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MIDDLE FORK APPLEGATE RIVER WATERSHED ANALYSIS

FEBRUARY, 1998

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1998 Watershed Analysis

Middle Fork Watershed Analysis Area

February, 1998

Applegate Ranger District,
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Middle Fork Watershed Analysis
Report Summary

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

The Middle Fork Watershed Analysis was conducted by an Interdisciplinary Team that consisted of Forest Service resource specialists. This team followed guidance contained in the Federal Guide for Watershed Analysis, Version 2.2, August 1995.

Characterization of the Watershed

The Middle Fork Watershed covers approximately 32,219 acres and is located in the headwaters of the Applegate River Watershed. Approximately ninety percent of the watershed is situated in California, with the remainder extending into Oregon. The watershed ranges in elevation from 2,000 to over 6,000 feet at Red Butte. The majority (ninety-eight percent) of the area is National Forest Land, with only two percent in Bureau of Land Management and private ownership. The Red Buttes Wilderness, designated in 1984, covers approximately 14,800 acres of the watershed.

There are five subwatersheds within the Analysis Area: Upper Middle Fork, Lower Middle Fork, Butte Fork, Whisky Creek, and Cook and Green Creek. Together they form a major tributary to the Applegate River.

The area experiences a Mediterranean-type climate typical of southern Oregon. A prolonged cool, wet period, from late October through May, is followed by a hot, dry season from June to October. Rainless periods for several months are common during the summer. Winter precipitation is usually associated with large storm systems moving in from the Pacific Ocean.

Past and present climatic conditions control weathering, mass wasting, and other erosion processes that impact geologic materials. Therefore current landforms in the watershed are the result of continual interactions between climate and regional geology over millions of years. Different mineralogy, structures, inherent strength of the bedrock and resistance to erosion and mass wasting influence the landforms. Rock types throughout the watershed include granitic, ultramafic, metasedimentary and metavolcanic rocks. These different types of rocks in the watershed largely determine soil development.

Twenty-one percent of the streams in the watershed are fish-bearing and seventy-nine percent are non fish bearing. Lakes are few small, and located in the higher elevations. Wetlands, also concentrated in higher elevations, comprise only a small percentage of the watershed.

The streamflow regime is similar to that of the precipitation patterns. Winter and spring high streamflows are generally several magnitudes greater than summer low flows. Historic peak flows of

large streams are usually defined by unusual winter rain-on-snow events such as occurred in 1964, 1974 and 1997. Water quality within these streams is generally high. Where high sedimentation does occur it is generally due to roads and timber harvest operations.

Activities affecting high elevation lakes include livestock grazing, recreation, and non-native fish stocking. These have simplified riparian and aquatic habitat and affected native aquatic species. Most of the Middle Fork and its tributaries are riffle dominated. Bedrock-formed pools are a characteristic of mainstem Middle Fork and step pools are found in the upper mainstem and tributaries with steeper gradients.

Fish, amphibian, and macroinvertebrate, populations are important indicators of water quality, watershed conditions, and instream and floodplain health. Different species prefer habitat based on specific valley and/or stream types, stream conditions, stream gradients, elevations and lakes features.

Human activities have changed instream and riparian habitat. Activities such as commercial timber harvest and road construction within riparian zones, instream wood removal, and mining have impacted habitat in portions of the analysis area. Overall, the interrelated aquatic and riparian habitats in the Middle Fork Applegate River are in good condition and at or near their full potential for producing diverse ages and species of medium sized trout (less than eight inches). Lower Middle Fork riparian forests have been altered and instream wood has been removed, eliminating necessary ingredients for complex habitat: pools, hiding cover, bank stability and the sorting of spawning gravels.

The Middle Fork Watershed includes an extremely variable and diverse pattern of plant communities. This high diversity is attributed to the diversity of soils and topographic features within the watershed. Four vegetation zones are present within this watershed. Beginning at the lowest elevation and extending to approximately 3,000 feet above sea level is the Interior Valley Zone; from 3,000 to approximately 4,500 feet is the Mixed Evergreen Zone; from approximately 4,500 to 6,000 feet is the White Fir Zone; and above approximately 6,000 feet is the Shasta Fir Zone. The Shasta fir zone is not distinct by elevation, and appears to be correlated more with the cooler east and north high-elevation areas, which usually maintain a heavy snow pack.

Insects and diseases have significant roles in forest ecosystems. Along with agents such as fire and wind, insects and disease cause disturbances that trigger changes in the composition, structure, and stocking levels of forest vegetation. These changes occur at the landscape, stand, and individual tree level. The most noticeable effects from insects and diseases in the Middle Fork Watershed today are due to bark beetles, Douglas-fir dwarf mistletoe, and white pine blister rust. The level of activity of insects and diseases is probably higher today than at the turn of the century due to human activities such as timber harvesting, fire exclusion, and the introduction of exotic species.

Wildlife abundance and distribution are directly related to the type, amount, and distribution of habitat. Habitats are fragmented throughout the watershed. Most of the late-successional vegetation is found in the lower elevations of the wilderness or in the upper reaches of Whisky Creek. Fragmentation is a result of natural features such as ridgetops and soil exposure, however, it is also affected by human management activities. Road density (especially in Whisky Creek) also disrupts habitat continuity. Riparian reserves provide some of the connectivity function, however, they too are fragmented along the reaches of certain streams. Connectivity within the watershed appears most suitable along Butte Fork

and Cook and Green Creek. Areas where connectivity and species movement are functioning well are very important and should be maintained.

The watershed analysis area encompasses approximately one-third of the Upper Big Applegate Allotment. Currently 140 cattle are allocated to use the allotment. Upper Middle Fork and Whisky Creek subwatersheds are preferred for grazing as a result of easy access provided by the large road system. Some cattle use the Red Buttes Wilderness area for grazing, however, they are not encouraged to do so. Elimination of unauthorized cattle in certain areas, such as Towhead Basin, remains a management challenge.

There are 18 known dispersed recreation sites within the Middle Fork watershed that cumulatively account for approximately 10 acres within Riparian Reserves. Heavy use of these dispersed recreation sites for camping and picnicking occurs annually, primarily during the summer months. Human use is increasing, impacting vegetation and plant distribution. The associated need for firewood, tent pads, and parking areas contribute to expansion of barren core areas in and around camp sites. Currently, almost every spur road and turn-out is used for recreation access along the Middle Fork, increasing the concern for sanitation and water quality.

The Middle Fork Watershed is well known for its fire dependent ecosystems. Fires influence vegetation type, age, distribution and species composition. The fire return interval varies in the watershed depending on the type of vegetation present. A major portion of the analysis area is designated as the Red Buttes Wilderness. Fire is the key natural disturbance mechanism shaping the landscape of the wilderness.

Approximately twenty-five percent of Rogue River National Forest lands within the Middle Fork Watershed Analysis Area is allocated by the Northwest Forest Plan to Adaptive Management Area (AMA). AMA's are designated to encourage the development and testing of technical and social approaches to resource management while achieving conservation objectives outlined in the Northwest Forest Plan and associated Standards and Guidelines. It is hoped that local, individualized approaches that rely on the ingenuity of resource managers and communities rather than traditionally derived and tightly prescriptive approaches can be pursued in the AMA. Late Successional Reserves (LSRs) are also identified within the watershed. They are established to protect and enhance conditions of late-successional and old-growth forest ecosystems.

Key Issues and Questions

The following is a summary of key issues and questions identified during the watershed analysis:

Key Issue: Overstocked forest and brush stands are leading to insect and disease vulnerability, declining forest health, and increased fire hazard in the watershed (including wilderness and LSR).

Key Questions:

- What areas within the watershed are currently in over-stocked conditions, and/or declining forest health?
- What are the causes of over-stocked stands and/or declining forest health?
- What is the priority for treatment?
- What potential treatments exist to reduce the potential?

Key Issue: High potential exists for large scale high intensity fire threatening values at risk (late successional habitat, T & E species, and water quality).
Key Questions:

- What areas have high potential for catastrophic wildfire?
- What potential treatments exist to reduce the potential?
- What is the priority for treatment?

Key Issue: Dispersed Recreation Sites on the Lower section of the Middle Fork impact vegetation and plant distribution and disrupt wildlife habitat connectivity.
Key Questions:

- Are the dispersed recreation sites along the lower section of the Middle Fork of the Applegate River meeting the Aquatic Conservation Strategy Objectives (ACS)?
- How are they not meeting the ACS?
- What are the potential remedies to the situation?

Key Issue: Habitat connectivity is deficient within portions of the watershed, specifically between Whisky Creek subwatershed and adjacent watersheds.

Additional Non-Key Issues and Questions:

- There is high decadence of summer range browse sites.
- Is progress being made excluding unauthorized cattle from Towhead Basin in the Red Buttes Wilderness?
- Do the Middle Fork and Butte Fork of the Applegate River meet the eligibility characteristics for Wild & Scenic River Status?
- Where is water quality and aquatic habitat an issue in the WAA?

Desired Future Conditions
It is desired:

- There be sufficient streamflow in all fish bearing streams to maintain habitat conditions and maintain stream temperatures at current conditions.
- Sediment levels are maintained so stream aggradation and embeddedness do not significantly affect fish habitat and populations.
- Allow Riparian Reserves to revert and be maintained to late successional forest characteristics and to provide a variety of habitats for a variety of wildlife species.
- Maintain diverse and robust populations of fish, macroinvertebrate, and amphibian, and achieve rainbow trout and sculpin populations with individuals of all life stages maintained throughout their habitat.
- Achieve an average of 25 to 40 pieces of large wood per mile in the stream channel where appropriate.
- Provide high quality recreation trails and manage dispersed recreation sites within riparian reserves in accordance with Aquatic Conservation Strategy objectives.
- Landscapes are relatively resistant to large scale, high severity, stand replacing fires.
- Landscapes are relatively resistant to large insect and disease infestations. Site productivity is restored and maintained at levels conducive to healthy vegetative growth and survival.

Management Recommendations

The following is a summary of management recommendations which address the key issues and questions:

- Where appropriate, to hasten meeting ACS objectives, encourage silvicultural activities within Riparian Reserves to hasten the progression of conifer stands to have late successional characteristics and to provide stream shade, bank stability and future large wood recruitment.
- Restore and /or diversify fish habitat and floodplain connectivity by placing large wood into streams.
- Reduce stand densities by thinning and prescribed burning in overstocked natural stands and in stands with high Douglas-fir mortality due to activities of various insects and disease.
- Survey for the Survey and Manage Species prior to ground disturbing activities. Survey known and suspected caves for bat habitat and consider previously listed Category II Species, older forest connections and late seral habitat when planning timber sale activities.
- Complete the RRNF Access and Travel Management plan and determine Wild and River Scenic Status for Butte Fork and Middle Fork of the Applegate.
- Design dispersed recreation sites that manage recreation use by designating vehicle access spurs and parking areas, establish fire rings in pre-designated locations and restore remaining sites through watershed restoration projects.
- Manage areas to reduce fire hazard and risk by density management, prescribed fires and manipulation of live and dead vegetation in strategic locations in order to protect watershed values.
- Permit lightening fires to play a natural ecological role within the Red Buttes Wilderness area.
- Reduce stream substrate embeddedness by minimizing erosion through removal or stabilization of roads and yarding impacts that are within Riparian Reserves on soils with erosion potential. Where applicable replace existing culverts, bridges, and other stream crossings to accommodate at least the 100 year flood including associated bedload and debris.
- Consider the identified older forest connections in and out of the watershed, in regards to improving/maintaining these dispersal avenues.

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1. INTRODUCTION

1.1 ANALYSIS STRATEGY

1.1.1 WATERSHED ANALYSIS

The Record of Decision for Amendments to Forest Service and Bureau of Land Management (BLM) Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan or ROD), incorporates the Aquatic Conservation Strategy. The Aquatic Conservation Strategy was developed to restore and maintain the health of watersheds and associated aquatic ecosystems, and it is a basis for the Standards and Guidelines defined in the ROD. Watershed analysis is a key component for implementing the Aquatic Conservation Strategy. Watershed analysis identifies opportunities for restoration and protection of aquatic and terrestrial ecosystems.

Watershed analysis assesses the health of an ecosystem at the watershed scale. This analysis has been used to identify key processes and functions that maintain healthy terrestrial and aquatic ecosystems within the Middle Fork of the Applegate River. Effects of human activities (historic, recent, and reasonably foreseeable future) and natural disturbances were assessed for their affects on these key processes and functions. This report will document the following: analysis completed by an Inter Disciplinary Team (IDT); important findings on watershed conditions and trends; recommendations for maintenance and restoration of ecosystem health; and additional data and information needed for future management.

1.1.2 CRITERIA FOR WATERSHED ANALYSIS UPDATES AND REVISIONS

Watershed analysis is an ongoing iterative process that will evolve as experience and knowledge of new techniques for completing this process grow. This report is a dynamic document, and it will be revised and updated as new information becomes available for the analysis area.

Updates of this document may include the following types of information:

- new or additional resource data collected at the project level,
- results of monitoring and analysis, and
- questions and answers clarifying findings and recommendations contained in this report.

During this analysis, southwestern Oregon experienced a significant rain-on-snow flood event during January 1997. Effects of the flood on the watershed were considered by the IDT in their recommendations. Revisions of this document may be warranted if new information collected indicates important changes in watershed conditions or trends.

1.2 WATERSHED CHARACTERIZATION

1.2.1 THE MIDDLE FORK WATERSHED ANALYSIS AREA

1.2.1.1 Location of the Middle Fork Watershed

The Middle Fork watershed covers approximately 32,219 acres, and is located within the headwaters of the Applegate watershed (see Map 1). It consists of the drainages of the Middle Fork and the Butte Fork of the Applegate River, Whisky Creek, and Cook and Green Creek. The watershed is a tributary of the Applegate River, and the Rogue River. The headwaters of the Middle Fork are situated in the Red Buttes Wilderness, within the Siskiyou Mountains on the Rogue River National Forest. Approximately ninety percent of the watershed is located in California., with the remainder in Oregon. The watershed ranges in elevation from approximately 2,000 feet at its confluence with Elliott Creek above Applegate Lake, to over 6,700 feet at Red Butte.

1.2.1.2 Basin Overview

The 492,730 acre Applegate watershed is one of seven sub-basins within the 3,300,000 acre Rogue River Basin, which flows into the Pacific Ocean (Map 1). The Rogue River Basin is located in the Klamath Mountain Physiographic Province and in the Cascade Mountains area (which includes the Western and High Cascade subprovinces). The Rogue River Basin is approximately 110 miles east to west, with the main river extending approximately 210 miles from its headwaters in Crater Lake National Park to Gold Beach. The upper section of the river originates in the steep topography of the Rogue-Umpqua Divide, the west slope of the Cascade Mountains, and the upper elevations of the Siskiyou Mountains.

The Applegate River meets the Rogue River in the central valley segment of the Rogue River. The lower Rogue River, below the confluence of the Applegate River, is characterized as a gorge with steep gradients and a tendency to transport sediment and large woody debris to the estuary and ocean.

The Rogue River serves as a highway for anadromous fish to reach the interior Rogue River streams for spawning and rearing. Much of the freshwater life-cycle of fall Chinook, spring Chinook, and summer steelhead is spent in the main stem of the Rogue River[1]. Coho salmon and winter steelhead are generally more dependent on tributary stream habitat and tend to stay in these habitats for one full year or more (Frick, 1994).

1.2.1.3 Land Ownership

The 32,219 total acres of land within the Middle Fork watershed are distributed as follows: 31,594 acres National Forest land, 578 acres private land inholding, and 47 acres Bureau of Land Management (see Map 2).

1.2.1.4 Subwatersheds

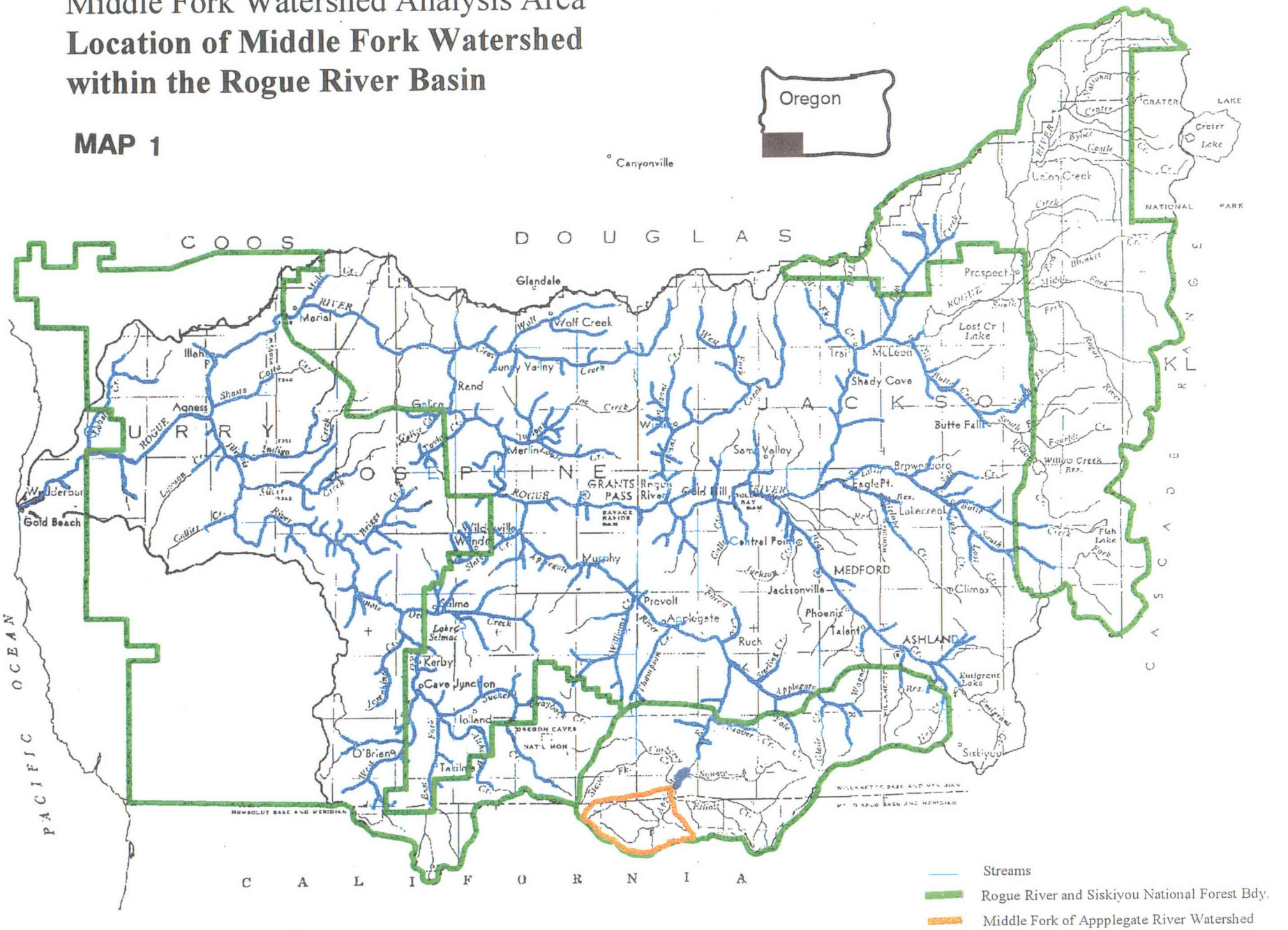
Five subwatersheds have been identified for analysis purposes; Butte Fork, Cook and Green Creek, Whisky Creek, Upper Middle Fork, and Lower Middle Fork (see Map 3 for location and Table 1 for acres). Together, these subwatersheds form a major tributary to the Applegate

[1] The Middle Fork watershed does not contain anadromous fish. The Applegate dam blocks all fish passage below the Middle Fork watershed.

Middle Fork Watershed Analysis Area

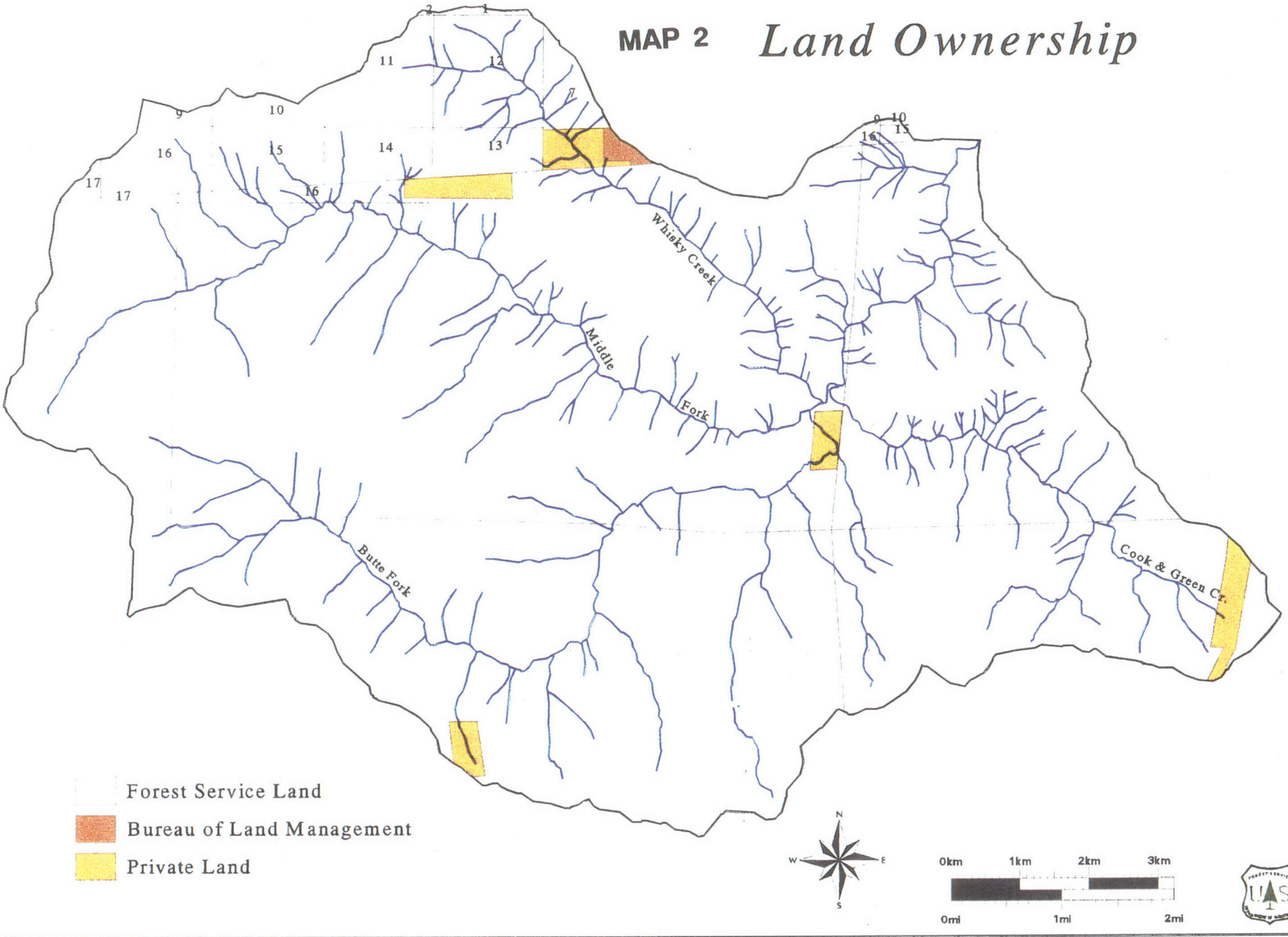
Location of Middle Fork Watershed within the Rogue River Basin

MAP 1



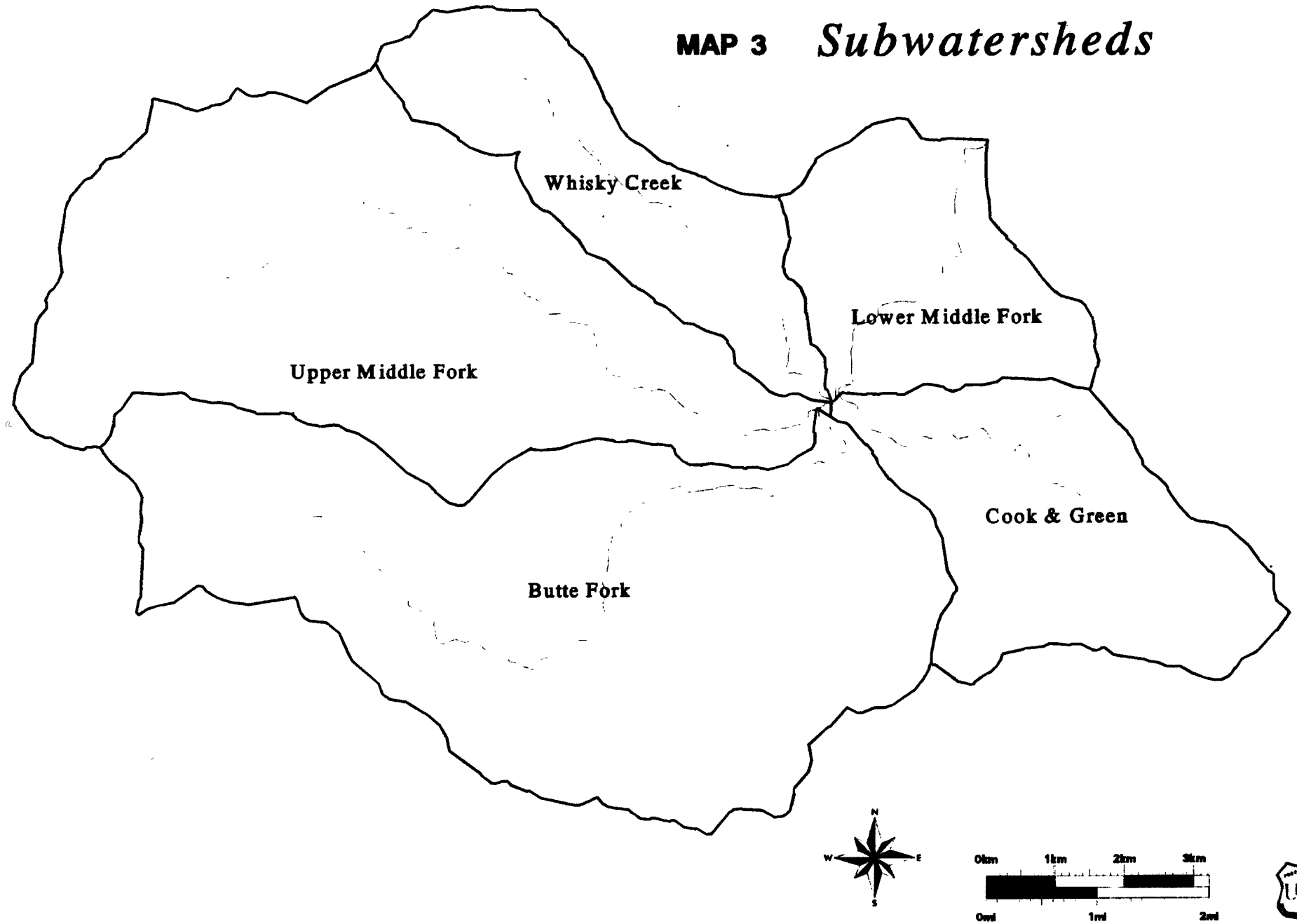
Middle Fork Watershed Analysis Area

MAP 2 *Land Ownership*



Middle Fork Watershed Analysis Area

MAP 3 *Subwatersheds*



River. The Applegate Dam which impounds the Applegate River down stream from the Middle Fork, forms a barrier that has caused the extirpation of the historic anadromous fishery in the Middle Fork watershed.

