Formation. Several large, natural failures have created unstable deposits of sediment which periodically fail, delivering boulders, finer-textured sediment, and large wood to the channel. These deposits have created a stepped stream gradient, a high degree of channel sinuosity, and multiple stream constrictions, which are sites of long-term wood accumulations. Sediment is stored behind the jams and is released periodically during high stream flows. The East Fork does not have any extensive areas of open riparian canopy or aggradation. One aggraded section appears along the toe and downstream of a large natural landslide which is active at the toe. This section is about a mile upstream from the confluence with the mainstem. This slide has delivered an estimated 44,000 cubic yards of sediment to the channel, presumably from the 1955 storm. This slide accounts for the high sediment yield for Panther Creek shown in Figure 31.

The West Fork of Panther Creek flows through the Humbug Mountain conglomerate. Slopes are steep, and ravel is the dominant erosion process. The stream course is controlled by the major faults, resulting in long, linear reaches and a low degree of channel sinuosity. Several debris slides and flows delivered pulses of fine sediment to the stream as a result of harvest prior to 1956 on privately-owned land in section 36, and harvest in 1972 lower in the drainage. Woody material is limited to small logging slash.

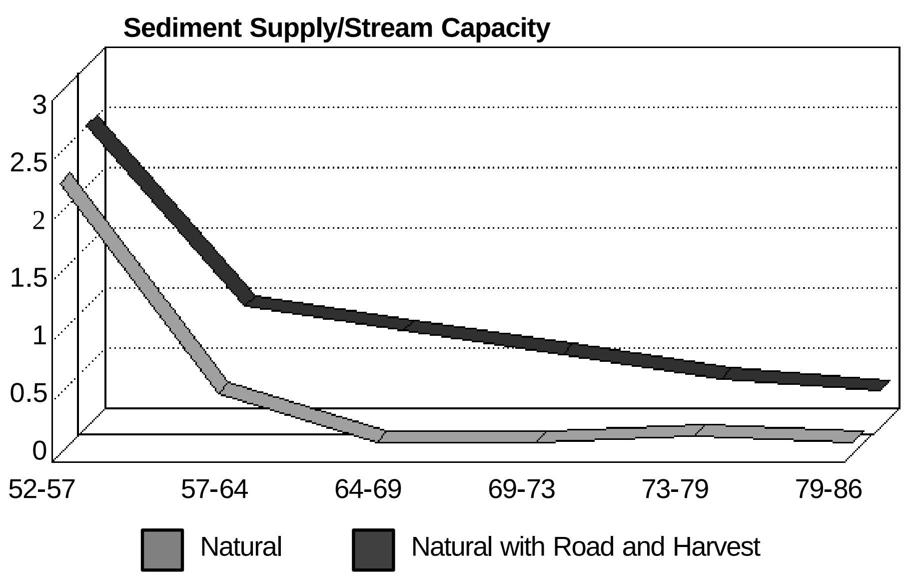
Intermittent scour and aggradation is typical of the West Fork of Panther Creek. Because the stream reach is relatively steep and straight, the stream channel and banks are vulnerable to scour from debris flows.

Both the East and West Fork lower reaches are aggraded from past sediment delivery. The lower mile of the West Fork where the gradient varies from 2 to 3 percent, remains severely aggraded. Despite low sediment delivery for the past 20 years, recovery has been slow with the channel just beginning to form pools behind logs and boulders and the width to depth ratio is improving. If sediment loading remains low it is estimated that full recovery will occur over the next 15 to 25 years.

Figure 31 compares the total sediment delivered from both natural and land use practices to Panther Creek's sediment transport capacity in the "productive flats" area (Maps 4 and 27) (see Appendix J: Data Used to Support Analysis). Total sediment values used in the analysis may be an over estimate, since a proportion of the sediment delivered to its upper reach and East and West Fork remains in storage. Based on the transport analysis, it is estimated that the large natural slide on the East Fork and road and harvest activity in the late 1950's through the 1960's created excessive sediment loading to the "productive flats" area on the mainstem. This probably resulted in loss of pool volume from encroachment of gravel bars as coarse-grained sediment accumulated. The low level of sediment delivery for the past 20 years combined with the ability of the mainstem to move sediment has allowed the channel to recover. This is consistent with field observations which show the lower channel to be in excellent condition.