Table 1. Subwatersheds of the Middle Fork Watershed

Subwatershed	Acres
Upper Middle Fork	10,060
Lower Middle Fork	3,042
Butte Fork	11,632
Whisky Creek	3,339
Cook and Green Creek	4,183

1.2.2 ENVIRONMENTAL HISTORY NARRATIVE

1.2.2.1 Prehistory (10,000 B.C. to 1830. A.D.)

The Middle Fork watershed's generally high elevation terrain, its ruggedness and relative remoteness from major valleys, served to keep prehistoric human uses of the area both seasonal and light. However, the presence of the Siskiyou Crest along the area's southern edge--although the crest is approachable only by travel across steep slopes and up narrow stream canyons--provides a comparatively easily followed high-elevation travel route. The Crest gave access to an extensive summer/fall hunting territory for groups inhabiting adjacent areas such as the Klamath River Canyon and the lower Applegate Valley. Thus, perhaps somewhat ironically, the highest and seemingly most "distant" part of the watershed--the Siskiyou Crest--may have attracted much of the prehistoric use that did occur within the watershed.

Small "lithic scatter" archaeological sites are documented for several of the flats along the lower-most Middle Fork, as well as at mid-to-high elevation meadows. Smaller lithic scatters and isolated artifacts have been found at ridge-crest locations (i.e., the main Siskiyou Crest and its spur ridges). Additional flats and benches found along the Lower Middle Fork and Butte Fork canyons may contain remnant prehistoric cultural deposits (from light seasonal use), but historic period activities at these locations (e.g., mining cabins, recreation use) has probably obliterated most surface evidence. Aside from limited test investigations at one site along the Lower Middle Fork in 1979 (conducted by Oregon State University for the U.S. Army Corps of Engineers), no sites within the watershed have been excavated by archaeologists.

During the several millennia of human prehistory in the area, populations within the Middle Fork watershed were probably very low in numbers, extremely mobile, and present only during portions of the year. By late prehistoric times, it is likely that during most winters the area was virtually uninhabited; during the late spring through early fall, the average number of people within the watershed may have been no more than a few hundred. A few extended family bands, hunting and gathering along the Siskiyou Crest each summer, would have found little to entice them down onto the adjacent steep slopes except for localized resources: huckleberries, Sadler oak acorns, an occasional deer drive (aided by the use of fire and dogs). The waters of the Middle Fork and Butte Fork, although they contained native and anadromous fish, were probably only lightly used in comparison to lower elevation, more productive fishery sites well outside of the watershed.

Five major groups that inhabited the surrounding area during the Late Archaic period (i.e., the last 1,000

years before Euro-Americans arrived) were the Dakubetede, the Takelma (both of whom inhabited areas to the north), the Shasta (living to the east), the Gamutwa/Watido (apparently an ethnically "mixed" Shasta/Karok group, occupying the Seiad Valley vicinity of the Klamath River Canyon to the south), and the Karok (of the Klamath River canyon to the southwest). All of these groups probably used portions of the watershed at least to some degree, but the Dakubetede seem to have been the most common seasonal occupants of the area. Periodic burning (particularly of berry fields, meadows, and perhaps Sadler oak patches) certainly would have been a long-term form of land management employed by these groups. However, it is unknown just how extensive anthropogenic fire (i.e., relative to natural fire) was within this area. (Compared to lower-elevation portions of the Applegate River drainage, where human-set fires would have been a very important factor in the creation and maintenance of particular vegetation communities, anthropogenic fire within the Middle Fork watershed may have been less frequent, less extensive, and more concentrated within a few favored locales).

1.2.2.2 Early Euro-American Exploration (1775-1855)

The Middle Fork watershed, as the headwaters of the Applegate River, was the last portion of that drainage to be explored by Euro-Americans. Maritime exploration of the Oregon Coast began in the 1770s and increased during the 1790s, but no exploration of the interior of southwestern Oregon occurred until the fur trappers of the Hudson's Bay Company arrived in the late 1820s. These trappers undoubtedly saw the peaks of the Siskiyou Crest--Red Buttes, Kangaroo Mountain, etc.--from the Applegate Valley during their first visit, in 1827. However, there is no indication that the trappers actually entered the area at that time, or later. Early trapping was done in the winter by fast-moving "brigades" that concentrated on more accessible streams. Therefore, the first actual penetration of the area by Euro-Americans may not have occurred until 1852-53, when gold miners arrived in the Applegate Valley.

1.2.2.3 Mining and Other Early Resource Extraction (1852-1910)

Prospecting for gold in the stream placers of the uppermost Applegate River drainage began in 1852-53. Miners certainly investigated the gravel deposits of the watershed during the early mining period of the 1850s-70s. However, because of geological factors, placer mining in the Middle Fork Watershed has always been significantly less than has occurred in the adjacent Elliott Creek, Carberry Creek, and main stem of the upper Applegate River areas. Large-scale hydraulic gold mining, for example, took place during the 1880s-90s along lower Elliott Creek, along upper Carberry Creek and Steve Fork, and along the Applegate River near the mouths of Carberry Creek and Squaw Creek; all of these mines were located less than five miles from the Middle Fork watershed boundary, but only a single, small, short-lived hydraulic mine operated along the lower-most Middle Fork. Virtually no lode or hard-rock gold mines were located within the watershed during this time. Gold was indeed present, but in very small amounts and in difficult-to-work locations.

Also unlike adjacent drainages of the upper Applegate River watershed, no agricultural settlement occurred within the watershed. Again, the area's physical geography, especially its almost total lack of level arable land, was the primary factor. During the last half of the nineteenth century, settlers living in the upper Applegate Valley definitely visited and used the watershed. They ranged hogs on the brushy slopes and, later, they grazed cattle in the meadows of the Siskiyou Crest. (As with mining, the watershed's geographic character limited grazing to small numbers of stock in very localized areas such as Cameron Meadows; cattle grazing was more feasible along portions of the Siskiyou Crest to the east and northwest of the watershed). Settlers hunted deer, elk, bear, and other game within the area; they

trapped fur-bearing mammals such as marten; and they may have harvested an occasional sugar pine from the steep Middle Fork canyon for manufacture into shakes.

When Oregonians passed a state-wide alcoholic prohibition law in the first decade of the twentieth century, moonshining likely became another seasonal activity within the Middle Fork area (evidence of at least one moonshine still is documented for a cabin site on the upper Middle Fork). As most of the people using the watershed (which is located in California but far from the nearest state/county authorities) were Oregon residents, the area may have begun its legal "noman's land" reputation at this time.

> Note: In addition to Stricklin Gulch, several other place-names within the watershed evidently date to the 19th-century mining and grazing era: Cook-and-Green Creek/Pass, French Gulch, Cameron Meadows, Goff Butte, and Whisky Ridge/Creek. A number of watershed place-names date to early 20th-century Forest Service rangers: Abney Butte (named for a ranger's survey instrument lost on the mountainside), Fruit Mountain (for ranger Bill Fruit), Mt. Emily (for the initials of Forest Supervisor Martin L. Erickson), Buck Peak (for Regional Forester Cecil Buck, not for a male deer); Kangaroo Mtn., Pyramid Peak, Figurehead Mtn., and Phantom Meadows may have been named by Forest Service employees as well.

1.2.2.4 Early Forest Service and the Depression (1910-1940)

Early-day Forest Service activities within the Middle Fork watershed consisted largely of fire detection, fire suppression, trail building, periodic contact with the area's small population of nomadic prospectors, and limited administration of grazing along the Siskiyou Crest. After a large 1910 fire swept up the west-aspect slopes of the Lower Middle Fork Canyon (jumping over the ridge and threatening the Elliott Creek community of Joe Bar), fire lookouts were erected on Windy Peak and on Whiskey Peak. The Middle Fork area was the last large section of the Applegate Ranger District to be "trailed" by the Forest Service. The Lower Middle Fork canyon remained the only portion of the watershed to have a "USFS system trail" until as late as 1920. During the 1920s, the agency built additional trails up the Butte Fork canyon and along the Siskiyou Crest (the "Boundary Trail"). (The Butte Fork Landslide, one of the largest recent mass-wasting events in the upper Applegate drainage, occurred in the 1920s. It was apparently an entirely natural event, unaffected by road building or logging).

During the 1905-1920 period, not far to the east of the Middle Fork watershed, copper mining brought relatively large numbers of people and extensive infrastructure development to parts of the Elliott Creek drainage. However, the low-grade copper ore deposits did not extend into the Middle Fork area, and none of this mining activity occurred within the watershed Only the "Mohawk Mine," a small placer gold operation on Knox Gulch, had any semblance of long-term mining activity. During the Great Depression, stimulated by both lack of jobs and the federally-supported high price of gold, a number of men arrived in the upper Applegate drainage to prospect and work very small placer mines. Some of them lived in or seasonally mined in the Middle Fork watershed (A few of these individuals remained into the postwar years, achieving a measure of local fame as "hermits" and "solitary sourdoughs" representative of a bygone era). By the late 1930s, virtually each of the small flats along the Lower Middle Fork as far upstream as the mouth of Marble Gulch contained a miner's tent, shack, or small cabin, and perhaps a fruit tree and small garden plot. These sites were connected to the "outside world" by a Forest Service road (built by the Civilian Conservation Corps) in the mid-1930s. Built upstream almost to Marble Gulch, the Middle Fork road remained the only vehicular travel route within the entire

watershed until the early 1960s.

1.2.2.5 World War II and After (1940-1980s)

America's entry into the Second World War brought a federally mandated shut-down of almost all gold-mining operations nationwide. Mining of various "strategic minerals," however, was encouraged and financially supported by the government. In the early 1940s, the U.S. Army funded and assisted in construction of a crude truck road to a complex of small chromite and asbestos deposits in the Red Buttes vicinity. Although this road (which accessed the Red Buttes mines from Seiad Valley via Cook and Green Pass) was tributary to the Klamath River canyon highway, a short spur was extended north over the Siskiyou Crest to reach the Kubli chromite mine in upper Hello Canyon. (Aside from the Kubli mine, all of the war-time mining activity was located on the Klamath River side of the crest). The road from Cook and Green Pass to Hello Canyon continues to serve as the main travelway used by Klamath River ranchers' cattle grazing at Bee Flat, Lilypad Lake, Kangaroo Springs, and (although unauthorized) Hello Canyon.

Due to high road-building costs and the available of timber from more accessible drainages, the remote timber of the Middle Fork watershed did not become economical to harvest until well after the war. In the early 1960s, the Forest Service extended a timber-haul road from near the terminus of the old Middle Fork road north up the spine of Whisky Ridge almost to the California/Oregon boundary (this road was not connected through to the upper Whisky Creek/Carberry Creek road system until over a decade later). In the mid-1960s, the Middle Fork road was built south to the Middle Fork/Butte Fork divide; from there, the Forest Service extended the road during the late 1960s almost the full length of the upper Middle Fork to Sweaty Gulch. A number of clearcut and shelterwood units were harvested (using highlead and then skyline cable systems with mobile yarders) on the steep slopes along these roads during the 1960s-70s. (The upper Middle Fork road's tie-through to the Steve Fork/Carberry Creek road system, via Low Gap, was not built until about 1980). During the 1970s, Forest Service contractors pushed the Elliott Creek/Joe Creek road system over Bloomfield Pass and into the Middle Fork watershed to the old Seiad Valley mining road at Cook and Green Pass. (Transportation plans for the early 1970s called for almost twenty miles of additional roads in the Butte Fork canyon and high up along the Middle Fork side of the Fruit Mountain/Mt. Emily ridge system).

By the 1960s, the various mining cabins along the Middle Fork, some of them occupied since the Depression, had become "occupancy trespass" structures situated on invalid mining claims. Years of legal measures by the Forest Service eventually resulted in the abandonment of most claims and the removal of all but a few of the oldest structures. The Army Corps of Engineers removed the last of the Middle Fork's "Depression era" mining cabins, a cluster of buildings near the mouth of Elliott Creek, in about 1979. The flats where miner's cabins once stood, (many of them situated at good swimming holes) continue to serve as popular dispersed camping and picnicking sites, used primarily by Jackson County residents.

As a "backcountry" area, the Middle Fork watershed (especially the unroaded Butte Fork canyon and Siskiyou Crest) attracted increasing numbers of equestrians, hikers, and motorcyclists during the postwar years. (The area was prominently featured in a popular 1970s backpacking guide, "Hiking the Big Foot Country"; this publication probably brought more people to the watershed's backcountry trails, including some who lived significantly longer distances away than previously). In 1984, Congress designated much of the watershed (including almost the entire Butte Fork drainage) as the Red Buttes Wilderness.

Although use of the unroaded portions of the watershed over the years by recreationists has been light compared to many other similar areas, use-concentration at popular lakes (Azalea lake and Lonesome Lake in particular) has resulted in vegetation loss and other impacts. In the early 1990s, much of the rest of the watershed was allocated to "Late-successional Reserve" under the Northwest Forest Plan. As in prehistoric and early historic times, the Middle Fork area's ruggedness, remoteness, and ecological uniqueness continue to be dominant factors in the kinds of human uses that occur (or are legally permitted to occur).

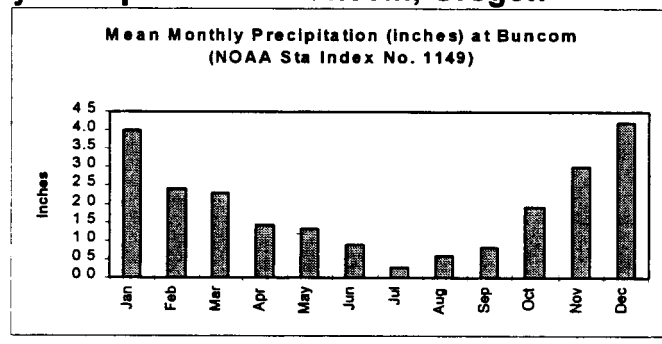
1.2.3 WEATHER AND CLIMATE

The Middle Fork watershed experiences the Mediterranean climate typical of southern Oregon. A prolonged cool wet period, from late October through May, is followed by a hot dry season from June into October.

1.2.3.1 Precipitation

Figure 1 displays average monthly precipitation at a nearby weather station. Although Buncom is not within the analysis area (approximately 30 miles away) it is the closest weather station with reliable long-term data. However, the seasonal distribution of precipitation displayed by Figure 1 is similar in the Middle Fork Analysis Area. Approximately eighty-five percent of annual precipitation occurs from October through April. Winter precipitation is often associated with large storm systems moving inland from the Pacific Ocean. Except for thunderstorms, usually at higher elevations, rainless periods of several months are common during the summer.

Figure 1. Mean Monthly Precipitation at Buncom, Oregon



Map 4 displays the distribution of average annual precipitation over the analysis area. Annual precipitation ranges from 38 inches per year at the lower elevations, to 65 inches in the crest zone. Most precipitation occurs as snow above 5000 feet and as rain below 4000 feet. The transient snow zone is generally between 4000-5000 feet.

Middle Fork Watershed Analysis Area

MAP 4 *Annual Precipitation*

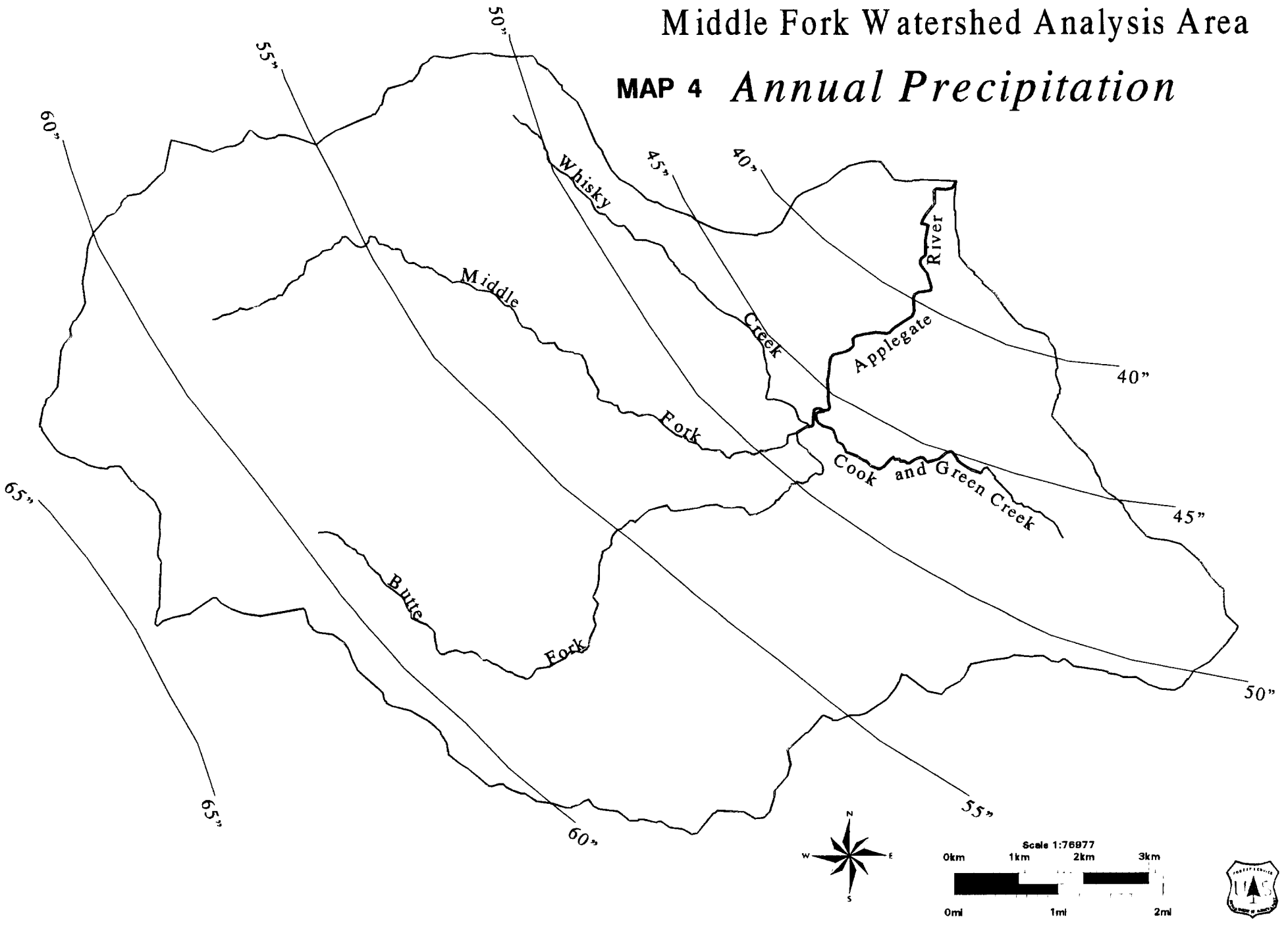
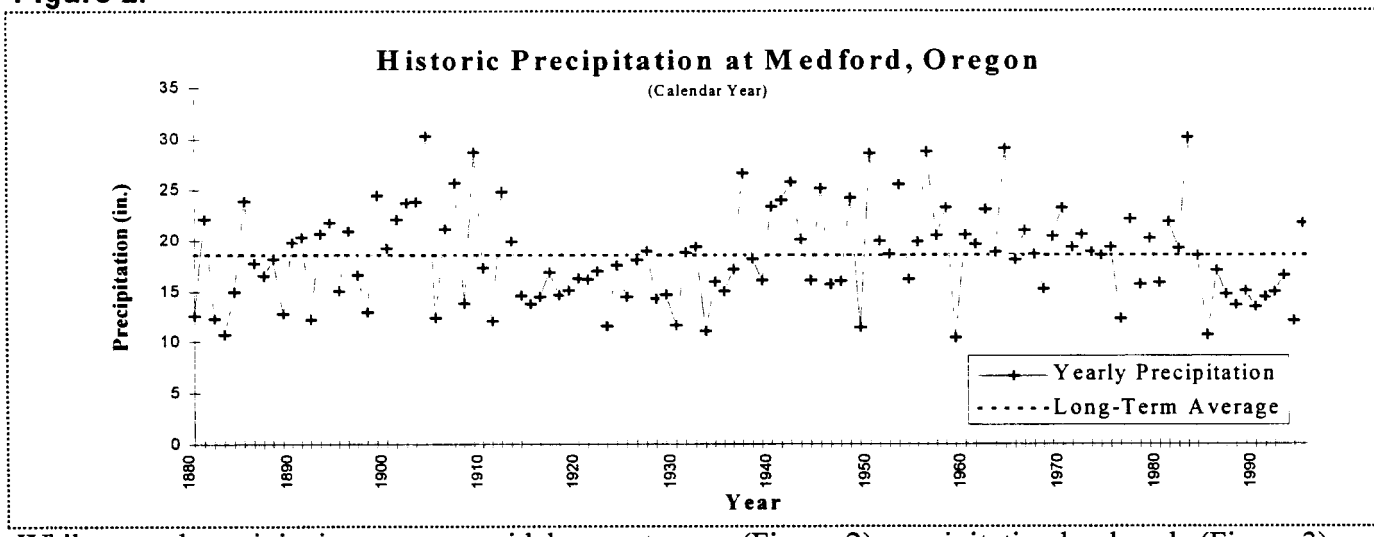
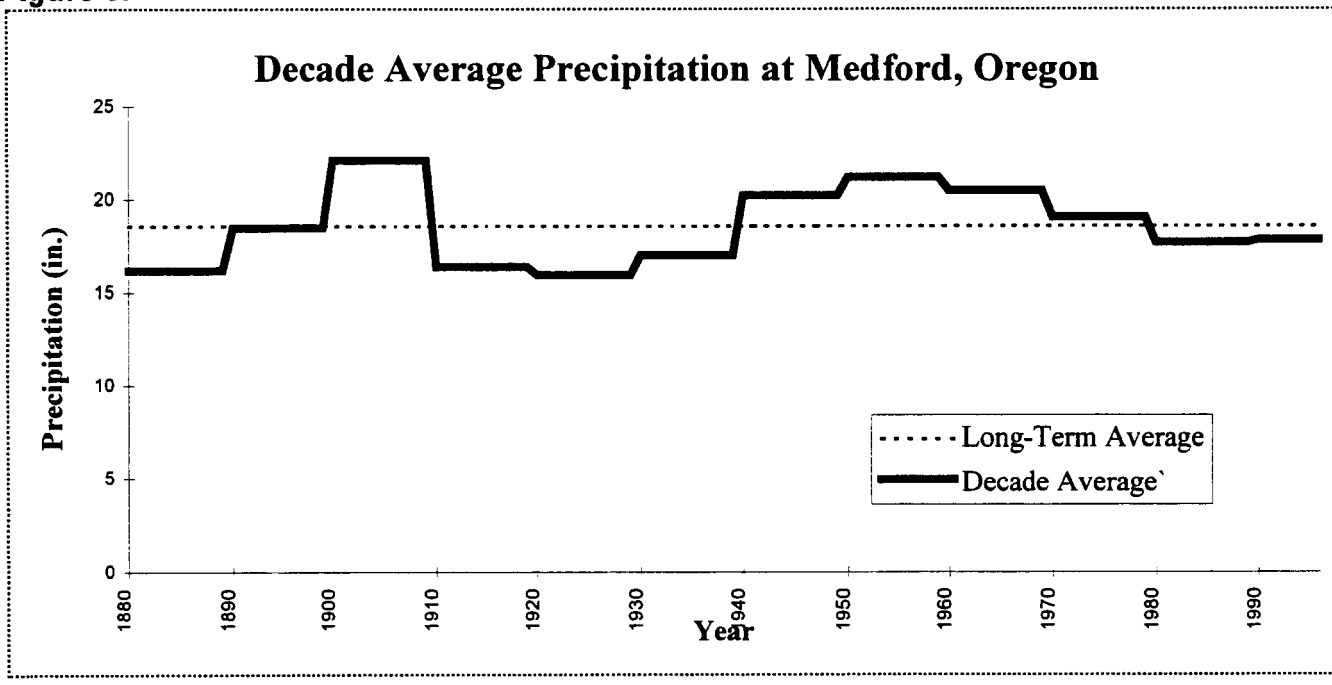


Figure 2.



While annual precipitation can vary widely year to year (Figure 2), precipitation by decade (Figure 3) indicates definable periods of wet and drought years. With a steady decline in precipitation over the past four decades, southwestern Oregon experienced drought conditions from the mid 1980s through the mid 1990s.

Figure 3.



1.2.3.2 Temperature and Humidity

Temperatures display wide variations throughout the watershed, daily, seasonally, and by elevation. Summertime daily temperatures commonly exceed 100 °F at the lower elevations, but may be 10-20 °F cooler in the crest zone. Winter highs commonly range in the 50's °F at lower elevations, to the 30's °F at the crest. Diurnal fluctuations up to 40 degrees are common throughout the year.

Summer temperatures can be closely estimated for the Middle Fork watershed from data collected at the Squaw Peak remote automatic weather station (located seven miles from the watershed, elevation 4,964 feet) and the Star Ranger Station weather station (located 9 miles from the watershed, elevation 1,676 feet). (See Tables 2 and 3).

Table 2. Summertime Temperatures at Squaw Peak

Squaw Peak (Month of)	Average High Temperature (°F)	Maximum High Temperature (°F)
June	65	89
July	72	90
August	72	89
September	68	92

Table 3. Summertime Temperatures at Star Ranger Station

Star Ranger Station (Month of)	Average High Temperature (°F)	Maximum High Temperature (°F)
June	80	107
July	87	107
August	90	107
September	86	108

Relative humidity readings are often in the single digits during the late summer months, particularly in September.

Elevation and aspect influence micro-climate and vegetative response. Low-elevation, south aspects are generally hot and dry. North aspects are relatively cooler and more moist.

1.2.3.3 Droughts

Medford weather data (collection of which commenced in 1911) indicate serious drought conditions from 1928 through 1935, with the most severe drought occurring in 1929-31 (Rivers, 1963). Later years of notably high summer temperatures and low annual rainfall in the eastern Siskiyous were 1946-47, 1949, 1959, 1967-68 and 1993-94 (National Oceanic and Atmospheric Administration, 1975). The regional drought of the mid-1980s through the early 1990s is simply the latest in a series of drought cycles of varying severity (LaLande, 1995). (See Figure 3 for precipitation by decade).

1.2.4 GEOLOGY AND SOILS

The Middle Fork and Butte Fork watersheds of the Applegate River are entirely within the Klamath Mountains Geologic Province, also called the Siskiyou Mountains. The Klamath Province consists of four adjacent belts of rock that roughly parallel the coastline of northern California and southern Oregon. These belts are progressively younger as they approach the coast, ranging in age from 350 to 153 million years. They consist of a complex collection of collapsed, back-arc basins and accreted terrain's, with the older of any two adjacent belts thrust-faulted over the top of the younger one.

In the Middle Fork watershed, only two of these belts are present. These belts were originally sections of ocean crust, approximately 4 miles in thickness. About 153 million years ago the older belt was thrust-faulted over the top of the younger belt by at least 62 miles.

Throughout the last 150 million years, this area was relatively flat. Relief was gentle, and thick lateritic soils covered the landscape which was likely characterized by broad flood plains, a few large meandering rivers, and rolling hills.

Starting about 14 million years ago and continuing through the present, the area around the Middle Fork watershed was uplifted. The uplift was centered under Condrey Mountain, to the east of the watershed, on the Rogue and Klamath River Divide, and is referred to in geologic literature as the Condrey Mountain Dome (CMD). The CMD was uplifted a minimum of 23,000 feet in elevation. As this uplift progressed, the surrounding area also rose and/or tilted.

As the older ocean crust slid 62 miles over the top of the younger ocean crust, rocks were sheared and juxtaposed with rocks from other levels of this 4 mile thick slab of ocean floor. Heat and pressure, produced by sliding and thickening, changed the minerals present into others that are more typical of higher temperatures and pressures.

- Coral reefs and sediments of the ocean floor, compressed into limestone and marble, are situated in the upper portion of this 23,000 feet layer.
- Massive sulfide deposits are sometimes found between overlying sediments and volcanic rocks. These include: gold, platinum, cobalt, mercury, silver, copper, and chrome and other minerals deposited by hot springs found near spreading centers. All ocean floors were created at spreading centers, and could be covered with these mineral deposits. The Blue Ledge Mine, in the southeast corner of the watershed, is a massive sulfide deposit.
- Increases in pressure and temperature induced peridotite, which is located in the lowest portion of the upper plate, to change into talc-rich serpentine. Serpentine exists along edges of most large, intact blocks in the upper part of the resulting melange. Serpentine almost always contains some asbestos, which is a known health hazard to humans.
- Increases in pressure and temperature between these two massive sliding plates also induced the sediments and ocean floor lava flows (in the upper portion of the lower plate) to re-crystallize into the black and green schists of the Condrey Mountain Dome.
- Pods of granite intruded through both levels of these supra-imposed oceanic floors. Intrusions often deposit precious minerals in the surrounding area. Granite weathers into a coarse, sand-like residue called "grus". Grus has no clay to hold particles together. As a result, streams and/or wet areas in granitic terrain have a high rate of debris slides. Grus damages fish habitat by filling the open space between cobbles. Though present, granite is not common in the Middle Fork watershed.

The uplift of the Condrey Mountain Dome occurred in periodic events. This uplift is thought to continue today, though at a much slower rate.

With this great increase in relief, the 7 km thick upper plate quickly eroded away, exposing a window into the underlying plate. This window is several hundred square miles in size. Approximately 10 square miles of the Condrey Mountain Dome (CMD) is in the Middle Fork watershed. The CMD is comprised of two rock types; a highly unstable black schist and a

relatively stable green schist. Only the green schist is found in this area, and occupies the eastern edge of the Middle Fork watershed.

Erosion removed over 20,000 vertical feet of rock that once covered the green schist. A vertical fault separates the green schist from the rest of the watershed, resulting in less uplift and less (though still significant) erosion in the western two-thirds of the watershed. Fish, wildlife, and fauna evolved on the watershed in this sediment-rich regime.

Increased relief resulted in the steeply incised streams and steep slopes characteristic of the watershed. The present-day watershed was sculpted by raveling, earth flows, debris torrents, and glaciers, which acted as the dominant forms of mass wasting. A review of geological literature generally indicates that glacial ice extended down to 5,500 feet elevation. Glacial moraines are found throughout the study area. Moraines on Whisky Ridge (4,500 feet elevation) and across the ridge-tops of Middle Fork Canyon (3,500 feet elevation) along Forest Road 1040 suggest that Middle Fork Canyon, between the two ridges, may have been occupied by a glacier down to at least 3,000 feet elevation.

1.2.4.1 Rock Types

Past and present climatic conditions control weathering, mass wasting, and erosion processes which impact geologic materials. Landforms in the watershed today are the result of continual interactions between climate and regional geology over eons of time. (See Map 4). The type of rocks found throughout the watershed has an effect on soils development. Different mineralogy, structures, inherent strength of the bedrock, and resistance to erosion and mass wasting influence the landforms.

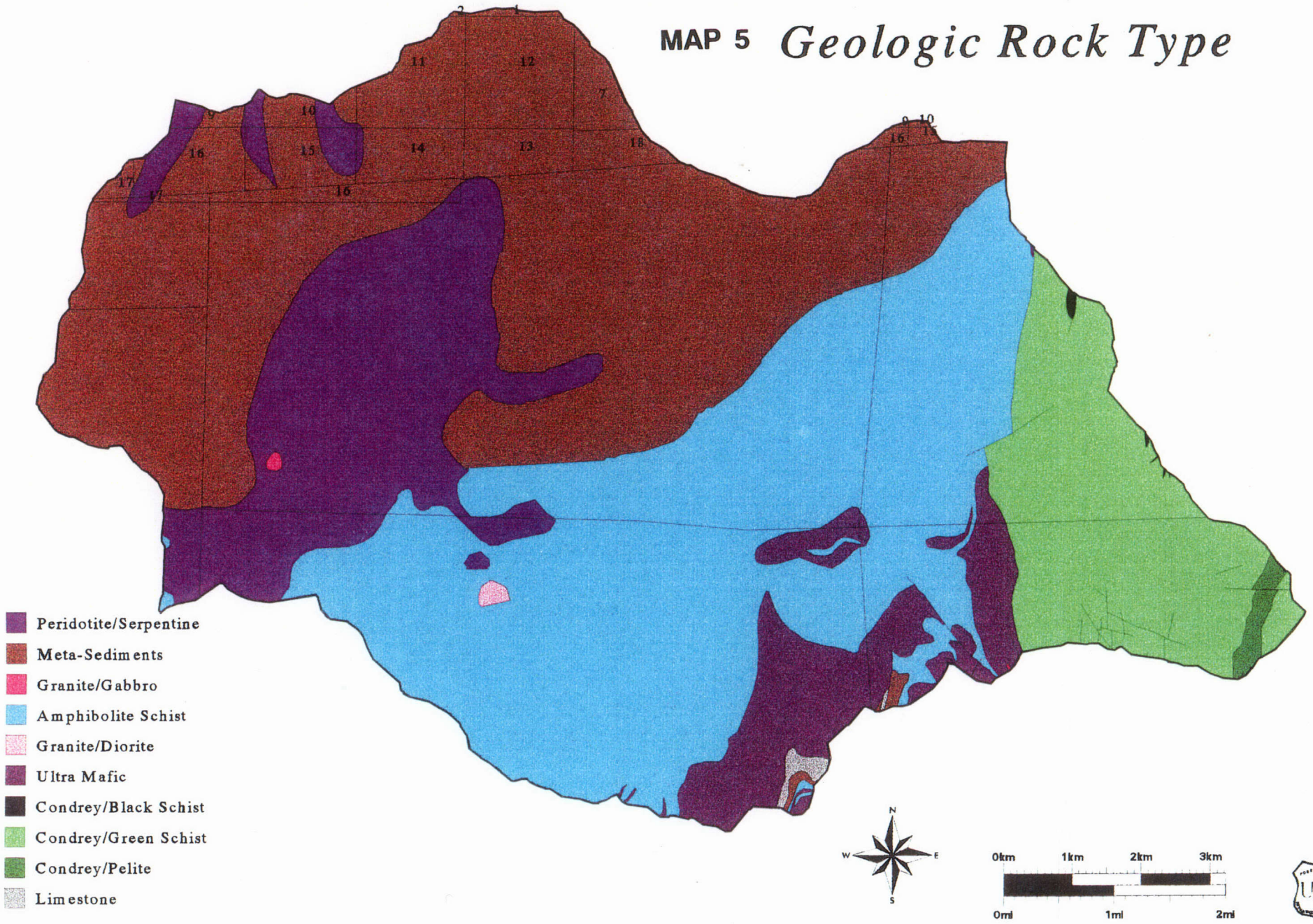
Granitic rocks and, to a large extent, amphibolite rocks are noted for their high strength when not subjected to weathering. However, after exposure to weathering, coarse mineral grains are readily separated from each other by the process of decomposition. Separated crystals of feldspar and quartz form sandy decomposed granite soils that are easily transported away from the parent material through surface erosion or debris slides. This process is very active in the headwaters of the watershed. Rapid erosion processes maintain granite and amphibolite bedrock near the surface rather than allowing development of a thick soil mantle.

Ultramafic rocks (peridotite and serpentine), present in the watershed, contain minerals which weather to form soils rich in clay. Where erosion does not outpace weathering (as on middle-and-lower slopes), thick, potentially unstable soil deposits can form. The same type of bedrock in the upland or glaciated headwaters produces thin rocky soils where erosion strips away the weathering products as rapidly as they are formed.

Metasedimentary and metavolcanic rocks, also found in the watershed, are relatively resistant to erosion and often occur on steep slopes. Resulting soils are shallow, composed of silts and clays with variable amounts of rock fragments. Generally, the upper fractured bedrock has a thin weathering zone. Metasedimentary and metavolcanic rocks form dense, tight formations as a result of interlocking crystals in the original sediments and lava flows, and low-grade metamorphism. Unlike granitic intrusions, which form miles below the earth's surface, lava flows and sediments form at surface levels which are subject to atmospheric pressures and

Middle Fork Watershed Analysis Area

MAP 5 *Geologic Rock Type*



temperatures. As a result, they are more resistant to weathering and erosion. This, coupled with their position in the lower precipitation zone of the watershed, has resulted in the rugged relief of the metavolcanics.

1.2.4.2 Geomorphology and Soils

(See Map 5)

Steep Green Schist (SGS) -

Elevation Range:	2500-5800 feet
Aspect:	all
Slope Shape:	long, straight
Slope Gradient:	60-80%
Rocktype:	green schist
Dominant Slope Processes:	ravel, rockfall, creep, debris slides
Soils:	gravely loam and sandy loam topsoil and subsoil, 1.5-30 feet deep
Erosion Potential:	high
Slope Stability:	unstable in drainages
Site Productivity:	low on southern aspects; moderate on northern aspects

The eastern portion of the Middle Fork watershed has formed on green schist associated with the Condrey Mountain Dome terrain. It is dissected by Cook and Green Creek, a very active downcutting stream which has steepened slopes creating an extremely steep topography. Processes associated with steep slopes, such as rockfall, creep, and ravel are very active. Colluvial material accumulates on dipslopes and drainageways, but in general, the soil mantle is very shallow, and not prone to mass movement. However, during flood events, accumulated material in draws is subject to downcutting and debris sliding.

Soils derived from green schist are draughty due to the high rock content and shallow depts. This effect is more pronounced on the southern aspects, where the vegetative communities are xeric.

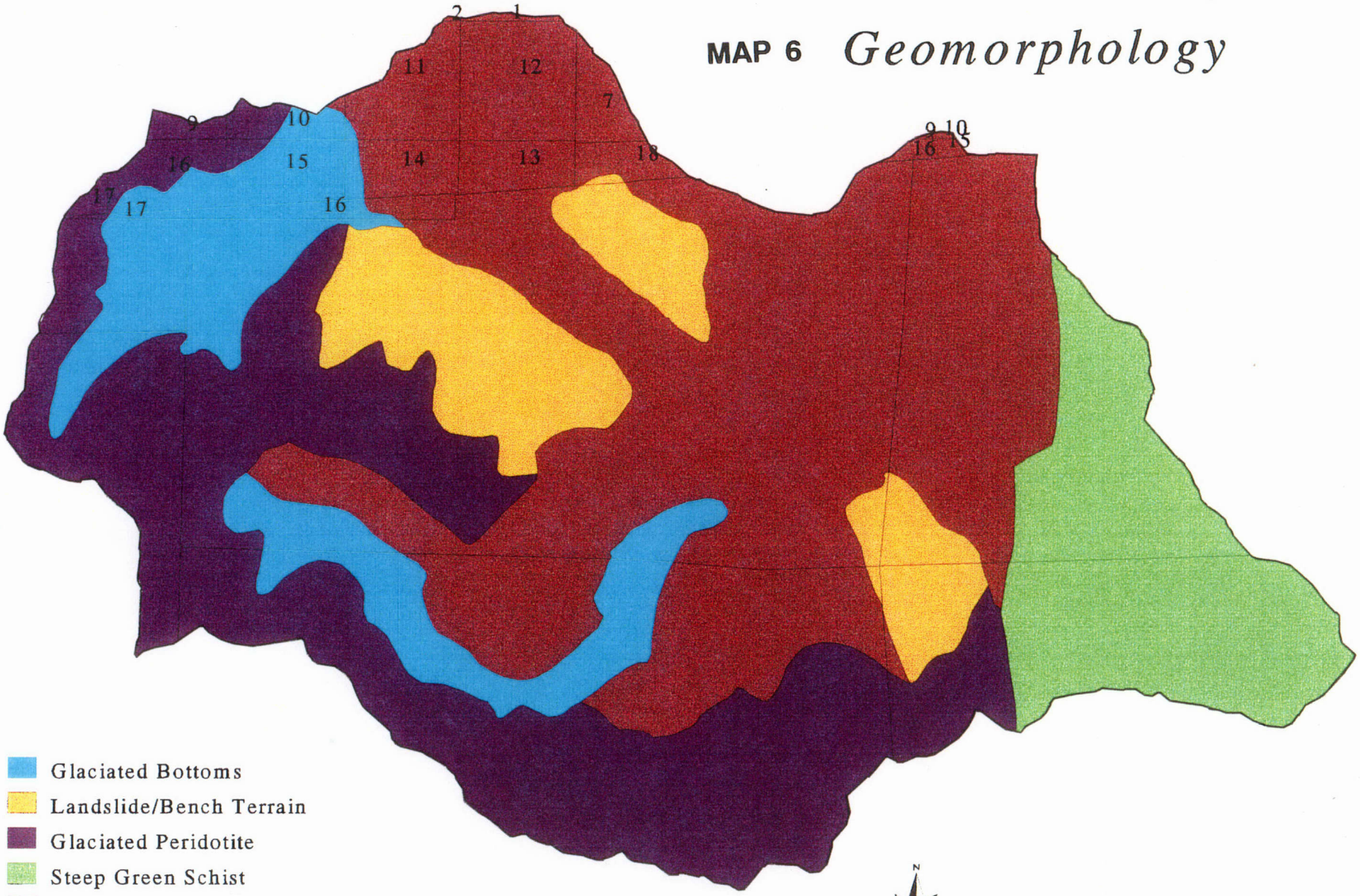
Resistant Metavolcanic (RM) -

Elevation Range:	2000-6000 feet
Aspect:	all
Slope Shape:	long, straight
Slope Gradient:	50-80%
Rocktype:	metavolcanic and metasedimentary, with some peridotite
Dominant Slope Processes:	ravel, soil creep, rockfall
Soils:	gravely silt and sandy loam, 2-40 feet deep
Erosion Potential:	low to moderate
Slope Stability:	moderately stable
Site Productivity:	low

This is the most common landscape and is concentrated in the central and northern portions of the Middle Fork watershed. The steep slopes have long, straight profiles. Soils are shallow and skeletal on the south slopes with very little topsoil or duff, while north slopes have a deeper

Middle Fork Watershed Analysis Area

MAP 6 *Geomorphology*



topsoil and duff depth. Many of the shallow drainages are filled with cobble-sized material that has moved through rockfall or soil creep processes from the surrounding sideslopes. Though many of these shallow drainages transmit water through the rock cobble, the occurrence of surface water is uncommon due to the presence of this material.

Whisky Ridge typifies this area. The south slopes are very steep and non-forested due to poor soils, low rainfall, and high evaporation rates. By contrast, the northern slopes are cooler and favorable for conifer growth. Reforestation is extremely difficult in areas of high rock content.

Landslide/Bench Terrain (LB) -

Elevation Range:	2600-5200 feet
Aspect:	north
Slope Shape:	broken and with hummock
Slope Gradient:	30-60%
Rocktype:	peridotite and serpentine
Dominant Slope Processes:	earth flow and deep weathering, channel erosion
Soils:	gravely loam and clay loam; deep on the gentler slopes
Erosion Potential:	high
Slope Stability:	unstable, especially at breaks in slopes
Site Productivity:	moderate

This landscape is typified by the Butte Fork Slide. Butte Fork Slide is old and very active, with several very steep, massive scarps, and barren of vegetative cover. This landform is a constant source of sediment of all sizes (boulders to gravel) and large woody debris to the Butte Fork and Middle Fork of the Applegate River. The constant removal of overstory in the toe of this slide near Butte Fork makes this a permanent feature on the landscape for thousands of years to come.

Glaciated Bottoms (GB) -

Aspect:	all
Slope Shape:	U-shaped, concave
Slope Gradient:	10-40%
Rocktype:	predominantly peridotite with some metavolcanic
Dominant Slope Processes:	surface erosion
Elevation Range:	3000-5200 feet
Soils:	deep soils - variable
Erosion Potential:	moderate to high
Slope Stability:	stable
Site Productivity:	moderate to high

This landscape was formed through several valley glaciations that occurred over the last 500,000 years. The landscape is comprised of deep glacial till of all ages. The gently rolling terrain of the upper reaches of Middle Fork (Bean Gulch area) is a glacial feature that was formed several ice ages ago, while glaciers of the last two ice ages carved out Butte Fork and created many of the cirque basins in this area. Soils of the Bean Gulch area are deep and very weathered while the soils of more recent glaciation (upper reaches of Butte Fork) are less weathered and have a higher content of boulders, cobbles, and gravel. The deep glacial

material acts as an excellent reservoir for snow melt accumulation. This water is released over the summer months through seeps.

Glaciated Peridotite (GP) -

Elevation Range:	4200-6700 feet
Aspect:	mainly north
Slope Shape:	U-shaped, concave
Slope Gradient:	10-80%+
Rocktype:	predominantly peridotite and serpentine, some metavolcanic
Dominant Slope Processes:	cold weather processes, surface erosion, ravel and rockfall on the steeper slopes
Soils:	thin and very rocky
Erosion Potential:	low
Slope Stability:	Stable
Site Productivity:	low

This landscape forms the spectacular ridges surrounding Red Butte. It can be seen from viewpoints in the Applegate. Created by small glaciers and snowfields, this landscape has many cirque basins surrounded by steep, barren slopes. Many of the small mountain lakes of the Applegate reside in these basins (Echo, Elk, Hello, Towhead, Snake, Azalea, and Frog Pond). The red color of Red Butte is from the weathering of peridotite and serpentine, which are high in iron. Parent materials, often characterized by an imbalance of certain minerals and rocky terrain, are poor for plant growth. Certain endemic plant species have evolved on these soils and are very unique to the Applegate area.

1.2.4.3 Key Processes and Functions

Agents of erosion and mass wasting for this watershed are similar to those found on other watersheds in the surrounding area. Refer to Squaw/Elliot/Lake, Carberry, and Beaver/Palmer Watershed Assessments for detailed discussions of erosion and mass wasting. Refer to the Applegate Aquatic Assessment for information on soils rich in clay, and the ecological importance of unstable terrain.

1.2.4.4 Historic and Current Conditions

The Applegate watershed is an area of high natural erosion and sedimentation rates. Some key concepts relating to geology within the Middle Fork watershed are:

- Roads and past management activities are not solely responsible for current sedimentation rates.
- Relatively recent uplift and glaciation have created oversteepened slopes.
- Vegetation adjacent to streams impedes channel down-cutting.
- Debris torrents and floods have transported large woody material from high gradient streams to Class 2 streams.
- Decomposed granite increases local embeddedness of streams by filling interstices of stream gravels with coarse sand.
- Outcrops of serpentine and granite are widely dispersed and often small in size, and may be the limiting factor in the distribution of some threatened, endangered, and sensitive

(TE&S) species (refer to Map 4).

- Deposits of gold, copper, mercury and chrome potentially exist for commercail extraction.

1.2.5 WATER

1.2.5.1 Hydrologic Features

Streams, lakes, and wetlands are displayed in Map 7. The miles of stream by stream class and by subwatershed are displayed in Table 4; Class 1 and 2 (fish-bearing) stream miles are combined, as are Class 3 and 4 (non fish-bearing) stream miles. Within the Middle Fork watershed, twenty-one percent of all stream miles are fish-bearing, and seventy-nine percent are non fish-bearing.

Table 4. Stream Miles by Subwatersheds

	Fish Bearing (Class 1 & 2)	Fish Bearing (Class 3 & 4)
Subwatershed	**Stream miles**	**Stream miles**
Upper Middle Fork	7.2	26.7
Lower Middle Fork	3.7	15.4
Whisky Creek	4.6	14.3
Cook & Green	3.2	17.9
Butte Fork	7.6	26.9
All	26.3	101.2

Several natural lakes occur within the watershed. They are small (generally under 10 acres), located at higher elevations (usually above 4,500 feet), and primarily found within the Red Buttes Wilderness. There are no large lakes or reservoirs.

Wetlands comprise a very small percentage of the watershed. They consist of wetland shrub communities, wet grass/forb meadows, alder glades, conifer/wetland complexes, bogs, springs, and seeps. Wetland communities are mostly found at higher elevations (above 4500 feet), and concentrated in the headwaters of Butte Fork subwatershed.

1.2.5.2 Water Yield, Stream Flow, and Uses

The Middle Fork watershed is an area of high runoff. Water yield is estimated to average about 111,000 acre-feet per year. This volume is equivalent to about 48 inches of runoff, and it represents over eighty-five percent of average annual precipitation.

As is typical in this region, the watershed experiences wide seasonal variations in runoff, which closely follows the seasonal precipitation pattern (see Figure 1). Approximately eighty-two percent of the annual runoff occurs from December through May. Seasonal variations in runoff can be seen in Figure 4, which looks at monthly discharges for the Middle Fork.