Figure 31: Panther Creek Channel Response to Sediment

Ratios greater than 1.0 indicate sediment supply exceeds stream transport capacity.
Ratios greater than 0.5 indicate possible effects on channel morphology.



The East Fork of Panther Creek has several large, natural failures which periodically deliver boulders and finer textured sediment to the channel. These periodic failures cause short term adverse affects to water clarity in the mainstem of Panther Creek and the downstream mainstem of the Elk River.

A combination of the 1955 and 1964 storm and timber harvest resulted in a reduction of stream shade and increased stream width. Stream temperature increased over a two decade period. From river mile 1 to the mouth the stream is naturally wide, increasing stream heating through this section. Such areas, while warm in temperature, are considered to be fish/aquatic “hot spots.” Elevated temperatures in these reaches contribute to higher productivity, but must be moderated by cool water input from upstream sources. Early logging of riparian vegetation elevated the cool water temperature from upstream sources. Results from stream temperature modeling indicate that summer stream temperature at the mouth increased 4 degrees F from timber harvest.

Since 1980, average maximum stream temperatures in Panther Creek have been decreasing as stream shade recovers from past disturbance. Independent of the variables that influence stream temperature, continued temperature monitoring from 1974 to 1995 clearly show a declining trend in maximum summer temperatures. Without further disturbance, such as a major storm, stream temperature modeling estimated that Panther Creek has a recovery rate of 1.6 F every 10 years. Maximum stream temperature between 1974 and 1976 was 68.0 F compared to 64.0 in 1995 or a 4 degree decreased in two decades.

Figure 32: Maximum Stream Temperature at the Mouth of Panther Creek

Year

1974	1976	1978	1984	1992	1993	1994	1995	1996
69.0 F	67.0	70.0	66.0	64.9	64.0	63.1	63.9	Lost
20.6 C	19.4	21.1	18.9	18.3	17.8	17.3	17.7	

(Note: The average of the 7 consecutive day maximum temperature should be used for determining temperature trends. However only single day maximum temperatures are available from 1974 to 1984 so, maximum stream temperature was used).

Panther Creek contains moderate populations of chinook and coho salmon and high populations of steelhead. It is rated as the second most important subwatershed. The west fork of Panther Creek contains the majority of the coho spawning and rearing habitat found in the subwatershed (Burnett 1997, personal communication). The lower mile of Panther Creek is a productive flat, susceptible to changes in sediment and large wood input as discussed above. A maximum of 6.5 miles of habitat are accessible to anadromous fish.

Bald Mountain Creek

Bald Mountain Creek is a large southern tributary that enters the Elk River at approximately river mile 15, two miles above the fish hatchery. The lower third of Bald Mountain Creek drainage is largely under private ownership. Except for a small area in the upper part of the watershed managed by the BLM, the remaining area is under Forest Service management.

A flat is located above the confluence of the mainstem and the South Fork of Bald Mountain Creek (Maps 4 and 27). This area is surrounded by large slump-earthflows in complex geologic structure with multiple faults (McHugh 1987). Weaker Galice Formation and ultramafic rocks are mixed with more resistant metavolcanics and diorite exposures. Periodic undercutting of the slump-earthflows by the channel causes reactivation of the slides, with chronic sediment and large wood delivery to the channel. The channel is sinuous with a low gradient, wide floodplain, and multiple terrace deposits with high groundwater retention. Reaches upstream in the diorite are straighter, with shallower channel units resulting from durable cobble-sized sediment delivered by debris slides and torrents.

The presence of many large boulders and large wood jams that completely blocked the channel in the lower to middle portions of the creek was documented in a 1930's log transport feasibility report (Port Orford Ranger District). Reeves (1984) reported the importance of large wood jams, both partial and complete, in accumulating and retaining gravels in lower Bald Mountain Creek. The formation and degradation of debris jams appears to be an on-going process. There is evidence of many previous jams along the stream, particularly at channel constrictions. When a jam breaks, woody material and gravel move downstream and become incorporated into new or existing jams. There are several partial jams in the upper portion of the survey area that are in various stages of rebuilding. The largest jams are located in the middle to lower sections. According to local residents, these jams were smaller before upstream jams broke during a storm event in 1986. An estimated 50-75% of the wood in these jams accumulated since that event. At one site where the jam is estimated to be 5 meters high, nearly all of the estimated 10,240 cubic meters of gravel accumulated as a result of that event (local resident, personal communication with Reeves).