Middle Fork Watershed Analysis Area

MAP 7 *Hydrologic Features*

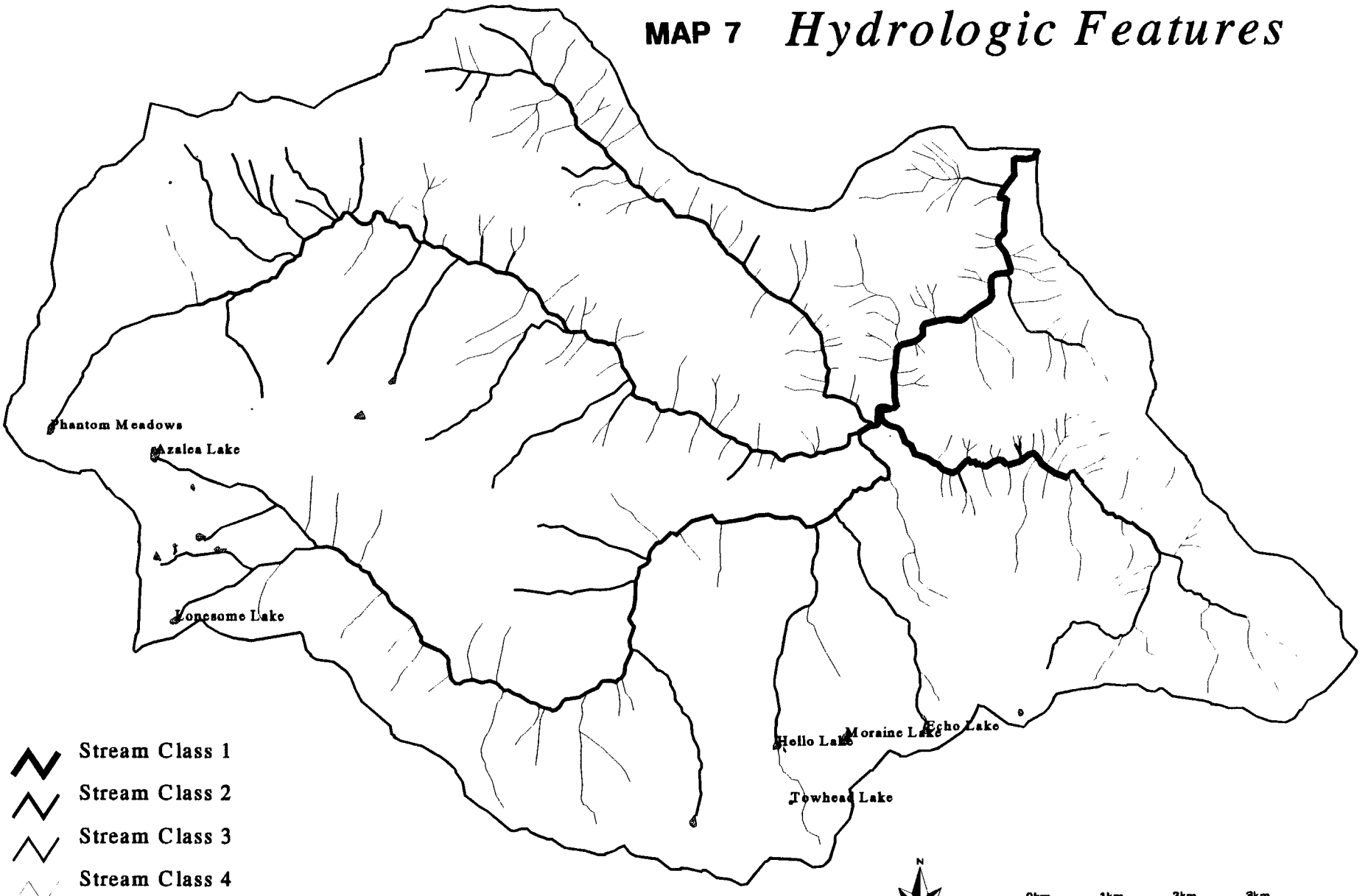
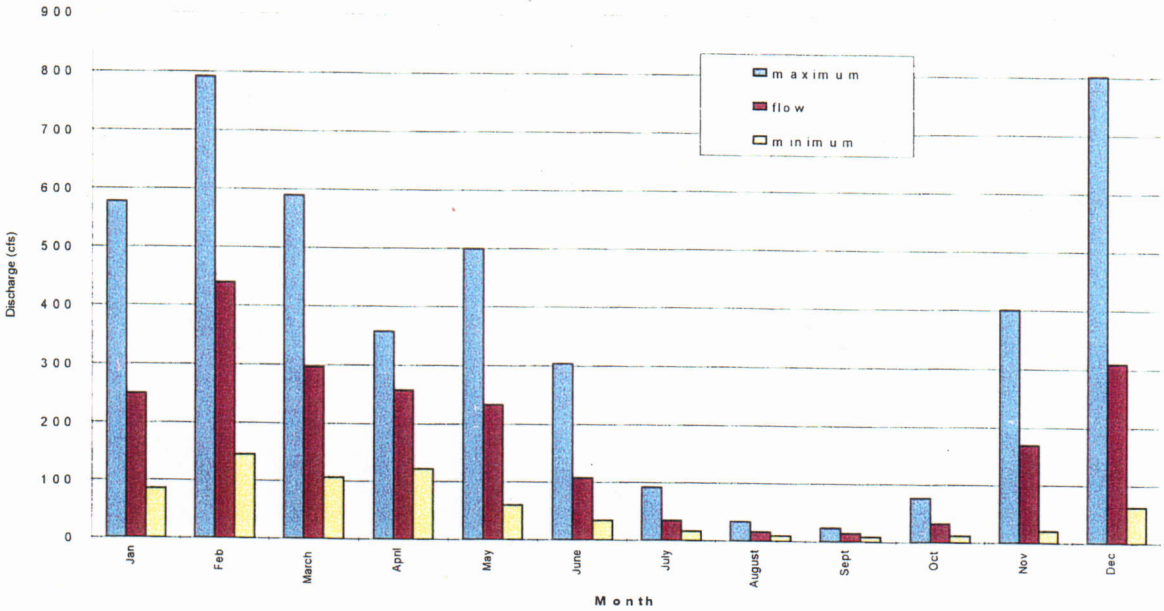


Figure 4. Monthly Average Discharges for the Middle Fork Applegate River Above its Confluence with Elliott Creek (1980-1987 Period of Record)



Winter and spring high-stream flows are generally several magnitudes greater than summer low flows. Historic peak flows of large streams are usually defined by unusual winter rain-on-snow events, such as occurred in 1853, 1861, 1890, 1927, 1955, 1964, 1974, and 1997. These historic flows on main-stem rivers do not appear to have been affected by management activities including timber harvest and roads. Lower Middle Fork and Butte Fork experienced unusually high peak flows in 1964 and 1974, but did not appear to have been affected by management activities. However, in the smaller tributary basins of Upper Middle Fork and Whisky Creek, channel altering during peak flows has occurred and is believed to have been directly influenced by heavy roading and regeneration harvesting. Low flows are not significantly affected by forest management activities or by other human processes.

According to data compiled by the US Army Corps of Engineers, the storm associated with the New Year's Day Flood of 1997 centered along a line through the center of the Applegate Basin eastward toward Ashland. The heaviest runoff occurred near, and in the middle of, the basin downstream of Applegate Dam. The estimated severity of the flood over the Applegate watershed, as a whole, was a 50-year event average. Some estimates in specific areas included a 40-year event in the Upper Applegate Basin, an 80 to 90-year event in the middle of the basin, and a 25-year event in the lower basin. Differing tributary flows were also noted on the Rogue River. The event appeared to be a 15 to 20-year event in the upper Rogue basin, about a 40 to 50-year event near Raygold, and a 15 to 20-year event near Grants Pass. The IDT estimated that the Middle Fork watershed received approximately a 25 to 40-year flood event from the storm.

Water uses within the watershed, such as for irrigation, are of minor significance and include needs for stock, fire fighting, and dust abatement of roads in association with timber sales. Large water withdrawals, such as irrigation, do not occur within the watershed. No impoundments exist within the analysis area.

1.2.5.3 Water Quality

Sedimentation and/or embeddedness is low in Butte Fork Creek, Cook and Green Creek, and Upper Middle Fork. In Whisky Creek and Lower Middle Fork, sedimentation is moderate. Roading and timber harvest operations (yarding, landings, etc.) are the human activities most responsible for sedimentation. Roads are the primary contributors of sediment to aquatic systems. The magnitude of sediment as a result of roads is directly related to overall road density, proximity to riparian areas, and the erodibility and mass wasting potential. Sedimentation from mining, grazing, and natural sources (mass wasting) are secondary to that of roads, but specific impacts on aquatic values is not known in this watershed.

Water Temperature - Preliminary conclusions from water temperature data indicate that stream temperatures in the Middle Fork and its tributaries during summer generally are in the "good-fair" range (52-62 °F) required by cold water fisheries. In Butte Fork and Cook and Green Creek, daily high water temperatures are typically <61 °F (Figures 5-9). Temperatures may exceed 61 °F, but this is only an occasional event and rarely lasts more than a few days. The exception was during the 1994 drought when extreme low flows contributed to daily highs between 61 - 64 degrees over 2-3 weeks in the Butte Fork. Cook and Green Creek is likely to have had similar daily highs in 1994.

Summer water temperatures in Upper Middle Fork, above Camp Gulch, are likely similar to those in Butte Fork because both streams originate within the Red Buttes Wilderness. Daily high water temperatures in Lower Middle Fork are a few degrees warmer, ranging primarily from 61-64 °F, with short periods at 65-68 °F. (Figures 10-11)

Temperatures in the lower reaches of Whisky Creek are unknown. It is suspected that they are similar to those in Lower Middle Fork owing to similar management activities within the subwatershed.

Figure 5. Butte Fork Applegate River - 1993 Stream Temperatures

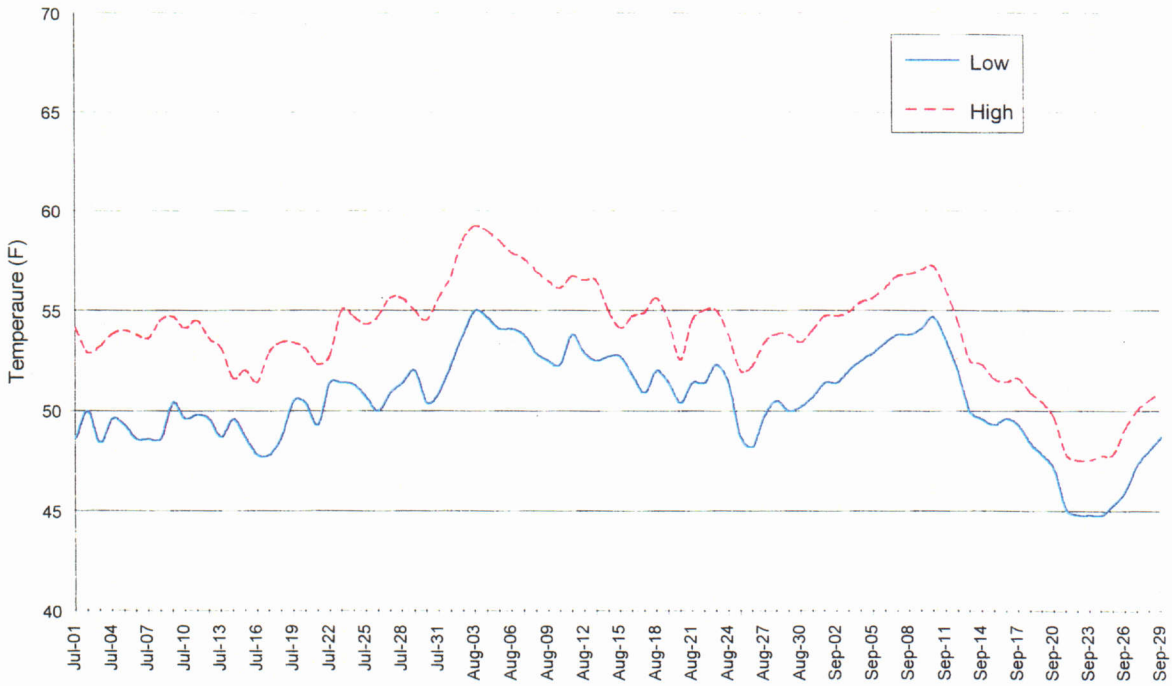


Figure 6. Butte Fork Applegate River - 1994 Stream Temperatures

Figure 7. Butte Fork Applegate River - 1995 Stream Temperatures

Figure 8. Butte Fork Applegate River - 1996 Stream Temperatures

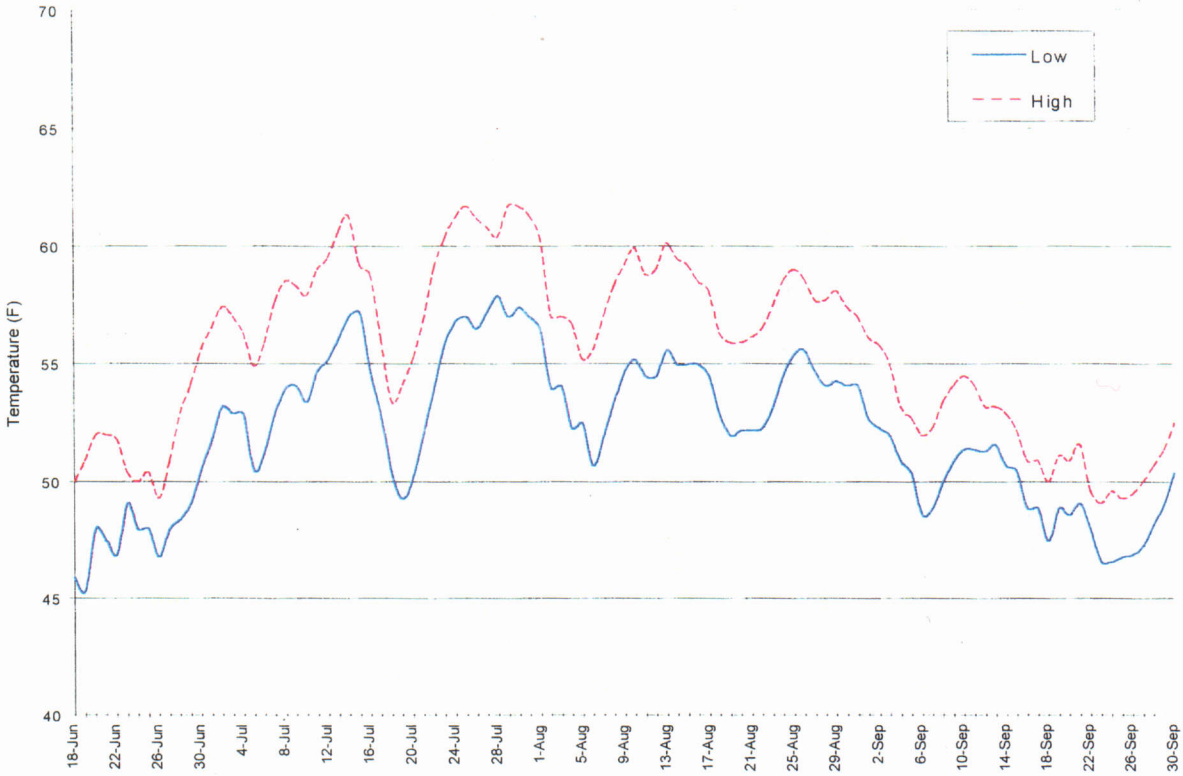


Figure 9. Cook and Green Creek - 1996 Stream Temperatures

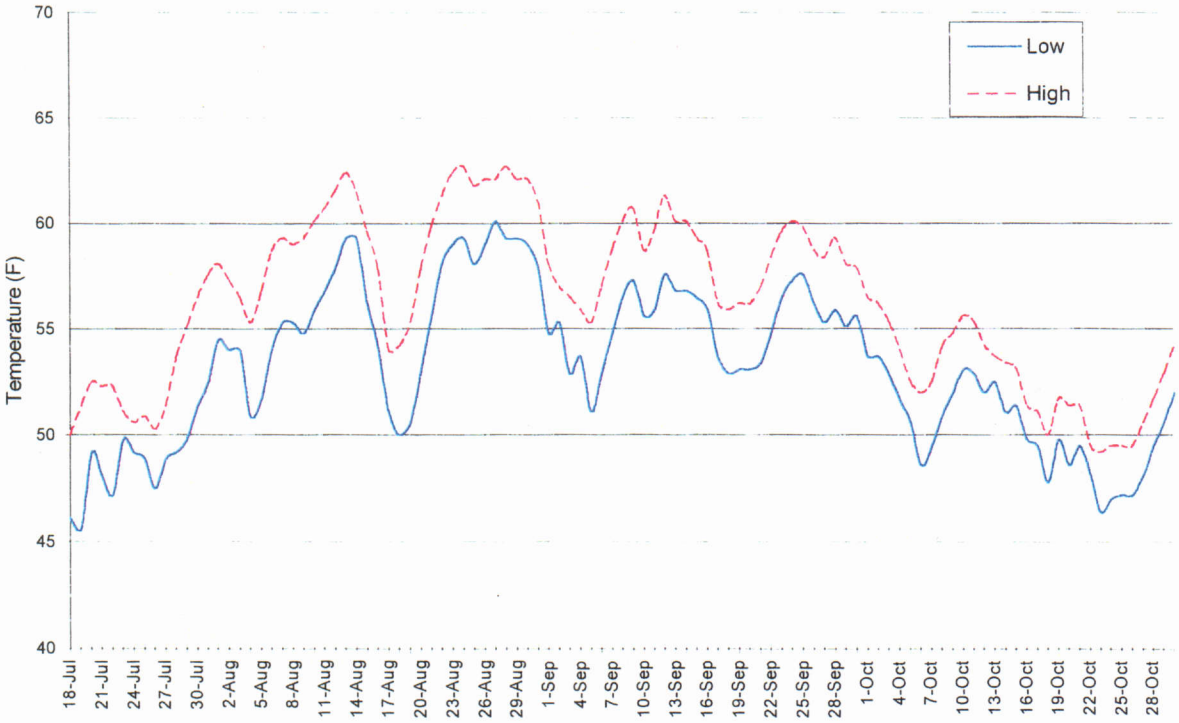


Figure 10. Middle Fork Applegate River - 1995 Stream Temperatures

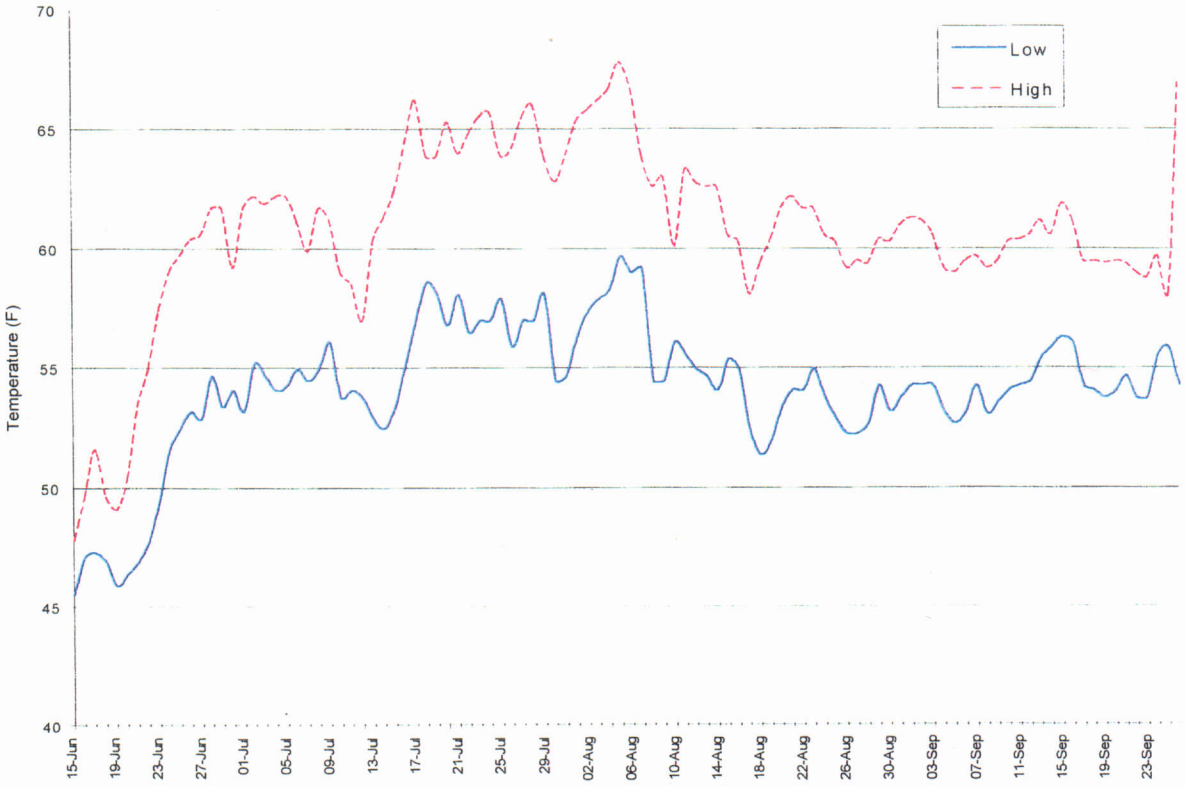
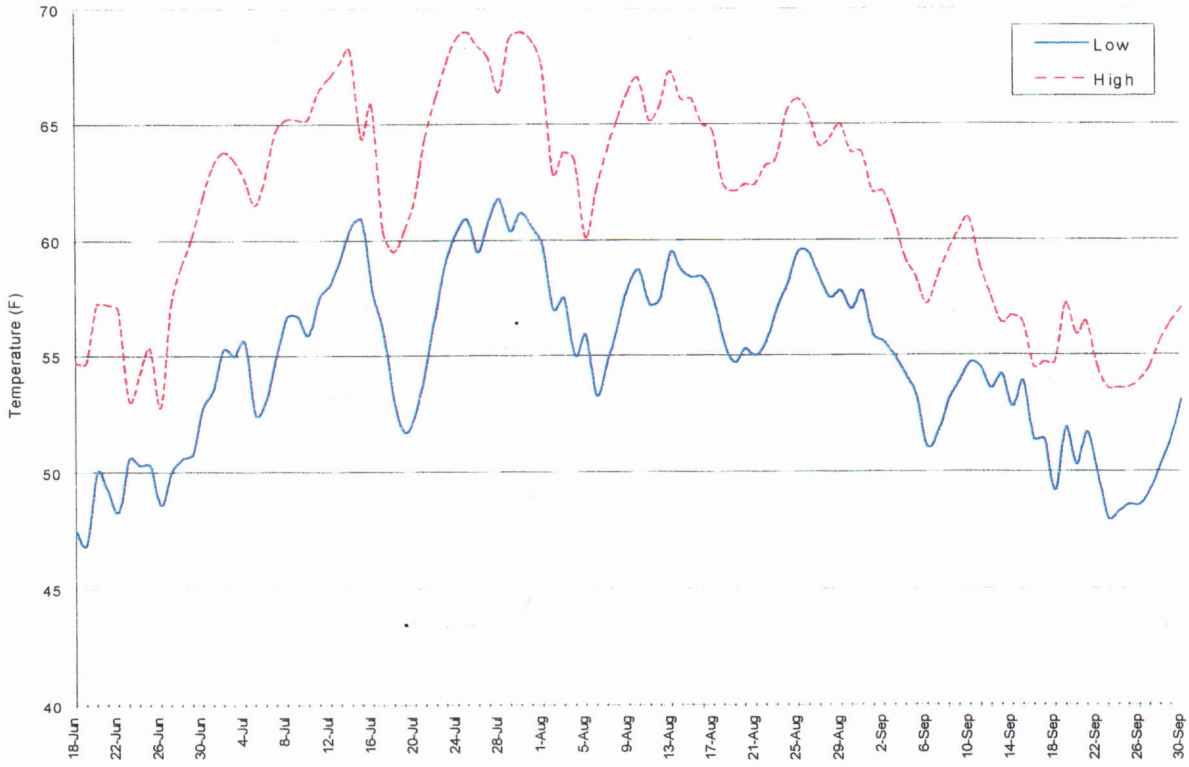


Figure 11. Middle Fork Applegate River - 1996 Stream Temperatures



Others - There are no known or suspected water quality concerns associated with toxic metals from mining activities, as occurs in the nearby Joe Creek subwatershed. There may be local high levels of fecal coliform associated with grazing and dispersed camping, as well as the possibility of Giardia and Cryptosporidium. Whether accelerated nutrient enrichment (and eutrophication) of high elevation lakes from grazing is occurring is unknown; nutrient enrichment of the high-volume steep-gradient streams in the watershed is not a likely concern.

1.2.6 AQUATIC HABITAT AND SPECIES

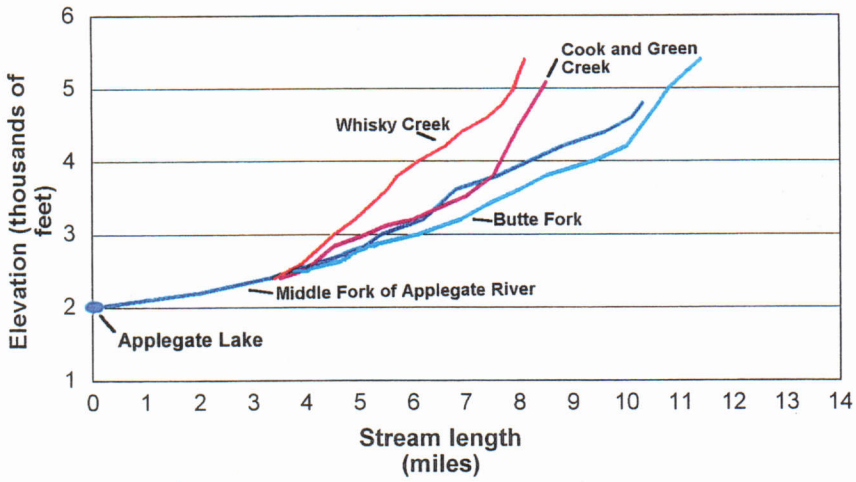
The Middle Fork watershed is located approximately 150 river miles from the mouth of the Rogue River (see Map 8). Headwater tributaries originate in the snow-dominated higher elevation Siskiyou Mountains, providing quality water to canyon and valley habitats.

1.2.6.1 Habitat Overview

Fish, macroinvertebrate, and amphibian populations are important indicators of water quality, watershed health, instream and floodplain conditions. Different species prefer specific valley and/or stream types, stream conditions, stream gradients, elevations, or lakes for habitat, depending on body size, shape, and life histories.

Three principal *valley types* dominate the watershed: alluviated, colluvial, and bedrock canyons (Frissell 1996). *Stream types* within these valley types can be characterized as: A, B, C and F (Rosgen, 1996). (See glossary for definitions). Middle Fork has bedrock canyons with inclusion of alluviated canyon. Cook and Green, Butte Fork, and Whisky Creek have short segments of alluviated canyon with dominant colluvial bedrock canyon.(see Figure 12, stream profile).

Figure 12. Stream Valley Types showing Channel Gradients within the Middle Fork of Applegate watershed (Stream Profile)

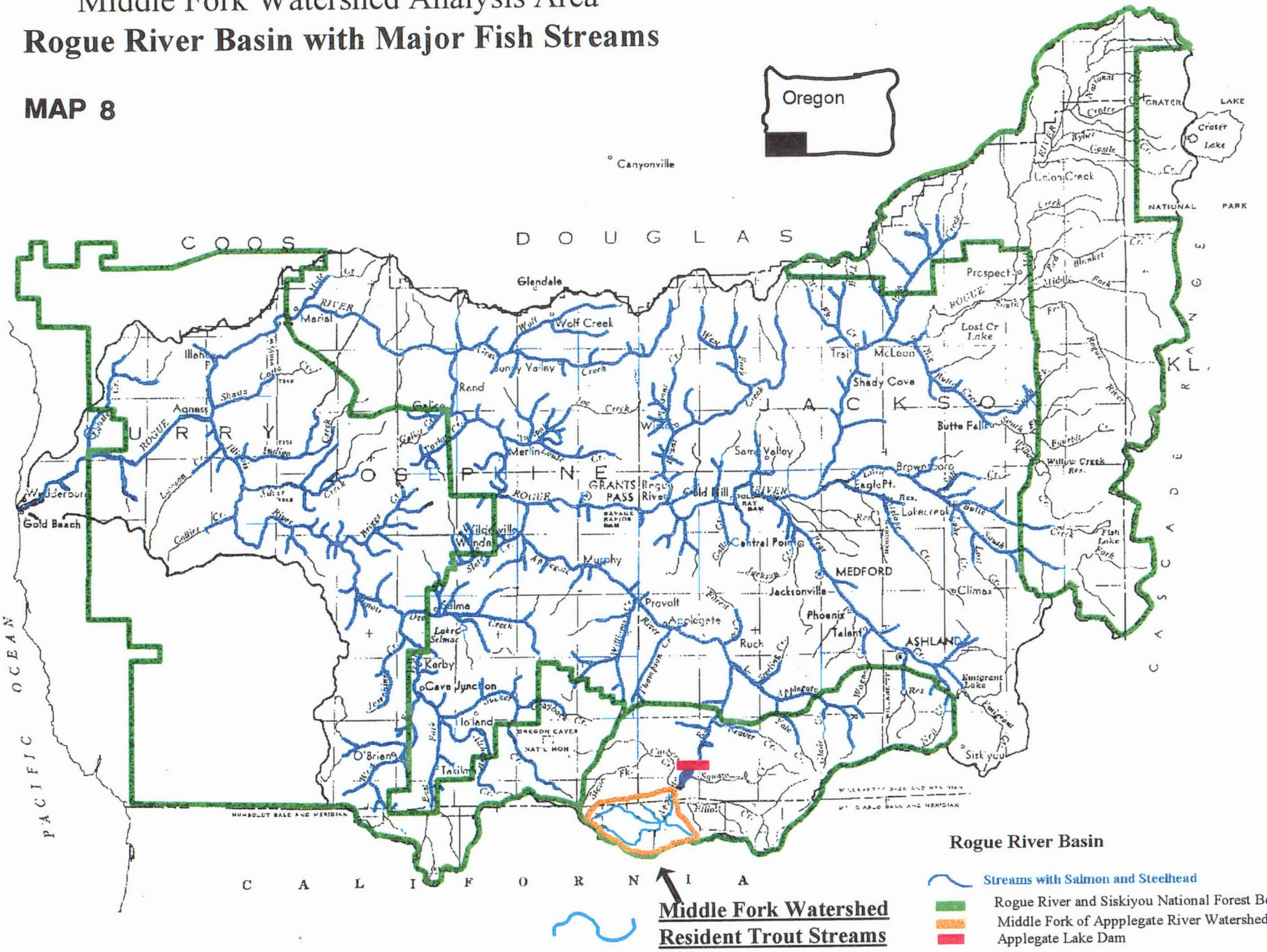


Streams in alluviated canyons often have "flats" with more depositional floodplains and terraces (Reeves et al.). Stream channel shifts can be frequent. Alluviated canyons were historically productive segments of the stream system, offering complex habitat of braids and side channels, wood deposits, and deep scour pools. These storage areas are important for spawning and as refuge for juvenile salmonids.

Middle Fork Watershed Analysis Area

Rogue River Basin with Major Fish Streams

MAP 8



Stream types C3, C4, B3, and B4 (Rosgen, 1996) were observed. Channel gradients range from 1 to 3 percent.

Stream channels in the colluvial and bedrock valley types of Middle Fork tend to be confined in narrow valleys, restricting lateral movement. Delivery of wood and sediment to these systems tends to be through debris torrents from tributaries and streamside landslides. These streams are A1 or A2 stream types (Rosgen 1996) and have average gradients of 3-6 percent.

Portions of the Middle Fork watershed have a history of management activities (outside of wilderness area, e.g., mining, and forestry practices) that have moderately degraded instream habitat conditions (LaLande, 1997). The net effect of these management activities has been the simplification of aquatic and riparian habitat in Lower Middle Fork and Whisky Creek, particularly in deposition areas formerly very productive for salmonid fish.

Channel morphology is within the range of natural variability where drainages, floodplains and stream channels have not been influenced by forest management, agriculture, and rural residential development. These areas are mainly in the upper reaches of streams in the Red Butte Wilderness area. Stream temperatures are cold, because of elevation, resulting in a good resident cutthroat and/or rainbow trout population. Presence of large wood and mature canopy cover also contributes to quality salmonid habitat in these areas, but the stream is too small here to support many large trout. (Large trout require complex habitat and larger pools as historically occurred in lower stream segments).

Within the wilderness, stream conditions exist that serve as an analog of healthy stream conditions. Livestock grazing and camping are currently impacting some of these streams and riparian zones, altering their pristine condition.

Limiting factors for long-term sustainability of native fish and other aquatic species include: sedimentation, riparian degradation, instream degradation, nutrient levels, and floodplain losses.

Sedimentation - Activities increasing sediment delivery to streams are: logging and road building, grazing, recreational activities, and natural and human-caused landslides adjacent to streams and in uplands. Fine sediment is evident in Lower Middle Fork, with some embeddedness of spawning gravel and filling of pools. Roads constructed on steep sideslopes of canyons affect drainage patterns and stream channels. These effects include timing and distribution of water flows, and increases in sediment transported to streams. Sedimentation into the main stem of the Lower Middle Fork has been aggravated by past mining activities.

Instream degradation - Habitat quality and quantity have primarily decreased in Whisky Creek and Lower Middle Fork due to instream degradation. Factors include: instream wood removal, logging in riparian and sensitive upland areas, grazing practices, past mining and recreational development (Lower Middle Fork). These activities in riparian reserves have limited the amount of future large wood recruitment and stream shading, and have changed the stream geomorphology. Historic removal of large wood from
Lower Middle Fork has reduced habitat complexity, scouring elements for pools and spawning gravels, and floodplain connectivity. This situation reduces the stream's ability to support a diverse variety of species.

Nutrient Levels - Salmon and steelhead trout historically provided significant nutrient input to streams within the Middle Fork watershed (i.e. from ocean minerals contained in their past spawningcarcasses). The loss of salmon and steelhead carcasses in Middle Fork watershed due to the dam has an interrelated impact on future salmonid populations and other aquatic ecosystem components. The loss of instream large wood accumulations or complexes has had an effect on the ability of Middle Fork Applegate River and tributaries to retain photosynthetic materials and nutrients.

Wetland Losses - Most impacts to wetland habitats have resulted from grazing and fire exclusion. These areas provided unique habitat for fish, amphibians, and other aquatic species. Unauthorized grazing may have affected wetland bank degradation and reduced riparian vegetation necessary for stream shading and aquatic habitat complexity. These activities have resulted in reducing or eliminating edge habitat and flood refugia important for trout and other aquatic species.
The following physical attributes are key components for fish habitat in the Middle Fork watershed.

Table 5. Desired and Current Conditions for Aquatic Processes and Functions

	Middle Fork		Butte Fork		*Cook & Green Creek		*Whisky Creek	
PARAMETERS	**Desired**	**Current**	**Desired**	**Current**	**Desired**	**Current**	**Desired**	**Current**
Large Woody Material (wood per mile) (dimensions 24" dbh X 50")	>30	3/3/28/32/37	>30	16/28/37/39/28	>30	15/25/30	>30	15/25/15
Pools per mile**	20/25/35/42/58/98	7/13/45/40/56/39	33/41/46/66/60	18/19/24/37/20	42/69	30/45	47/75	25/50
Pool/Riffle/Glide/S.Channel Ratio ***		24/72/3		35/64/1		33/65/2		25/72/2
Side Channel/mile	Fair	Fair	Poor	Poor	Poor	Poor	Poor	Poor
Rosgen Classification (Dominate/Subdominate)	A/B/C	*A/B/F	*A/B/C	A/B/C	A/B/C	A/B/C	A/B/C	A/B/C
Stream Temp. (summer)	<62F	Upper Middle Fork - < 60F Lower Middle Fork - 64-68F	<62F	>60F	<62F	<62F	<62F	64-68F
Spawning Gravels	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair
Riparian Canopy	80%	60%	90%	88%	90%	85%	80%	60%
Riparian Component **** (% of mature trees per reach)		0/35/86/45/62		0/63/28/5/0/30		80/20		80/20
PARAMETERS	**Historic**	**Current**	**Historic**	**Current**	**Historic**	**Current**	**Historic**	**Current**
Fisheries (adult fish per mile):								
F. Chinook	High	None	None	None	None	None	None	None
Steelhead	High	None	High	None	High	None	High	None
Coho Salmon	High	None	None	None	None	None	None	None
Rainbow/Cutthroat Trout	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Fair
Macroinvertebrates (relative density); Positive indicator groups #	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Low
Amphibians	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Low
Slope (percent gradient) per stream reach		1/3/3/8//4/5		6/4/6/4/13		4/5/6		5
Total miles surveyed		9.3 (1995)		10.6 (1993)		proposed survey 6.8 miles (1998)		proposed survey 5 miles (8/1999)

** Expected range of pools per mile based on pool frequency of 5,280 ft/7 X bankful width (2-4% slope - Rosgen B stream type) and 4 X bankful width (>4% slope - Rosgen A stream type).
***Glide habitat was combined with riffle habitat to correlate with updated FY96 R-6 Stream Survey protocol
****Conifer (mature trees condition - >21 in. dbh)
Positive indicator groups or taxa in a healthy stream system are highly intolerant taxa which are particularly sensitive to high summer temperatures or impairment due to habitat quality limitations (sedimentation, high winter scour, opening of the riparian canopy, reduction of channel depth).

Stream attributes were surveyed in the watershed during the past five years by the Forest Service (pre-1997 New Year's Day flood). A brief assessment of streams within Middle Fork watershed was conducted after the 1997 flood by federal biologists. Changes in stream attributes (e.g. wood per mile, pool quality and quantity, and substrate) were observed but it is difficult to assess the overall aquatic habitat conditions without a complete stream survey.

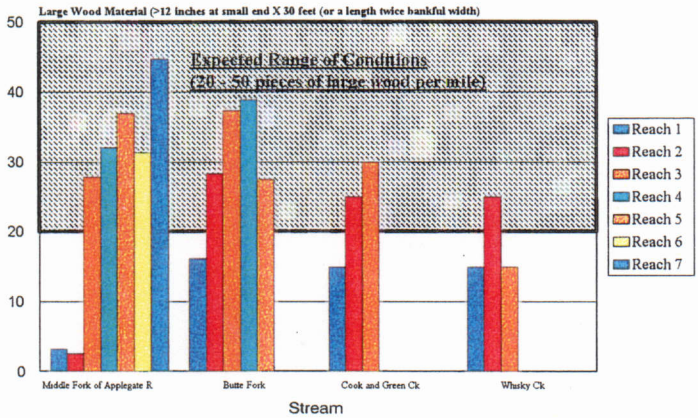
1.2.6.1.1 Coarse Woody Material

Wood material meeting the requirement of "greater than 12 inches diameter (at the small end) by 30 feet in length or twice the bankful width" (small, medium and large-sized wood classes) was recorded. Researchers have determined that key wood pieces with 24 inches diameter (at the small end) by 50 feet in length are necessary for wood-complex stability during high flow events. It was observed during a quick post-stream assessment that the number of large wood pieces deposited after the flood has increased.

Field observation in this watershed has shown a direct correlation between small/medium/large wood presence and high pool quality. In the absence of wood, fewer large-sized fish and decreased abundance of fish were observed.

Coarse woody material in the canyon stream types of the analysis area has a range of 0 - 31 pieces of wood per mile. Upper Middle Fork, Reach 6, has the highest amount of wood per mile due to its location in an unroaded area; limited management activities have occurred here. The lower sixty percent of Whisky Creek riparian is inaccessible, which accounts for increased wood per mile. Road accessibility is greater in the upper forty percent, where there is less wood per mile. (see Figure 13). The lower segments of Middle Fork and Butte Fork have some large bedrock pools. Wood adds cover to these large pools.

Figure 13. Coarse Wood Comparison - Streams in the Middle Fork of Applegate River Watershed Analysis Area



Data obtained from FS streams surveys 1993 & 1995, (Cook and Green Ck. and Wisky Ck. estimated)

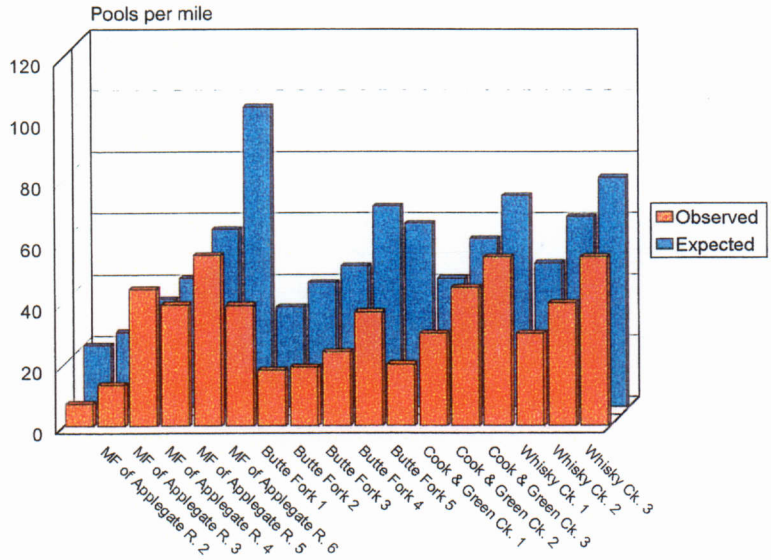
The flat unconfined areas associated with the alluviated canyon stream segments were some of the first effected by roading, mining and timber harvest. Flats were often roaded, exploited for gold, and large conifers during the late nineteenth and twentieth centuries. In these sections, instream wood has been removed from instream, eliminating necessary ingredients for complex habitat: pool maintenance, hiding cover, bank stability, and the sorting of spawning gravels. The removal of wood and the related increase in sediment has also contributed to channel widening. This, coupled with reduced amounts of stream shading due to the removal of large trees, has increased solar radiation and hence, water temperatures.

(See Table 5, Desired and Current Conditions for Aquatic Processes and Functions for numeric wood per mile data).

1.2.6.1.2 Pools per mile

Pools per mile are below the desired range of conditions and indicate varying degrees of habitat degradation (Figure 14). A relatively low number of pools were recorded where coarse wood has been reduced or eliminated. There is considerable amount of literature documenting the importance of pools for salmonid fish production.

Figure 14. Comparison of Observed and Expected Pools Per mile



*Cook and Green Creek and Whisky Creek - estimated observed data; proposed stream survey 8/1996 and 8/1997 respectively.

The streams with slopes greater than four percent in the watershed analysis area have short step pools or pocket pools. Some of the pools may not have been accounted for during the stream survey in stream segments with greater than four percent gradient. As per Region 6 stream survey protocol (before 1996), any pool with a length less than the stream width was not reported. This exclusion of "pocket pools and step pools" may cause the total pool percentage to be slightly underestimated. Region 6 protocol now includes this type of habitat. Large pools exist in Lower Middle Fork formed by geologic features.

Pocket pools and short plunge pools are important rearing areas for trout. Nonetheless, there are fewer large trout per mile then would be expected in Middle Fork, Butte Fork, Whisky Creek and Cook and Green Creek. This is partially attributable to the poor pool quality existing today, e.g. lack of depth,

Green Creek. This is partially attributable to the poor pool quality existing today, e.g. lack of depth, wood cover, and microhabitat complexity. Pools associated with wood complexes purportedly held large rainbow and cutthroat trout in previous years. This large wood complex component is almost totally lacking in lower-gradient segments today. Butte Fork probably contains about the same pool/riffle morphology as occurred historically.

(See Table 5, Desired and Current Conditions for Aquatic Processes and Functions for numeric wood per mile data).

1.2.6.1.3 Stream Substrate

Data collected from Wolman pebble counts in the lower reach of the mainstem of Butte Fork, illustrates the lack of variation in substrate (USFS surveys, 1995). Streambed substrates are more homogenous than expected, but Butte Fork is highly erosive in this reach.

Middle Fork contains fine sediment that has filled in approximately twenty percent of the hyporheic interstitial spaces, reduced crevice space in the surface layer of riffles and filled in pools. This results in fair spawning habitat for trout and hiding cover for amphibians and fish. Many of the macroinvertebrate positive-indicator groups or taxa that are sediment intolerant are either absent or present in very low numbers. (See Aquatic Species, Macroinvertebrate for further discussion).

Much of the aquatic habitat outside of the Red Buttes Wilderness is below its biological potential and large trout (greater than eight inches) are rare within the watershed. Aquatic habitat located within the wilderness is good according to a survey of the Butte Fork (Cooper, 1996). Nevertheless, during the 1974 flood event, a large landslide occurred. The stream remains in an erosive condition and continues to contribute large-sized sediment to the Middle Fork.

1.2.6.1.4 Management of Fish Populations

Federal agencies are responsible for managing habitat on public lands. These agencies are required to meet the intent of the Aquatic Conservation Strategy of the Northwest Forest Plan (NWFP) and the Rogue River National Forest Plan, as amended by the NWFP Record of Decision (ROD) for lands within the range of the northern spotted owl. Private lands must adhere to the State Forest Practices Act. Management of fish populations are the responsibility of the Oregon Department of Fish and Wildlife (ODFW) and California Department of Fish and Game (CDFG).

Trout fishing is allowed by ODFW from May through October above the Applegate Dam in Middle Fork Applegate River and tributaries. Most of the watershed, however, is in the State of California, and fishermen require a California fishing license.

Stocking of Applegate Lake with hatchery trout, surplus steelhead from below the dam, etc. by ODFW may affect native fish populations above the reservoir in Middle Fork, Butte Fork and Whisky Creek. (Fish are manually moved into the reservoir from below the dam). No known fish stocking by CDFG occurs within Elliott Creek or Middle Fork.

Numerous fish introductions by private individuals (without permits) and the CDFG have occurred over the years within the high mountain lakes. CDFG stocks the following high mountain lakes (see Table 6 below) every year (except Towhead Lake). (Towhead Lake is stocked every other year - last stocked

during 1996). Lake stocking generally takes place during end of June to the first of July. Brook trout, a non-native species, are stocked. The future of non-native fish species management is currently under review in these high mountain lakes because of their competition with and predation on native amphibians and impacts to fragile lakeshore environments from fishing and camping.

Table 6. Fish Stocking in Lakes Within the Watershed Analysis Area

LAKE	QUANTITY	AGE	SPECIES
Azalea Lake	1,498	fingerlings	Brook Trout
Echo Lake	500	fingerlings	Brook Trout
Lonesome Lake	500	fingerlings	Brook Trout
Towhead Lake	500	fingerlings	Brook Trout
Hello Lake	0 (depth to shallow)	N/A	N/A

1.2.6.2 Aquatic Species Overview

Historically, anadromous fish populations flourished in the watershed. There was an abundance and wide distribution (Map 9) of chinook salmon, coho salmon, winter and summer steelhead trout, and Pacific lamprey. Resident fishes: rainbow and cutthroat trout, sculpin, Klamath smallscale suckers, and amphibians also flourished. Macroinvertebrate species were mostly cold water taxa intolerant of warm stream temperatures, frequent channel changes, and excessive fine sediment.

It is believed that the historic quality habitat for large trout and juvenile salmon was located largely in the downstream lower-gradient alluviated canyon segments (identified in Figure 12, e.g., Lower Middle Fork of Applegate River). These less-confined stream segments were collection areas for large wood, and they complemented rich riparian areas. They often had deep pools with overhead cover and were capable of rearing large adult trout and high densities of juvenile salmon and steelhead.

Currently rainbow, cutthroat and rainbow/cutthroat hybrid trout are located throughout the watershed. Coho and chinook salmon and steelhead trout have been excluded from this watershed by the completion of the Applegate Dam in the early 1980's (see Map 10).

Resident Fish Species - Native resident fish in these streams are rainbow trout (*Oncorhyonchus mykiss),* cutthroat trout *(O. clarki),* and reticulate sculpin *(Cottus perplexus).* Rainbow trout and sculpin are found throughout the watershed. Cutthroat trout tend to inhabit small headwater streams and are found in several tributaries. They are listed as "sensitive" in the Regional Foresters Sensitive List and "rare" in California. (However, their status is under review for listing under the Endangered Species Act). No information exists about the distribution and abundance of sculpin and Klamath smallscale sucker *(Catostomus rimiculus)* in this watershed.
(There are no barriers effecting fish migration within the watershed).

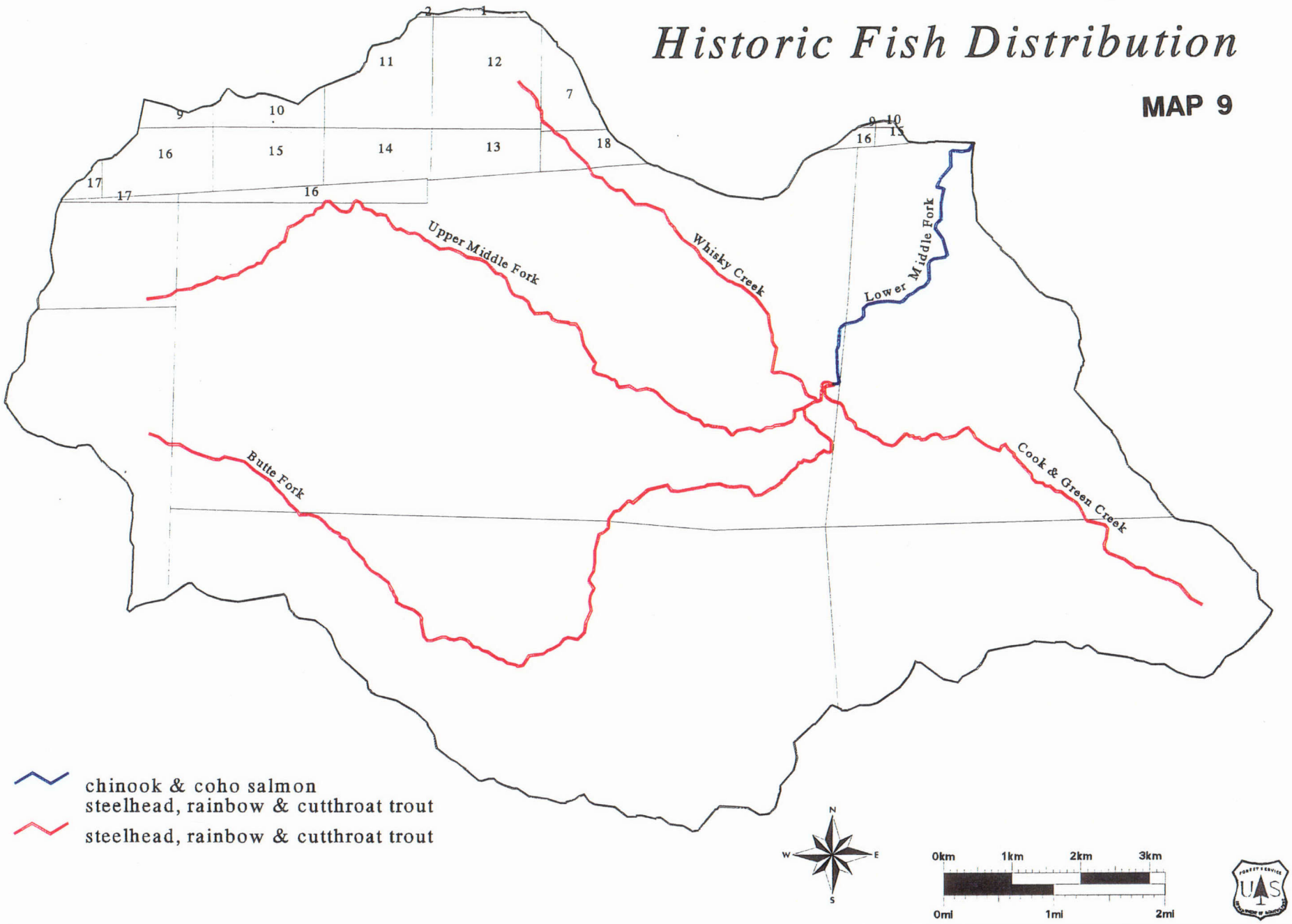
Introduced Fish Species - Eastern brook trout (*Salvelinus fontinalis)* are introduced in the Middle Fork watershed. They were introduced to the watershed prior to 1960, and are currently being stocked in some of the wilderness lakes by the California Department of Fish and Game (CDFG).