Considerable quantities of sediment have been delivered to the mainstem of Bald Mountain Creek, both directly and via two tributaries which enter from the south in section 27. Notable landslides are from Roads 5502 and 5400020, from harvest on privately-owned land in section 22, and from harvest of the Oakridge units in 1979.

McHugh (1985) documented an increase in open riparian canopy perhaps resulting from the 1964 event, but also saw an upstream shift in the distribution of open riparian canopy from 1956, 1969, and 1979 photos. The magnitude of road and harvest-related slides in this upstream reach has aggraded the channel and created a distinct change in the riparian vegetation.

Figure 33 compares the total sediment delivered from both natural and land use practices to Bald Mountain Creek's sediment transport capacity in the low gradient area on the mainstem (Maps 4 and 27) (see Appendix J: Data Used to Support Analysis). Total sediment values used in the analysis may be an overestimate, since a proportion of the sediment delivered to its upper reaches remains in storage. Based on the transport analysis, it is estimated that the sediment transport capacity has been continually exceeded for the past 40 years from road and harvest activity.

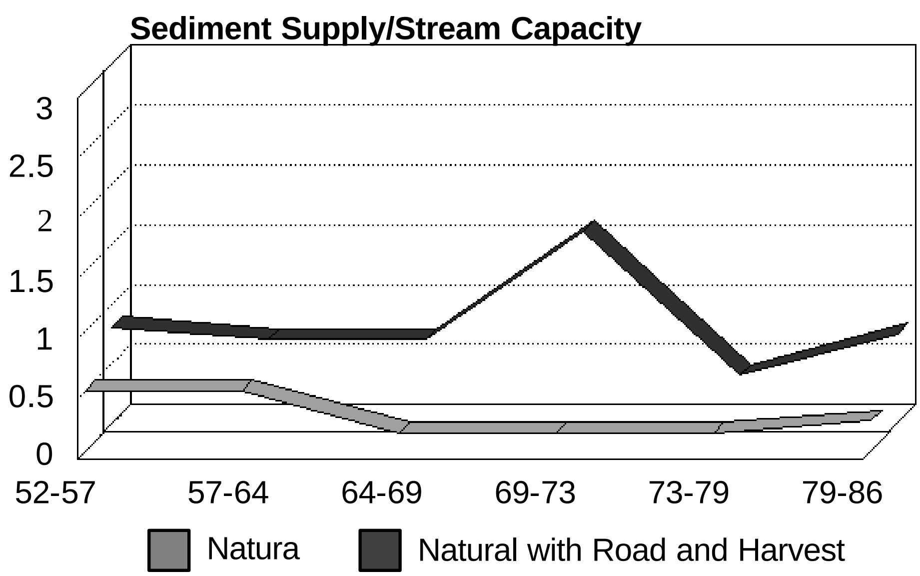
The excessive sediment loading to the mainstem has caused pools to fill and the channel width to depth ratio to significantly increase. These findings are consistent with field observations and fish surveys. It is speculated that the continued persistence of debris flows from road and harvest units may be affecting channel recovery.

A periodic source of turbidity is present at the toe of a large earthflow located in T33S, R14W, section 20, adjacent to the National Forest boundary in the northwest quarter of that section. In the past, a shift in the channel location directed streamflow into the landslide toe, carrying fine sediments downstream which clouded Bald Mountain Creek and the mainstem Elk River below the confluence. Water clarity of the mainstem of the Elk River was affected past the fish hatchery and well into the lower river, following the largest winter storms and persisting for two to three days. Presently the toe of the earthflow is protected from erosion by large wood and boulders.

Considering changes in stream flow and other variables that affect stream temperature, maximum stream temperatures on Bald Mountain Creek has remained unchanged for two decades. Stream temperature modeling indicates that temperature at the mouth has increased 5 F to 6 F degrees as a result of timber harvest and road construction. Most of the stream heating occurs on the lower mainstem of Bald Mtn Creek. This is attributed to a wide aggraded channel and harvest of tall conifers which were replaced by hardwoods as the primary stream shade. It is speculated that there will be little change in stream shade and channel conditions, holding stream temperatures at current levels.