Lake Species and Habitat - Most of the lakes in the analysis area are shallow and small, with mud/silt bottom composition (Hoover, 1969). Only Azalea, Echo , Lonesome and Towhead Lakes have fish populations. The other, nonfish-bearing lakes present important habitats for sensitive aquatic flora and

Middle Fork Watershed Analysis Area

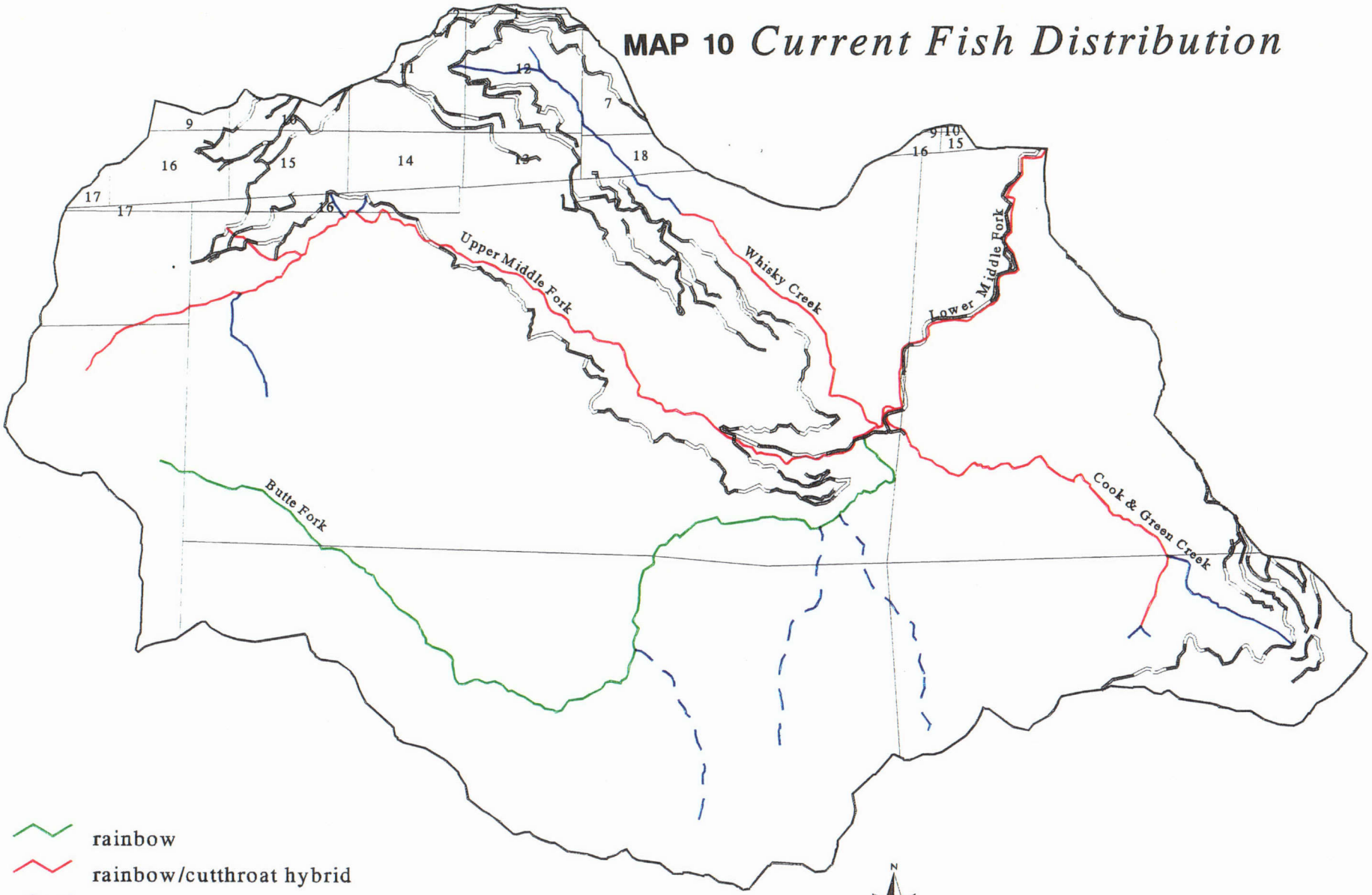
Historic Fish Distribution

MAP 9



Middle Fork Watershed Analysis Area

MAP 10 *Current Fish Distribution*



fauna specific to high-elevation ecosystems. No known aquatic animal or plant species survey information is available for the nonfish-bearing lakes.

Hoover (1969) collected data on lakes within the analysis area. Below is a brief summary of his findings. (See Aquatic Species, Fish Management, Table 6, for current fish stocking populations and frequency):

- Azalea Lake is fairly clear and is approximately 9 feet in depth at the middle. Previous research indicates that brook trout were stocked by early settlers prior to its first stocking (date unknown) by the CDFG, (Hoover, 1969; pers. comm. Dennis Maria, CDFG, 1996).
- Lonesome Lake contained no fish prior to fish stocking by CDFG.
- It is unknown when Echo Lake was first stocked with fish. In 1969, eight brook trout of six to ten inches in length were captured from the lake. Due to the shallow depth of the lake, a severe winter freeze of 1966-67 caused a fish kill. The population was decreased to an estimated 100 fish. It was recommended that CDFG stock the lake with brook trout during the following summer .
- Towhead Lake is approximately 16 feet deep. This lake was first stocked by CDFG in 1967.

Recreational use of Towhead Lake basin and the surrounding area may be having negative impacts on riparian habitat conditions (See Management Recommendations section). Similarities between Towhead Lake and Azalea Lake have been identified. Both lakes contain rare macroinvertebrates believed to be representative of the Siskiyou Mountain range.

Macroinvertebrates - Aquatic macroinvertebrates (insects, snails, and other invertebrate taxa) are good indicators of stream habitat quality because their life cycles and habitat requirements are known. Different macroinvertebrates are sensitive or tolerant to fine sediments, substrate disturbance, water temperature, shade, or perennial flow.

In 1992 the Forest Service contracted macroinvertebrate sampling within Middle Fork, approximately 0.5 miles below Cook and Green Creek. (Wisseman, 1991, 1994-5). The site was described in terms of erosional habitat, marginal habitat, and detritus habitat.

Erosional habitat is located on the stream bottom of riffles, glides, cascades, and chutes where erosional activity is greatest. This stream section was given a low total score for erosional habitat which reflects significant habitat and/or water quality limitations. There were several high summer temperature intolerant taxa present but they were not common. Stream temperatures were probably too high for cool adapted fauna to develop. Winter scour events are too high to allow the more tolerant species to colonize the site. General community parameters for erosional habitats show a community that has relatively low species richness, and a high community tolerance. This community is dominated by a single taxa (*Simuliidae* - blackfly larvae).

The habitat assessment indicates that the erosional habitats have moderate-to-high complexity. Cobble and boulder surfaces and pockets are numerous, silt quantity is low, and crevice space is moderate. There is a moderate amount of entrained detritus, and filamentous algae is relatively low where the current is strong.

Increased algal production during the drought has led to a large build up of these highly tolerant collectors. These high levels collector taxa can be reset to lower levels after a wet winter. This is a

"flashy" system and scour is thus a factor during big storms. Data from other southwestern Oregon sites indicate decreased taxa during the drought cycle that culminated in 1992, especially where management activities were moderate to high. Hence the 1992 data may reflect the bottom of a cycle (natural cycle exacerbated by human incfluence).

Marginal habitats are defined as the wetted or submerged substrates in slower water near shore. These areas provide rearing and refugia areas for many aquatic invertebrates. General community parameters for marginal habitats show a community that has moderate species richness; moderate dominance by a single taxa (*Lepidostoma*-sand case, a scraper caddisfly); and moderate general taxa richness.

Conditions appear conducive to presence of highly tolerant macroinvertebrate taxa, but few were present. Scour may push these taxa down stream. Margin rocks may support a richer community since they don't receive as heavy scour during wet winters. Extended drought may have also been a factor.

Detritus habitat is found in coarse particulate organic matter (CPOM) within the stream. The detritus sample from this site was lost.

For more information, refer to the Benthic Invertebrate Biomonitoring report, completed in Fall 1992 (Wissemann, 1992).

Amphibians - Amphibian surveys have not been conducted for the watershed. However, there are known locations for the more common species and those of concern (Terrestrial Wildlife Species). Most of the sightings occur in the higher reaches of the perennial streams. Amphibians, such as the tailed frog, seem to be sensitive to sediment impacts, low flow, and increased stream temperature. Increased sedimentation resulting from management activities and natural processes can affect aquatic organisms. Fine sediments fill cracks and crevices in the streams, thereby altering critical microhabitats used by some amphibians. Low-gradient stream microhabitats can be persistently affected by fine sediments. High-gradient streams, where sediments are flushed, maintain substrate crevices. Decreased diversity and abundance of stream amphibians can be attributed to habitat loss and sedimentation (Bury and Corn 1988; Blaustein et al. 1995).

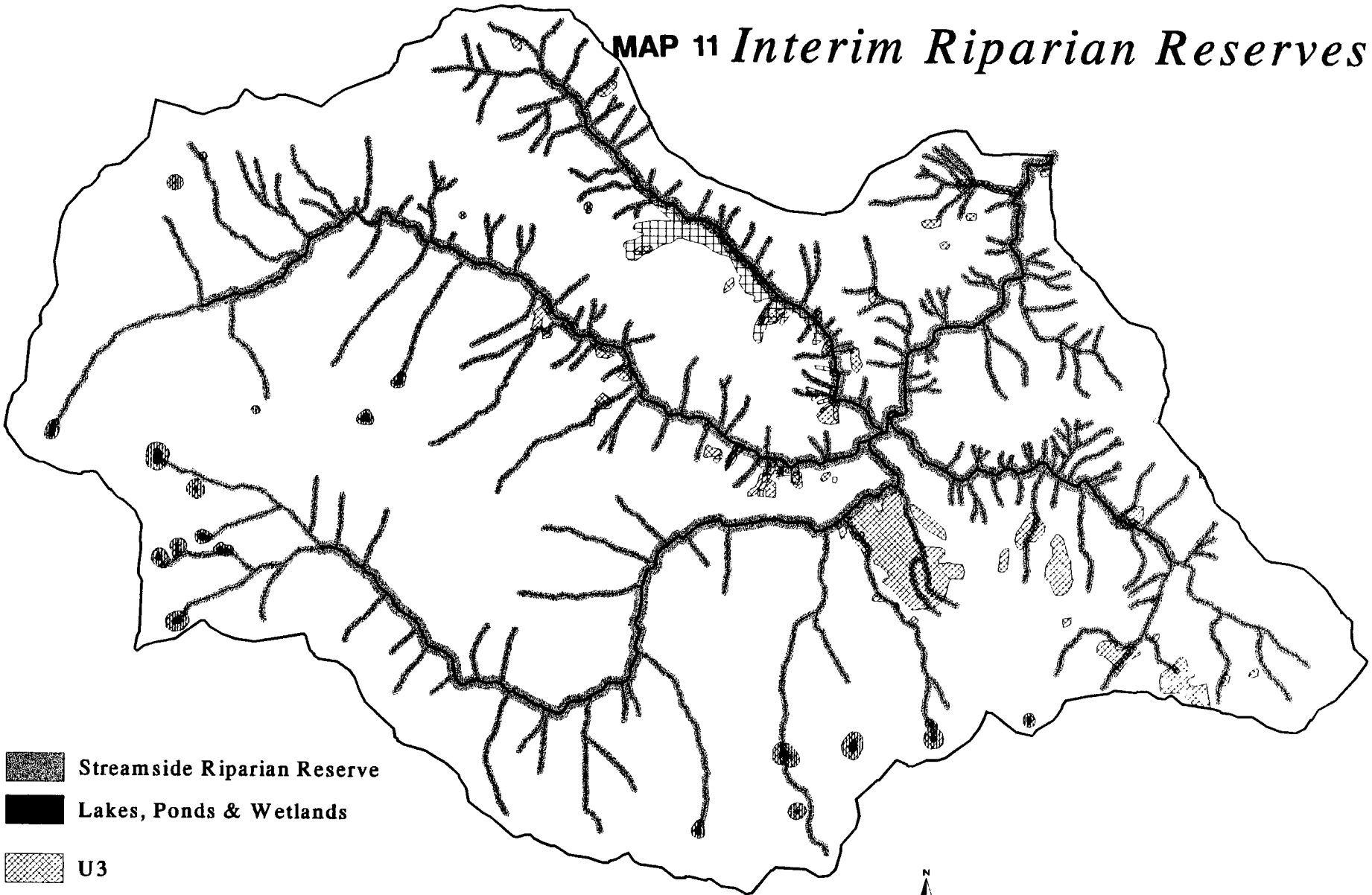
Amphibian and reptile species have been observed during fish surveys,. Pacific giant salamanders (*Dicamptodon ensatus*), Cascades frog, (*Rana cascadae*), and aquatic garter snakes (*Thamnophis couchii*) have been observed throughout the Middle Fork watershed; population unknown. See Terrestrial Wildlife section for additional information on terrestrial amphibians, such as Siskiyou Mountain salamander.

1.2.7 RIPARIAN RESERVES

The riparian zones evaluated in this analysis are defined in the Record Of Decision (ROD) and referred to as Interim Riparian Reserves (see Map 11). By definition, Interim Riparian Reserves include 300-feet (two tree-heights) on each side of fish-bearing (Class 1 and 2) streams; 300-feet adjacent to natural lakes; 150-feet (one tree-height) on each side of non fish-bearing perennial (Class 3) and intermittent (Class 4) streams; 150-feet around wetlands greater than 1-acre; the extent of riparian vegetation associated with seeps, springs, and wetlands under 1-acre; and geologically unstable areas.

Middle Fork Watershed Analysis Area

MAP 11 *Interim Riparian Reserves*



Streamside Riparian Reserve

Lakes, Ponds & Wetlands

U3

High Land Slide Hazard Risk

Wetlands Buffer

N W E S

0km 1km 2km 3km

0mi 1mi 2mi

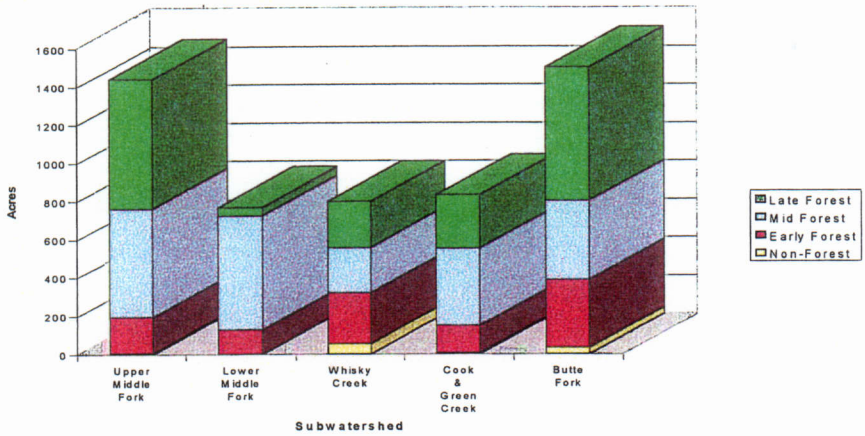
Except for fish-bearing perennials, and those smaller streams that are readily accessible by roads, most of the streamside Riparian Reserves have not been field-verified. Wetlands Riparian Reserves have been identified using the USFWS National Wetlands Inventory. These have not yet been field-verified. Finally, unstable and potentially unstable areas have only partially been identified; therefore, this inventory is incomplete. Four types of geologic information were separately entered into the data base: unstable U3 terrain identified in the 1990 LRMP FEIS, earth flows, debris slides, and Landslide Hazard Zonation Class 1. The Landslide Hazard Zonations were verified as part of previous timber sale planning. Riparian Reserves can be identified in GIS separately for streams, water bodies, wetlands, and geologic features. Map 11 is a composite Interim Riparian Reserve map of all those features; it uses the one and two tree-height buffers defined in the ROD (150 and 300 feet).

The historic vegetative condition of Riparian Reserves is not known for certain. However, it is generally assumed that most Riparian Reserves that were not in a "permanent" montane hardwood forest type or a non-forest type (i.e. grass, forb , shrub, or barren rock) possessed mid to late-successional characteristics associated with large conifer trees. Many of the late-successional Riparian Reserves were believed to have maintained open, park-like conditions due to frequent fires, especially at lower elevations. Despite fires, these stands provided many beneficial attributes (i.e. shade, cover, and large wood for channel structure) of late-successional forest stands for both terrestrial and aquatic habitats and species.

The current vegetative condition of Riparian Reserves varies by subwatershed (see Maps 12 to 16 and Figure 15). These maps and figures display present-day distributions (by subwatershed) of early, mid, and late-successional forest plant communities, and non-forest communities, within Riparian Reserves currently identified in the Middle Fork watershed. Riparian Reserves legally apply only to public lands, but are included for all land ownership's here for comparison purposes. Riparian Reserves applied to private lands account for about two percent of Riparian Reserve acreage in the entire Middle Fork Watershed.

It is emphasized that some of the acreage in Figure 15 and Maps 12 to 16 that are displayed as "early" forest and "mid" forest (11-17"dbh) include montane hardwood forest types. Therefore, these maps/figure somewhat underestimate the percentage of conifer forest type in riparian reserves that are large mid forest (17-21"dbh) and late succession.

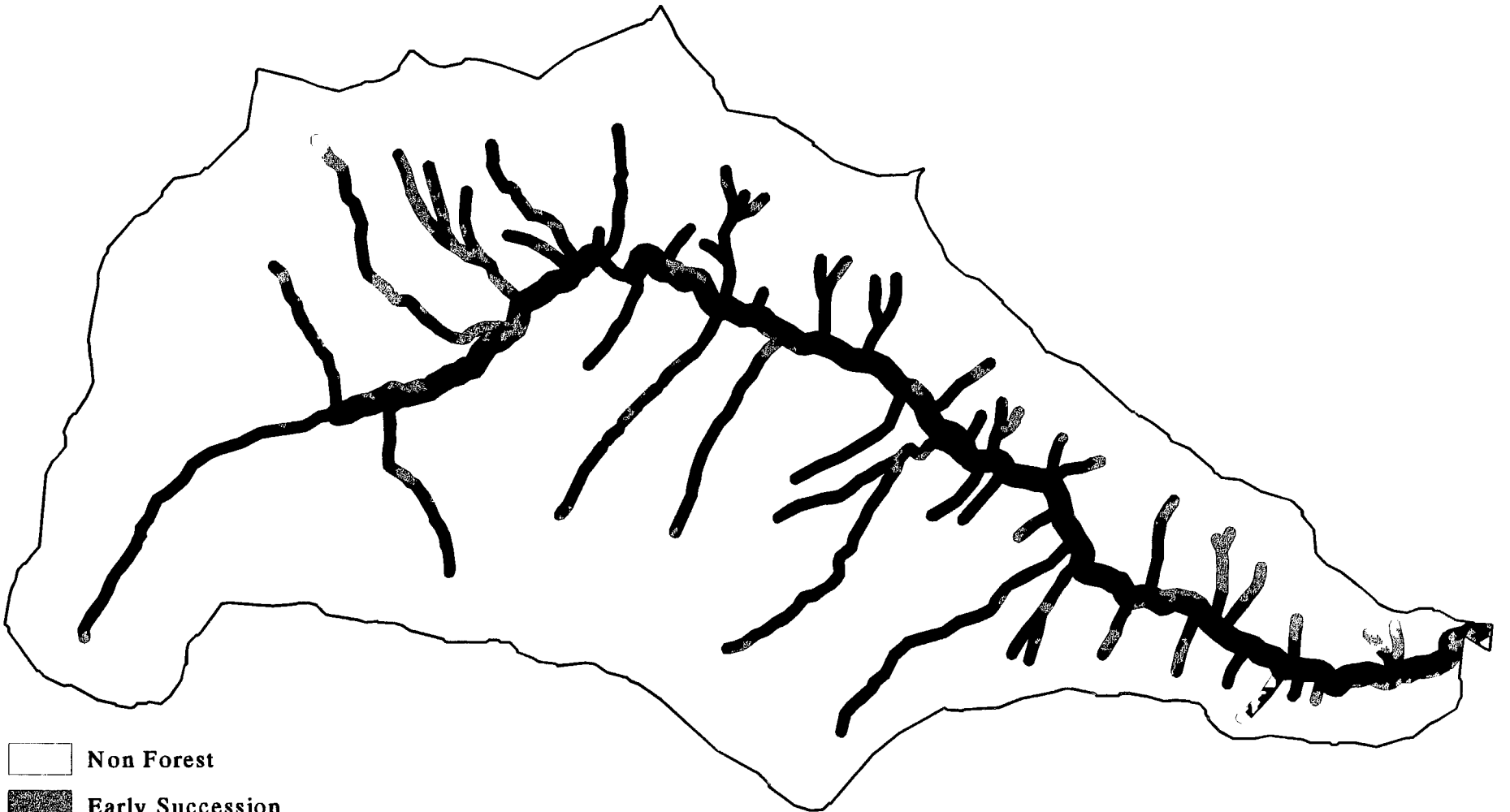
Figure 15. Amounts of Various Forest Successional and Non-Forest Vegetation Types Within Streamside Riparian Reserves



Middle Fork Watershed Analysis Area

MAP 12 *Streamside Riparian Successional Stages*

Upper Middle Fork Subwatershed

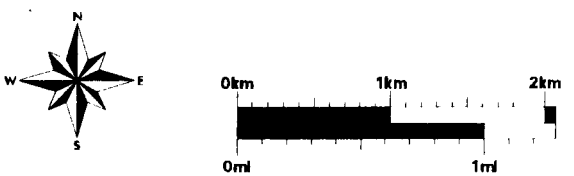


Non Forest

Early Succession

Mid Succession

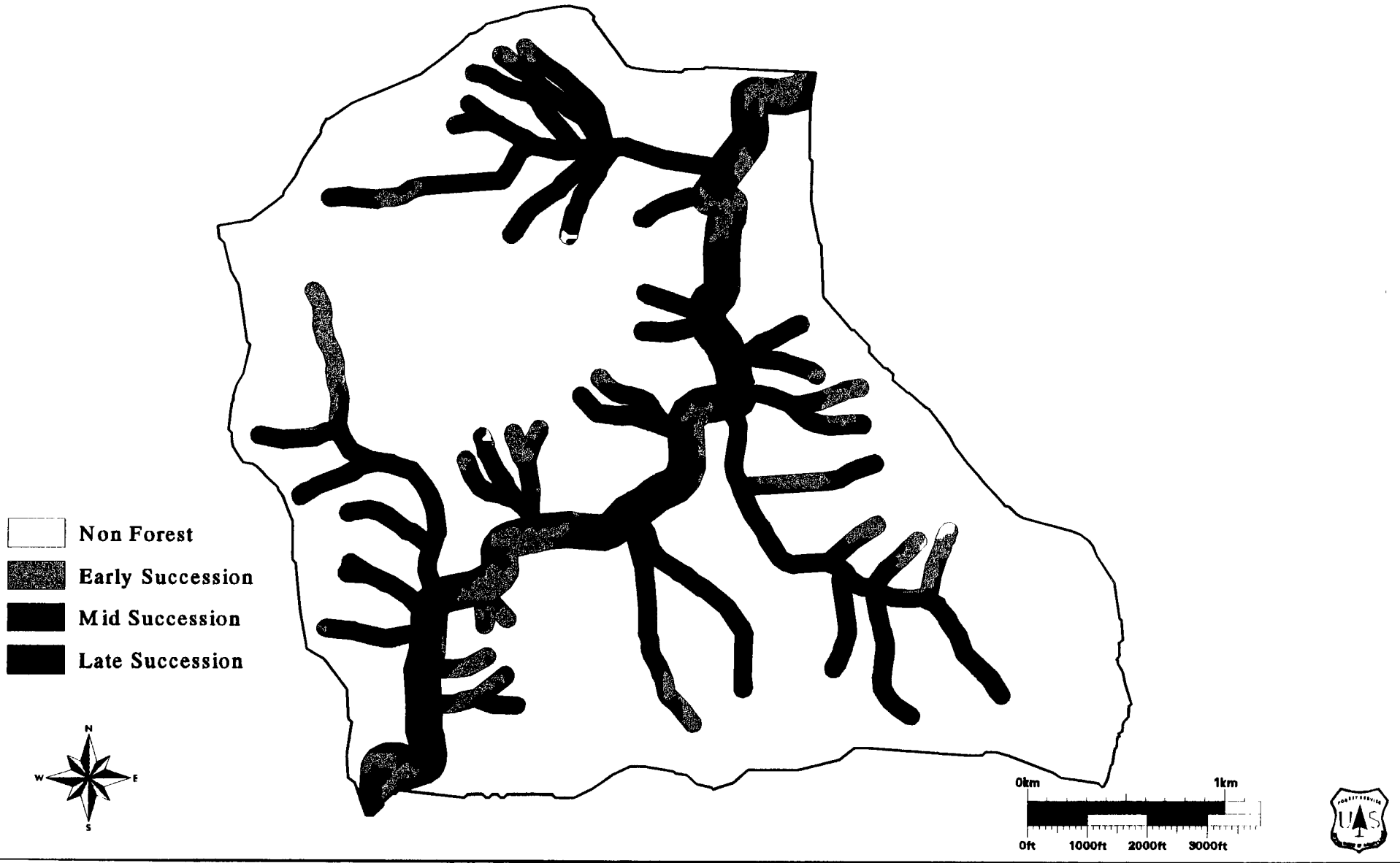
Late Succession



Middle Fork Watershed Analysis Area

MAP 13 *Streamside Riparian Successional Stages*

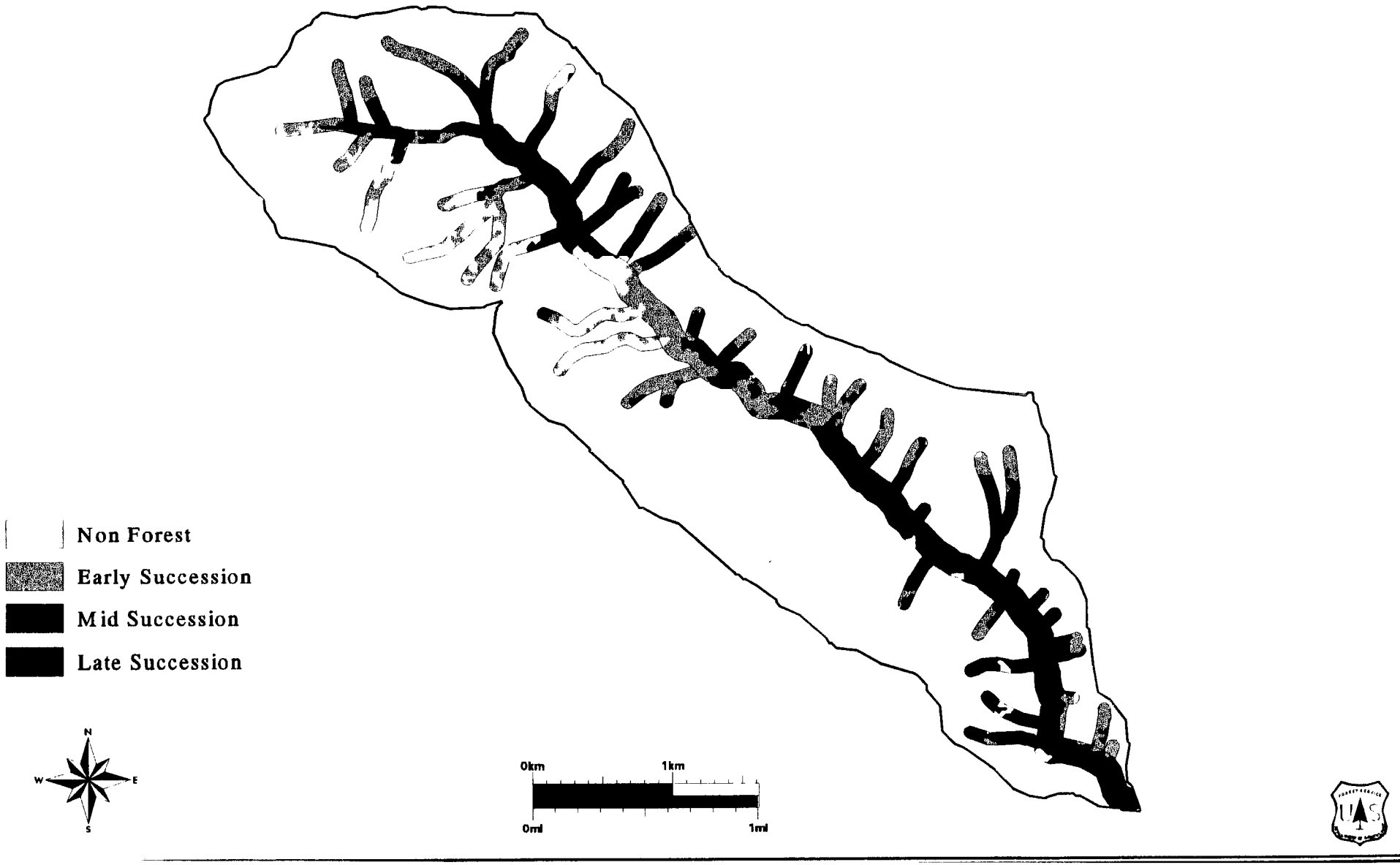
Lower Middle Fork Subwatershed



Middle Fork Watershed Analysis Area

MAP 14 *Streamside Riparian Successional Stages*

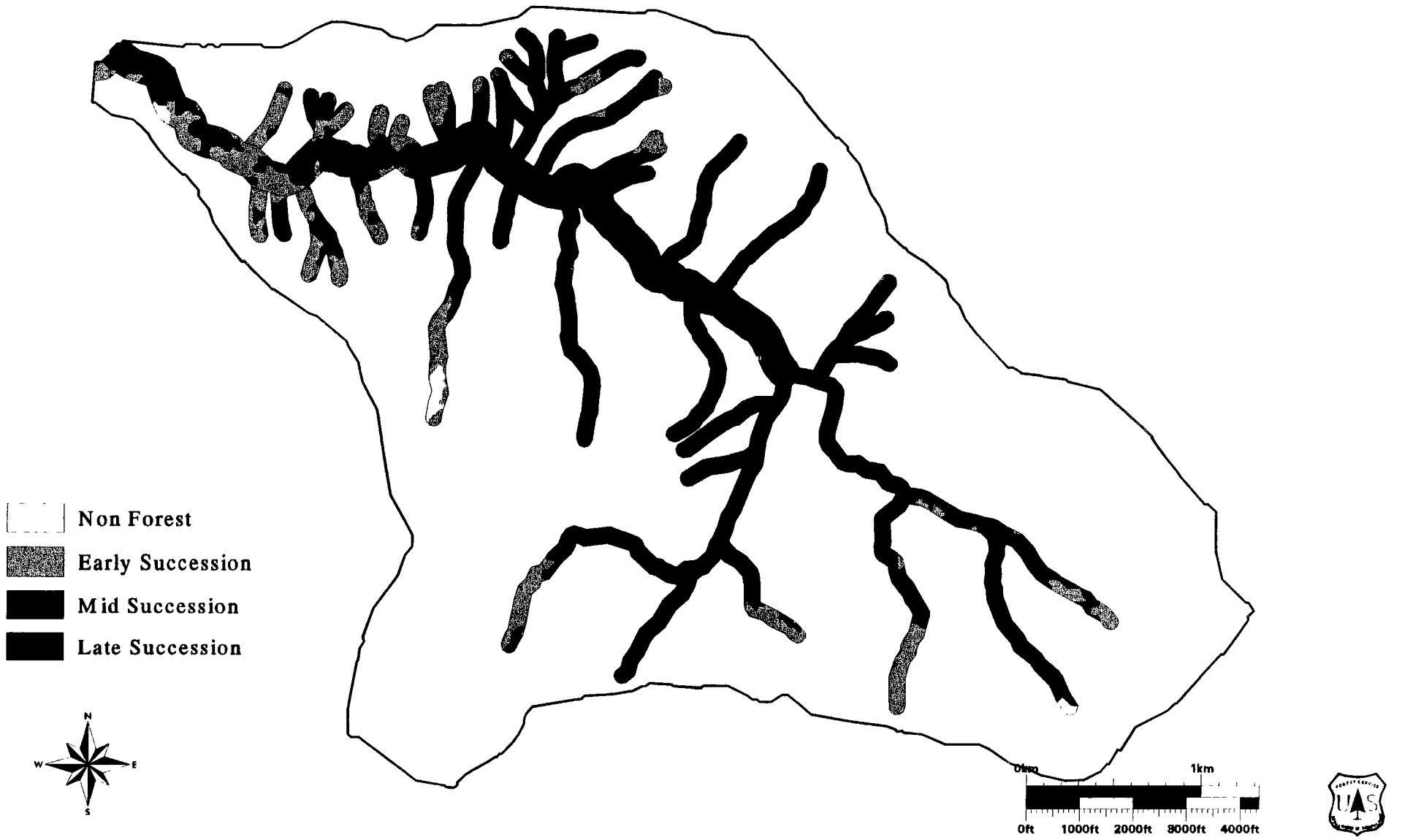
Whisky Creek Subwatershed



Middle Fork Watershed Analysis Area

MAP 15 *Streamside Riparian Successional Stages*

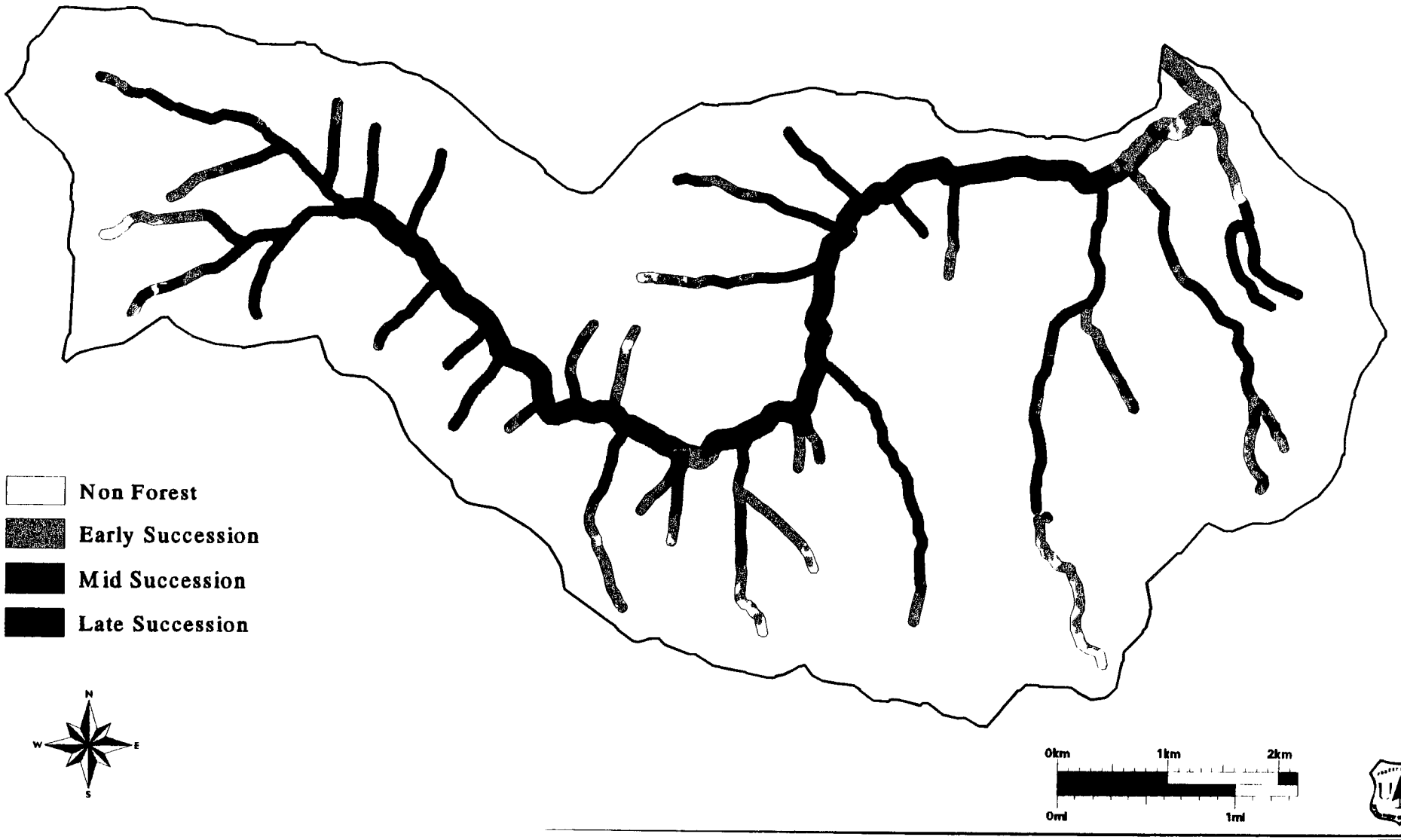
Cook & Green Subwatershed



Middle Fork Watershed Analysis Area

MAP 16 *Streamside Riparian Successional Stages*

Butte Fork Subwatershed



The successional character of Riparian Reserves in Butte Fork, Cook and Green Creek, and the Upper Middle Fork subwatersheds is not believed to have changed very much from historic (pre-European settlement) times. However, vegetative structure and successional character of Riparian Reserves has changed in the Whisky Creek and Lower Middle Fork subwatersheds. Timber harvesting, roading, mining (mainly along the Middle Fork below Marble Gulch), fire, and fire exclusion, have significantly influenced this change.

One important item not readily apparent from the maps is the number of Riparian Reserve acres currently identified as mid-successional conifer forest that are in the 17-21-inch average diameter class. These stands are approaching late-successional characteristics. The percentages of currently mid successional acres in the 17-21-inch size class are estimated by subwatershed as follows: Butte Fork (73%); Cook and Green (67%); Lower Middle Fork (75%); Upper Middle Fork (58%); and, Whisky Creek (88%). Many of these stands are likely to be the result of stand replacement fires 80-100 years ago.

While construction of roads does not reduce the number of acres in late succession the way timber harvest does, roads usually have a permanent impact on Riparian Reserves. Roads also produce a disproportionately larger percentage of stream sediment and more pronounced impacts to riparian wildlife values than does logging. Roading within Riparian Reserves of the Middle Fork watershed is spatially displayed in Map 17. Road miles within Riparian Reserves associated with streams are summarized in Table 7.

Table 7. Road Miles within Riparian Reserves Associated With Streams

	Road Miles Fish Bearing (Class 1 & 2 RRs)			Road Miles Fish Bearing (Class 3 & 4 RRs)		
Subwatershed	Stream Miles	Road Miles	Ratio Rd/St	Stream Miles	Road Miles	Ratio Rd/St
Upper Middle Fork	7.2	2.18	0.30	26.7	2.45	0.09
Lower Middle Fork	3.7	3.71	1.00	15.4	0	0
Whisky Creek	4.6	0	0	14.3	2.75	0.19
Cook & Green	3.2	0.30	0.09	17.9	0.37	0.02
Butte Fork	7.6	0.04	0.01	26.9	0	0
All	26.3	6.23	0.24	101.2	5.57	0.06

(Components of Riparian Reserves associated with wetlands, lakes, ponds, and geologic instability are not displayed on Map 17 or in Table 7.)

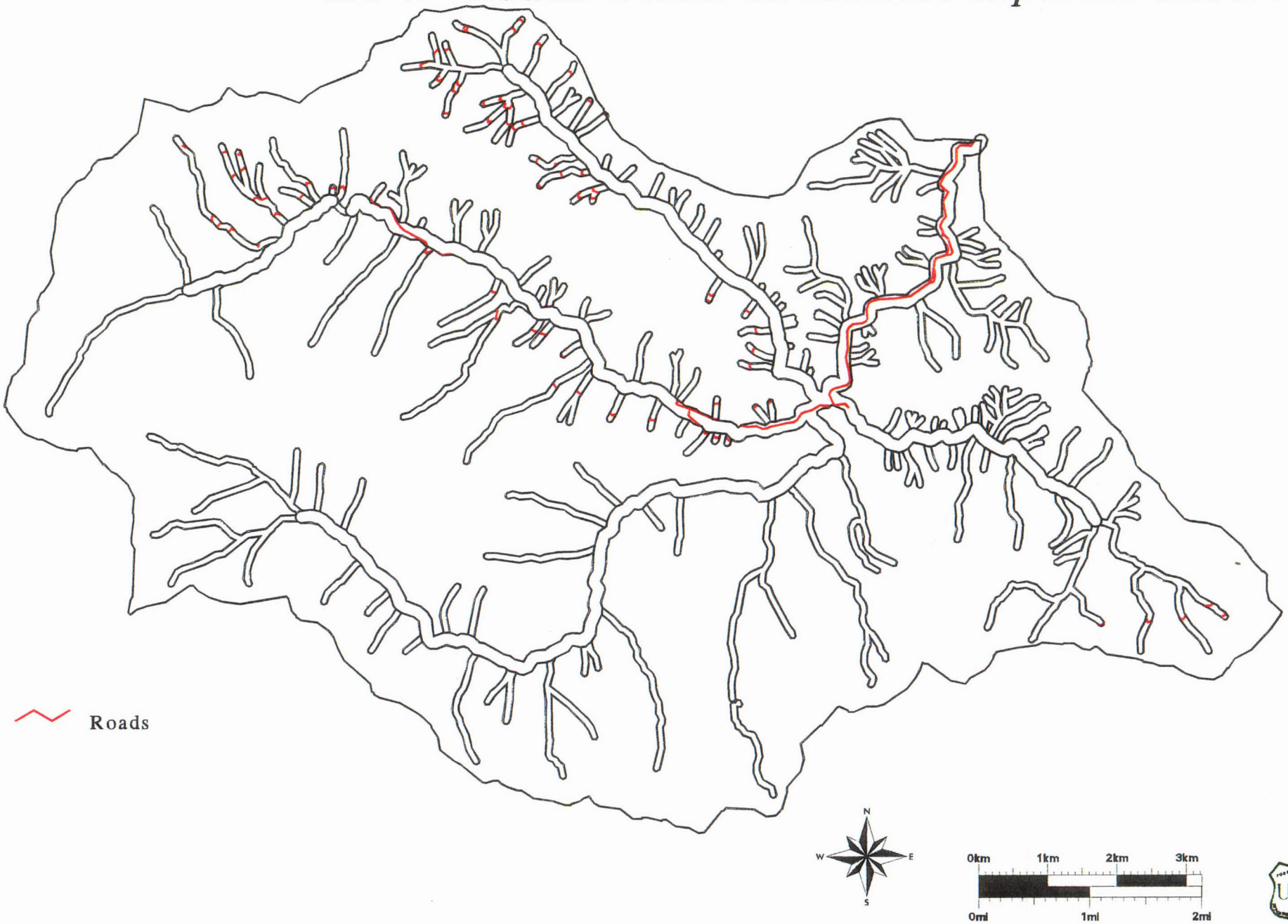
Approximately 12 miles (twenty-two percent) of the total miles of roads within the planning area are within Riparian Reserves. Roading is virtually non-existent in Butte Fork riparian reserves and is very low in Cook and Green and Whisky Creek where they are found primarily at road crossings of non-fish-bearing headwater tributaries. Roading within Upper Middle Fork riparian reserves is also low relative to stream miles, except the lower section of the main stem. The greatest road impact is where Forest Road 1040 parallels the Lower Middle Fork.

1.2.8 OVERALL WATERSHED CONDITION

An overall current watershed condition rating was obtained for the five subwatersheds in the Middle Fork watershed by using a process for determining risk of cumulative watershed effects from multiple activities. The "overall condition rating" is obtained by combining a "watershed risk rating" and a

Middle Fork Watershed Analysis Area

MAP 17 *Roads Within Streamside Riparian Reserves*



"channel condition rating," which are developed from an analysis of various physical parameters for each subwatershed. The watershed risk rating is an index of current human activity (processes) within a subwatershed and the potential of those activities to adversely impact aquatic resources. The two processes that determine the watershed risk rating are road density and the proportion of watershed area with regenerated areas of less than 30 years recovery. The channel condition rating is an index of current channel and fish habitat conditions, and is based on factors that limit fish populations. The two conditions used to determine the channel condition rating are temperature and sediment (as indicated by embeddedness). Variables and rating procedures are described in detail in "Determining the Risk of Cumulative Watershed Effects Resulting from Multiple Activities" (US Forest Service, February 1993). Table 8 summarizes information used to derive current watershed risk and condition ratings and the overall condition rating for each subwatershed.

Table 8. Current Watershed Condition - Middle Fork Analysis Area

	Watershed Risk rating			Channel Condition Rating			
Subwatershed	Road Density (mi/sq mi)	% wtrshd in stands <30yrs	Risk Rating	Temperature	Embedded-ness	Rating	Overall Condition Rating
Upper Middle Fork	1.21	5.7	low	good	good	good	Good
Lower Middle Fork	0.84	0.1	low	fair	good	fair	Fair
Whisky Creek	4.31	20.9	high	fair	good	fair	Poor
Cook & Green	1.38	4.3	low	good	good	good	Good
Butte Fork	0.03	0	low	good	good	good	Good

Only Whisky Creek subwatershed is rated "poor." This subwatershed has a relatively high probability of incurring additional risks to fish habitat and populations, based on existing conditions and potential effects from new projects within the subwatershed. While new activities may not appear to adversely affect fish habitat/populations, they may present additional risk when viewed cumulatively with other (existing and proposed) impacts, depending on location within the subwatershed. Human activities most likely to provide increased risk are those that remove vegetation and/or cause additional compaction, such as timber harvest and road building. The risk of these activities is magnified when they occur on sensitive sites such as Riparian Reserves. Whisky Creek subwatershed should receive emphasis for watershed restoration. Any new proposal should include restoration to the extent that it negates additional risk. Restoration should focus on sensitive areas (i.e. Riparian Reserves and areas of high erosion/sediment potential), as well as on reducing road densities and compacted areas such as skid trails and landings.

Condition of the Lower Middle Fork subwatershed is rated "fair." This consideration does not take into account the incidence of dispersed campsites. Care must be taken in planning new projects so that the subwatershed is not moved into the high-risk "poor" category. Restoration is desirable in "fair" subwatersheds to at least negate impacts from new activities.

The Butte Fork, Cook and Green, and Upper Middle Fork subwatersheds are rated "good." New activities are generally admissible here without concurrent restoration activities to the extent that they do not result in a decline of the overall watershed condition. This assumes implementation of standards and guidelines included in the Northwest Forest Plan, as well as, the Rogue River National Forest Land and Resource Management Plan.

1.2.8.1 Analysis of Effects (Cumulative impacts to aquatic species and habitat)

The matrix below (Table 10) was designed in conjunction with the objectives in the Aquatic Conservation Strategy. This matrix provides a good approach for assessing environmental baseline conditions of a fish-bearing stream system and its tributary watershed during the watershed analysis process The effects of proposed action(s) on relevant indicators (shaded) will be completed using the results of the environmental document (NEPA). (See Table 9, Middle Fork Applegate River Watershed Analysis Area Matrix, for Assessing Baseline Conditions for Instream and Riparian Habitat.)

Table 9. Matrix of Factors and Indicators: Baseline Conditions for Instream and Riparian Habitat

	Environmental Baseline		
Factors: Indicators	**Properly Functioning**	**At Risk**	**Not Properly Functioning**
Water Quality			
Temperature (7 day max average)	2nd - 4th order streams <62F	2nd - 4th order streams <62 -68F	2nd - 4th order streams > 68F
Sediment & Turbidity	<20% fines (sand, silt, clay) in gravel, little cobble embeddedness. Fine sediment within range of expected natural streambed conditions		>20% fines (sand, silt, clay) in gravel, embedded cobbles. Fine sediment outside of expected natural streambed conditions
Habitat Access			
Physical Barriers	No human-made barriers to prevent passage of age 1+ salmonids		Human-made barriers prevent upstream and downstream passage of age 1+ salmonids
Habitat Elements (focus on conditions in low gradient, fish-bearing stream segments {LGS}, usually alluviated canyons or alluvial valleys - Frissell, 1986, 1992)			
Large Wood Material {LGS}	>25 pieces/mile; >24 inches in diameter and >50 ft. in length or 2X bank full width (BFW). Little evidence of stream clean out	10-25 pieces per mile >24 inches. in diameter and >50 ft. in length or 2X BFW. Some stream clean out	<10 pieces per mile >24 inches in diameter and >50 ft. in length or 2X BFW. Evidence of stream clean out
Pool Character and Quality >/= 3rd order streams {LGS}	>30% pool habitat by area; little evidence of pool volume reduction and majority of pools >3 feet in depth	<30% pool habitat by area; some evidence of pool w/fines and majority of pools <3 feet in depth	<30% pool habitat by area; widespread evidence of pool volume reduction and majority of pools <3 feet in depth
Off-Channel Habitat {LGS}	Active side channels relatively frequent; backwater areas present; related to large wood, nick point, etc. or within the expected range of natural conditions	Relatively few side channels, or backwater areas. Evidence of abandoned side channels due to past management activities	Few or no active side channels or backwater areas. Entrenchment or evidence of abandonment of floodplain. Side channel frequency outside of range expected
Flow/Hydrology			
Changes in Peak/Base Flows (Watershed Risk Rating)	Timber harvest, roads and other human activities have not likely influenced the hydrologic regime of the watershed. Little extension of channel network	Moderate amounts of timber harvest and roads have likely influenced the hydrologic regime of the watershed, some increase of channel network.	High levels of timber harvest and roads have likely effected the hydrologic regime of the watershed. Moderate amounts of timber harvest and roads Considerable increase in channel network.