Figure 33: Bald Mountain Creek Channel Response to Sediment

Ratios greater than 1.0 indicate sediment supply exceeds stream transport capacity.
Ratios greater than 0.5 indicate possible effects on channel morphology.



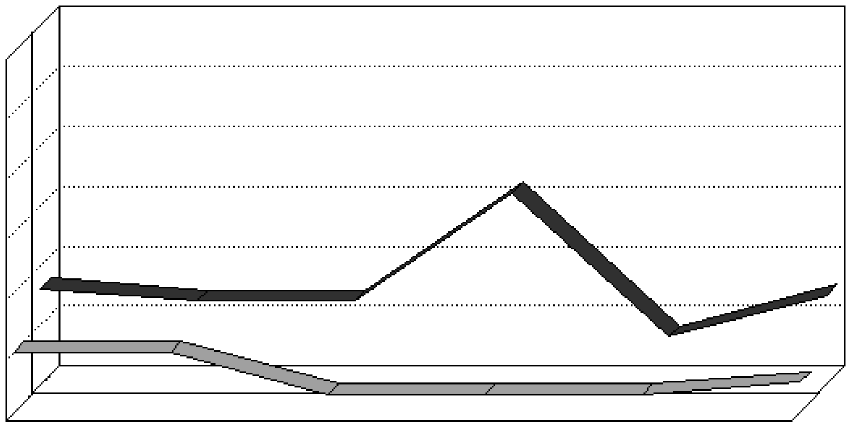


Figure 34: Maximum Stream Temperature at the mouth of Bald Mountain Creek

Year

1976	1978	1984	1990	1991	1992	1993	1994	1995	1996
65.0F	66.0F	66.0F	66.4F	67.5F	67.3F	NC	64.4F	67.3F	65.0F
18.3 C	18.9 C	18.9 C	19.1 C	19.7 C	19.6 C	NC	18.0 C	19.6 C	18.3 C

(Note: The average of the 7 consecutive day maximum temperature should be used for determining temperature trends. However only single day maximum temperatures are available from 1974 to 1984 so, maximum stream temperature was used).

NC = Not Collected

A report from the Oregon Game Commission (mid-1960's) indicated that Bald Mountain Creek contained coho and chinook salmon, in addition to steelhead and cutthroat trout. Increased quantities of sediment and elevated stream temperatures may be responsible for the loss of the salmon in Bald Mountain Creek. Today, salmon juveniles are largely absent from Bald Mountain Creek. Spawning and rearing are concentrated below the six foot falls near the mouth (RM 0.2). High densities of juvenile steelhead contribute substantially to the Elk River. Bald Mountain Creek is considered the most important tributary for steelhead rearing and production in the watershed (Susac 1997, personal communication). Bear Creek, a tributary to Bald Mountain Creek contains very high densities of cutthroat trout. The salmonid habitat rating is moderate, with some flats not meeting their productive potential. A maximum of five miles is accessible to anadromous fish in the subwatershed.

The Bald Mountain Creek subwatershed may be an example of how timber harvest and road building can influence the assemblage of anadromous fish. Winter steelhead seem to be more tolerant to increases of sediment because they spawn in the spring after most gravel-shifting rainstorms occur. Juvenile steelhead can rear successfully in riffle-dominated environments. Salmon prefer pool habitat and large wood material (especially coho salmon), and are usually associated with more stable stream systems.

Smaller Tributaries

The mainstem of Elk River has numerous tributaries which are too small to be designated as subwatersheds. These are known as "facing" drainages, and have been divided into groups of Lower, Middle, and Upper areas. The Lower Area drains into the mainstem downstream from the hatchery and will be discussed separately. The Middle Area includes Anvil, Slate, Purple Mountain, and other unnamed creeks. The Upper Area includes Red Cedar, Sunshine, Lost, Milbury, Bungalow, and other unnamed creeks.

These tributaries are important as sources of sediment and large wood because of their proximity to the mainstem. The high volume delivered by natural slides in the Upper Area (Figure 24) is mainly from three large slides ranging from 9,600 to 17,700 cubic yards which failed prior to 1973. In the Middle Area, four road-related slides ranging from 10,300 to 29,400 cubic yards failed prior to 1969 along the Elk River road. Within Purple Mountain Creek (Middle Area), intense road and harvest disturbance in the late 1950's and following the 1962 blowdown event caused extremely high sediment delivery from landslides and surface erosion (Figure 24).

Red Cedar Creek is included in the Upper Area. Located entirely within the Grassy Knob Wilderness, all disturbance in this watershed has been of natural origin. Humbug Mountain Conglomerate is present in the upper watershed, with a high-gradient bedrock and boulder cascade channel (McHugh 1987). The lower mile of Red Cedar Creek is within the Galice Formation. Several relatively large inactive debris slides are present within the deep soils. Debris deposits form terraces along a relatively sinuous, low-gradient channel. Large wood accumulations are present at channel constrictions.

In the lower channel of Red Cedar Creek, a debris slide in February, 1986 (known as the "alder patch" to stream survey crews) was cited as having reduced the areas of pools and glides by 22% and 72%, respectively, between surveys in 1985 and 1986 (Reeves 1988, p.13). The landslide inventory update by McHugh did not detect a new slide in Red Cedar Creek. This may be because it was a reactivation of an existing slide, a slide that was too small to include (<100 square meters), or an oversight in the inventory. Additional information about the effects of such a natural event on fish habitat could be gained by reexamining the aerial photos and comparing pool and glide areas from subsequent stream surveys.

The smaller tributaries such as Anvil, Red Cedar, and Purple Mountain Creek contain lesser amounts of aquatic habitat for salmonids, but are very important. The stream temperature on these tributaries is good ranging from the mid 50^{o} F to low 60^{o}F. The lower reaches of these tributaries are important for juvenile refuge from high stream temperatures and high flow conditions in the mainstem. In addition, Anvil and Red Cedar Creeks contain some of the highest coho rearing densities found in the Elk River (Figure 28).

Lower Mainstem

The lower mainstem contains the bulk of the historic coho habitat. It is an extremely valuable winter refuge area and out migration corridor. All of the species indigenous to the watershed utilize this section in some part of their life cycle. Chum salmon spawn and rear entirely in the lower reaches. The majority of the hatchery chinook salmon spawn from the hatchery downstream to Bagley Creek (Susac 1997, personal communication). Large numbers of steelhead pre-smolts overwinter in the lower mainstem prior to out migration the following spring.

The lower mainstem of the Elk River contains several tributaries that are the focus of restoration activities on private lands. Rock, Bagley and Indian Creeks have the highest potential for coho recovery efforts. Local watershed councils have been working with private landowners to restore habitats. For a list of completed projects see Restoration Accomplishments section. Management should pursue cost share opportunities to assist efforts on private lands.

Fisheries

The November flood of 1996 had definite impacts upon the fisheries resource. To what degree these impacts have on salmonid populations will be unknown for several years. Preliminary observations made in the mainstem and tributaries by Ken Flizar (1997, personal communication) of the Oregon Department of Fish and Wildlife's Elk River Research Laboratory include:

- Noticeable increase of sand and silt in the mainstem.
- Pools have decreased depth.
- Historically deep pools have noticeably filled in with sediments.
- Widespread loss of riparian vegetation.
- Gravel bars have grown in size.

- There is less large woody in the mainstem of the Elk River.
- Steelhead smolt numbers were well below average at the hatchery smolt trap.
- Steelhead smolt numbers were average at the lower smolt trap.
- There seems to be low numbers of age 1+ steelhead rearing in the Elk River.
- Many of the 1+ steelhead have predator marks on them.
- The steelhead young of the year are abundant and show excellent growth.
- The late migrating chinook smolts were largely absent from the upper mainstem.
- There is an increase of filamentous algae higher up in the watershed.

Many of these effects are similar to those that occurred after the 1955 and 1964 floods (see channel morphology section). The reduction in pool volumes and increases in fine sediments has the most impact upon salmonid populations, especially for those species that rear in fresh water for a year or more. Available rearing habitat appears to have decreased. The loss of riparian vegetation will take years to recover and management should pursue planting of fast growing willows, hardwoods and conifers on exposed areas to accelerate the recovery process. Continued monitoring of salmonid populations and habitat will be important to assess the complete effects and recovery rates of the November 1996 storm.