Channel Conditions and Dynamics			
Width/Depth Ratios by Channel Type	Width/depth ratios and channel types within natural ranges and site potential within watershed. Expected range of bank full width/depth ratios by channel type: Rosgen Type — W/D Ratio A,E,G — <12 B,C,F — 12-30 D — >40	Width/depth ratios and channel types partially outside historic ranges site potential within watershed	Width/depth ratios and channel types throughout the watershed are well outside of historic ranges and/or site potential
Streambank Condition	Stable stream banks, little evidence of eroding banks or within range of expected conditions	Moderately stable, some streambank erosion evident	Unstable streambanks, numerous areas of exposed soil and cutting, outside of expected range
Floodplain Connectivity {LGS}	Off channel areas frequently linked to main channel, floods frequently connect stream to floodplain and riparian zone	Reduced floodplain connection to main channel, some evidence of lowering water tables on floodplain	Greatly reduced connectivity between main channel and off channel habitats and riparian areas
Watershed Condition			
Road Density and Location	Low road densities <1.8 mi./sq. mi.,. valley bottom roads not restricting stream meanders or affecting riparian function.	Road density 1.8 - 3.5 miles/square mile, some valley bottom roads restricting stream meander, riparian function.	High road densities (>3.5 mi./sq. mi.), valley bottoms well-roaded, effects on stream channel and riparian function are evident. Portions of some of the sub-watersheds have >4.5 mi./sq.mi.; when combined with unroaded areas, road density appears to be lower than actual
Overall Condition Rating (Human Disturbance History) (utilized road. density, % watershed in stands <30 yr., temp., embeddedness)	Little harvest and road activity, with no concentration in unstable areas, aquatic and riparian refugia or riparian reserves	Moderate harvest and road activity, with disturbance concentrated in unstable areas	Widespread harvest and road activity with disturbance concentrated in unstable areas, refugia, or riparian reserves
Riparian Reserves	Riparian reserves provide adequate shade, future large wood, habitat protection and connectivity for sensitive aquatic species. Little or no evidence of salvage, sufficient down wood or within expected range of conditions	Altered riparian reserves, providing partial adequate shade, habitat protection and connectivity for sensitive aquatic species. Evidence of salvage and down wood deficient	Substantially altered riparian reserves, not providing adequate shade, habitat protection and connectivity for sensitive aquatic species. Extensive salvage, and down wood lacking or outside of expected range of conditions
Landslide and Erosion Rates	Landslide rate and volume near natural rates. Stream conditions not altered by human-caused landslides	Some landslide rate and volume increased related to management activities.	Landslides related to land management far exceed natural rate and volume. Stream conditions obviously altered by human activities

Table 10. Rating of Environmental Conditions in the Watershed

	Environmental Baseline		
FACTORS: Indicators	**Properly Functioning**	**At Risk**	**Not Properly Functioning**
Water Quality			
Temperature (7-day max average)	Upper MF of Applegate River, Butte Fork, Cook & Green Creek	Lower Middle Fork, Whisky Creek	
Sediment and Turbidity	low gradient segments in all streams showed signs of embeddedness		
Habitat Access			
Physical Barriers*	MF of Applegate River, Butte Fork, Cook & Green Creek., Whisky Creek		*
Habitat Elements			
Large Woody Material	MF of Applegate River, Butte Fork, Cook & Green Creek., Whisky Creek		
Pool Characteristics & Quality.	MF of Applegate River, Butte Fork, Cook & Green Creek., Whisky Creek	All low gradient stream segments have less than 30% of area in pools	
Off-channel Habitat		Side channel habitat represent less than 2% in low gradient stream segments	
Flow/Hydrology			
Changes in Peak/Base Flows	MF of Applegate River, Butte Fork, Cook & Green Creek.	Whisky Creek	
Channel Conditions and Dynamics			
Width/Depth Ratios by Channel Type	Upper stream segments appear to be in range of desired conditions	Low gradient stream segments in Lower MF of Applegate R. and Butte Fork have high width/depth ratios	
Streambank Condition	MF of Applegate River, Cook & Green Creek., Whisky Creek	Butte Fork	
Floodplain Connectivity		Evidence of remnant side channels; most are not functioning at present.	
Watershed Conditions			
Road Density and Location	MF of Applegate River, Butte Fork, Cook & Green Creek.	Portions of: upper MF of Applegate River. and upper Whisky Creek.	Whisky Creek
Overall Condition Rating (Human Disturbance History)	Upper MF of Applegate River, Butte Fork, Cook & Green Creek.	Lower Middle Fork,	Whisky Creek
Riparian Reserves (percent of mature and late seral = >17"dbh)	Upper MF of Applegate River, Butte Fork, Cook & Green Creek	Lower Middle Fork, Whisky Creek	
Landslide and Erosion Rates	MF Applegate River, Whisky Creek. (unknown - Cook & Green)	Butte Fork	

1. These three categories of function ("properly functioning," "at risk," and "not properly functioning") are defined for each indicator in the "Matrix of Factors and Indicators"(Table 10).

2. For the purposes of this checklist, "restore" means to change the function of an "at risk" indicator to "properly function", or to change the function of a "not properly functioning" indicator to "at risk" or "properly functioning" (i.e., it does not apply to "properly functioning" indicators).
3. For the purposes of this checklist, "maintain" means that the function of an indicator does not change (i.e., it applies to all indicators regardless of functional level).
4. For the purpose of this checklist, "degrade" means to change the function of an indicator for the worse (i.e., it applies to all indicators regardless of functional level). In some cases, a "not properly functioning" indicator may be further worsened, and this should be noted.

*Applegate Dam excluded

1.2.9 BOTANY

The Middle Fork watershed includes an extremely variable and diverse pattern of plant communities. This high diversity is attributed in part to the diversity of soils and topographic (ridge/aspect/drainage) features within the watershed. The wide distribution and abundance of hardwood plant communities can also be attributed to a "rain shadow area" located in the watershed. This results in the northeast portion of the watershed being the driest area on the Applegate Ranger District. The adjacent Carberry watershed, located to the northwest, is the wettest watershed in the Applegate Ranger District. There is a dramatic difference in plant communities between these two watersheds. Unlike the Carberry watershed, which has generally distinct and contiguous plant communities, the Middle Fork watershed plant communities are complex and scattered throughout the landscape.

1.2.9.1 Vegetation Zones

Four vegetation zones are present within this watershed (Map 18). Beginning at the lowest elevation (near the south end of Applegate Lake) and extending to approximately 3,000 feet is the Interior Valley Zone. This zone includes forest stands dominated by hardwoods, including Oregon white oak, California black oak, Pacific madrone, and canyon live oak. South slopes include savannas occupied by grass, forbs, "brushfields" of ceanothus and manzanita, and the hardwoods listed previously. North slopes include Douglas-fir as the dominant conifer, with ponderosa pine, sugar pine, incense cedar, and madrone as common associates.

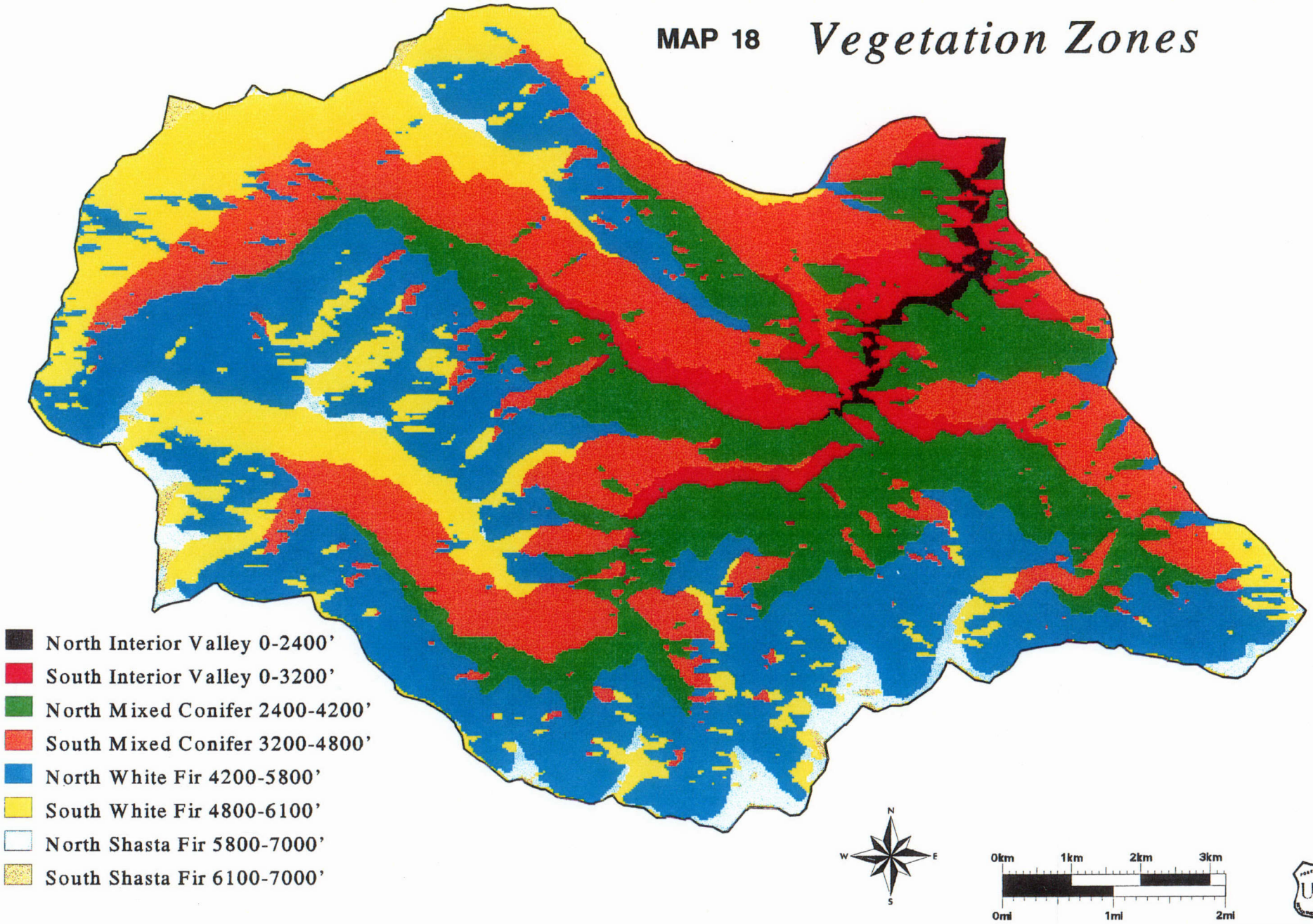
Above the Interior Valley Zone, extending to approximately 4,500 feet is the Mixed Evergreen Zone. "The landscapes of this zone are made up of a complex mosaic of habitat and vegetation types reflecting environmental mosaics since the last disturbance." (Franklin, 1979) On north slopes, this zone is dominated by Douglas-fir. Hardwoods present may include Pacific madrone, canyon live oak, golden chinquapin, Californian black oak and big leaf maple. Associated conifers often include ponderosa pine, sugar pine, incense-cedar, western white pines and white fir. On south slopes ponderosa pine is often the dominant conifer with incense-cedar, sugar pine and Douglas-fir as associates. Hardwoods, including canyon live oak, madrone with manzanita, and poison oak shrubs, are common at lower elevations. Chinquapin (both tree and brush forms) is common in the upper area of this zone, and Knob cone pine is a past-fire pioneer species in this and the higher zones.

The White Fir Zone extends from approximately 4,500 feet to 6,000 feet. On north slopes, white fir may dominate below this elevation range. Associated conifers may include Douglas-fir, sugar pine, ponderosa pine, Brewer spruce, and mountain hemlock. The higher elevations, includes Shasta red fir.

The Shasta Red Fir Zone begins above approximately 6,000 feet,. This zone is not distinct by elevation, and appears to be correlated more with the cooler east and north high-elevation areas, which usually maintain a heavy snow pack. In addition to Shasta red fir, mountain hemlock is common in this zone.

Middle Fork Watershed Analysis Area

MAP 18 *Vegetation Zones*



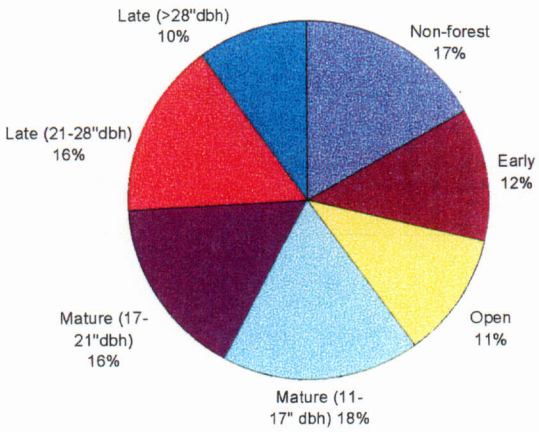
1.2.9.2 Historic Stand Composition

Historically the lower Mixed Evergreen Zone and the Interior Valley vegetation zones were maintained in a much more open vegetative condition, due to frequent wildfires. Large diameter, wide spaced stands of Ponderosa pine and California black oak with associates including Douglas-fir, sugar pine, incense cedar, and madrone were common on north slope benches and riparian areas. The south aspects, west aspects and ridges were generally open, including savannas with scattered white oaks and pines. Brush fields of ceanothus and manzanita were present, but included younger plant communities. These much more open stand conditions would have generally prevailed throughout most of the watershed. Periodic fires would have also maintained larger areas of high elevation meadows. Brush/forb communities dominated south aspects with much less conifer stocking present.

1.2.9.3 Distribution of Successional Stages

The attached chart (Figure 16) displays the current seral stand composition for this watershed. The acreage of seral stands reflects the lack of wildfires (fire exclusion) over the past 90 years. The distribution and acreage of late seral habitat has been impacted by the harvesting of older, higher value, mature stands over the past 50 years. Also, the mature components of ponderosa pine, sugar pine, and Douglas-fir have been significantly reduced by dwarf mistletoe disease and bark beetles over the past 25 years.

Figure 16. Successional Stage Distribution



1.2.9.4 Plant Community Concerns

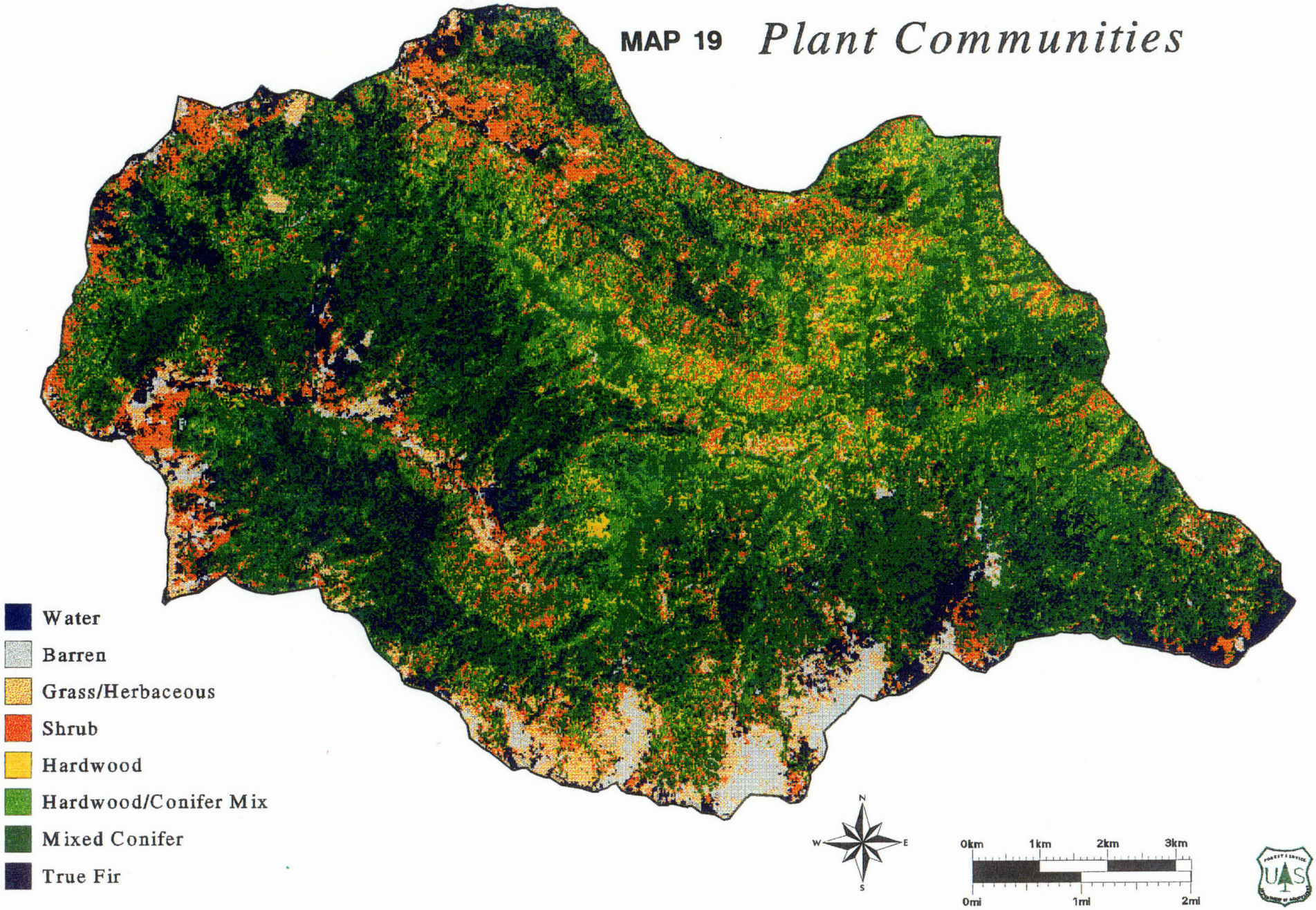
Plant communities within the analysis area are shown on Map 19. The following are plant communities that are not indicated on the map[2].

Moist mountain meadows: Many moist mountain meadows in this watershed no longer support the species composition or structure that they had prior to their long history of livestock grazing. They are often dominated by "increaser" species (those that are unpalatable or otherwise do well under grazing pressure). More palatable and less resilient native plant species, some of which may have dominated these meadows in the past, now exist only in microsite refugia. Purposeful introduction of non-native

[2] Acreage not significant to show on the map

Middle Fork Watershed Analysis Area

MAP 19 *Plant Communities*



forage species has been common. Other non-native species have encroached on their own, capitalizing on the grazing disturbance. Excellent examples of intact moist meadow plant communities are Snake Lake Basin, the meadows between Frog Pond and Mt. Emily, and Elk Meadow basin. The latter is one of the most pristine wetlands on the Siskiyou side of the Rogue River National Forest.

Pines: Large ponderosa pines and sugar pines are dying throughout the watershed, weakened by drought-cycle competition, and killed by bark beetles. These large pines have become vulnerable to beetles because of increased competition with other trees and shrubs which in earlier times would have been thinned out by frequent wildfires.

Western white pines have become scarce in the watershed. White pine blister rust (an introduced pathogen), followed by bark beetles, has eliminated a large portion of the western white pines in the last decade. This recent mortality, as well as the effects of the blister rust over many previous decades, has severely limited the abundance of western white pine in the watershed. In the last ten years a massive western white pine die-off has occurred in Moraine Basin Lake. Instead of an open white pine community, the area has now become either non-forested or is now a Jeffrey pine woodland.

Non-native plant species and noxious weeds: Non-native plant species can potentially displace native plant species, alter the suitability of native animal habitat, and affect ecological processes in native plant and animal communities. Some non-natives have been purposely introduced and others are invaders. Non-native trees and shrubs are generally not found in the watershed except immediately around historic human dwelling sites.

Some open dry habitats in low to mid elevations within the watershed have herbaceous vegetation layers now dominated by non-native plant species. In these habitats, invading species have sometimes become established even without human disturbances. The remainder (and majority) of the watershed commonly has non-native grasses and forbs in areas that have experienced human or grazing disturbance. The rate of invasion and establishment of non-native plant species is clearly correlated to elevation, with low elevation areas being particularly vulnerable and extremely high elevation areas being relatively immune to most of the invaders.

Undisturbed upland coniferous forest in the watershed generally does not support non-native plant species, except where they exist as minor elements in canopy light gaps. Where disturbance occurs however, these invaders often readily establish, colonizing from outside seed sources, or emerging from the soil seed bank. It is not clear if any of these non-native species will, over time and repeated disturbance, manage to increase their presence in coniferous forest habitat. In the short term, the abundance of non-native species appears to decline as the canopy closes over a developing forest stand.

There are at least 50 non-native plant species established in the watershed. These include the following state-designated noxious weeds that are known or suspected to occur in the watershed:

yellow starthistle, medusa head, grass bull thistle, Klamath weed, tansy ragwort.

Among the non-natives that have been purposely introduced, the most invasive are probably colonial bentgrass and Kentucky bluegrass.

1.2.9.5 Botanical Areas and Research Natural Areas

Botanical Areas - There are three botanical areas, portions of which are within the Middle Fork watershed: Cook & Green Pass and Whisky Peak.
Research Natural Areas - There are no RNAs within the watershed.
Red Buttes Wilderness - Many important botanical resources are contained within the wilderness. The "wilderness" designation provides "for the protection of these areas, the preservation of the wilderness character and for the gathering and dissemination of information." (The Wilderness Act, 1964)

1.2.9.6 Rare Vascular Plant Species

Table 11 below displays the rare vascular plant species that are known to occur in the Middle Fork watershed. This listing includes plants from the Regional Forester Sensitive Species list, selected plants from Oregon Natural Heritage lists, species from California Native Plant Society's rare plant lists, and species that are locally rare.

Table 11. Rare Vascular Plant Species Occurring in the Middle Fork Watershed

Scientific Name	Common Name	*Risk of Extirpation
Arabis koehleri var stipita	Koehler's rockcress	
Arabis X/ultrapurascens	Goforth's rockcress	
Carex gigas	Gigas' carex	
Castilleja schizotricha	split hair Indian paintbrush	
Cupressus nootkatensis	Alaska yellow cedar	
Cypripedium fasciculatum	clustered lady's slipper	High
Cypripedium californica	California lady's slipper	High
Dicentra pauciflora	few flowered bleeding heart	
Draba carnosula	Mount Eddy draba	
Draba howellii	Howell's draba	
Epilobium siskiyouense	Siskiyou willow herb	
Erigeron cervinus	Siskiyou daisy	
Erigeron petrophilus	cliff daisy	
Eriogonum lobbii	Lobb's eriogonum	High
Eriogonum ternatum	ternate buckwheat	
Gentiana newberryi	Newberry's gentian	
Hazardia whitneyi ssp discoideus	Whitney's hazardia	
Hiercium bolanderi	Bolander's hawkweed	
Hiercium greenei	Green's hawkweed	
Lewisia cotyledon var howellii	Howell's lewisia	
Lewisia leana	Lee's leana	
Mertensia bella	Oregon's lungwort	
Pedicularis howellii	Howell's lousewort	
Pellaea breweri	Brewer's pellaea	
Poa piperi	Piper's bluegrass	
Polystichum lemmonii	Lemon's needlegrass	
Ribes marshallii	Marshall's gooseberry	
Rubus nivalis	snow bramble	High
Scirpus subterminalis	water bulrush	High
Sedum laxum ssp heckneri	Heckner's stonecrop	
Sedum spathulifolium ssp purdyi	Purdy's stonecrop	
Tauschia glauca	Glaucous tauschia	High
Veronica copelandii	Copeland's veronica	

*"High" risk of extirpation means there is reason to believe the species could disappear from the Middle Fork watershed within the next 100 years, based on low population numbers and/or perceived natural and man made threats to habitat.

Among the species at risk of extirpation, clustered lady-slipper and glaucous tauschia are considered highest priority for protection, monitoring and habitat improvements. These were chosen based on a combination of the following criteria:

- importance of these populations to species viability at larger geographic scales;
- ability to manage local populations to decrease the risk of extirpation.

There are at least four known sites of clustered lady-slipper, Cypripedium fasiculatum, (a ROD survey and manage species), in the Middle Fork watershed. There is only one population of Tauscha glauca in the Middle Fork watershed, in California; this plant is on the watch list in California. It is more common further south in California, and in the Grants Pass and Illinois Valley areas of Oregon.

1.2.9.7 Survey and Manage Species

Vascular Plants:

The clustered lady slipper orchid, Cypripedium fasciculatum: The lady slipper orchid is at high risk of extirpation primarily because of low population numbers, and sensitivity to both ground disturbance and canopy removal. There is uncertainty of how this orchid responds to wildfire or prescribed fire. This species is threatened throughout its range.

Howell's lousewort, Pedicularis howellii: Known populations have consistently few individuals. However, the frequency of occurrences and variety of habitats indicates there is almost no risk of extirpation within the next 100 years. Higher elevations in the watershed are in the heart of this species range.

Also likely to be present is the Candy-stick, Allotropa virgata, a vascular plant that has no chlorophyll and cannot make its own carbohydrates relying on mycorrhizal fungi. Not enough is yet known about the distribution, abundance, and habitat requirements of this species to predict risks to its viability within the watershed.

Bryophytes, Lichens, and Fungi:

There are no known sites of Survey and Manage bryophytes, lichens, or fungi within the watershed. There is potential habitat for bryophytes, liverworts, and fungi within the watershed and some species are certainly present. It is reasonable to assume that special protective measures or management may be needed in the future to maintain viability of some of the species within the watershed. Those that may occur in the watershed are:

- Bryophytes
- Liverworts

  Kurzia makinoana; remotely possible on forested, low-elevation stream terraces and floodplains, and around low-elevation wetlands at the bottom of the watershed.

  Ptilidium californicum: almost certainly present in the watershed and may be locally common. Survey and Manage status and surveys only apply to the California portion of the Middle Fork watershed. Projects in older, white fir forests at middle and higher elevations in California will need surveys.
- Fungi:

  Bondarzewia montana, a polypore with an annual fruiting body, can reasonably be expected to occur in the watershed at higher elevations in late-successional fir forest.

1.2.9.8 Disturbance mechanisms

Historically, fire has been the primary disturbance mechanism in this watershed. With the exclusion of natural wildfire over most of the area of this watershed since the early 1900s, high vegetation densities are causing severe competition for moisture, nutrients and growing space.

Logging and road building have been major disturbance mechanisms in this watershed. Logging began on private land after World War II. In the 1950s and 1960s logging on Forest Service land accelerated. Initially, road building and logging focused on partial cutting and salvage of large diameter ponderosa pine, sugar pine and Douglas-fir. Later in the 1970s and 1980s many stands were re-entered with regeneration systems including shelterwood and clearcut harvests. The presence of high value conifer in several areas led to intensive/concentrated harvesting. The concentrated harvesting north of Whisky ridge is an example of this disturbance mechanism.

Early harvesting was done with tractors and high-lead cable systems. Recent harvests have been more sensitive responsive to the soil constraints, using skyline and helicopter logging systems. Approximately 2,000 acres of the total acres in the watershed have been regenerated with either clearcut or final overstory removals.

1.2.10 INSECTS AND DISEASES

Insects and diseases have significant roles in forest ecosystems. Along with agents such as fire and wind, insects and disease cause disturbances that trigger changes in the composition, structure, and stocking levels of forest vegetation. These changes occur at the landscape, stand, and individual tree level.

The most noticeable effects from insects and diseases in the Middle Fork watershed today are due to bark beetles, Douglas-fir dwarf mistletoe, and white pine blister rust. The level of activity of insects and diseases is probably higher today than at the turn of the century due to human activities such as timber harvesting, fire exclusion, and the introduction of exotic organisms.

1.2.10.1 Current Conditions and Trends

Bark beetles: This watershed, like many in southwestern Oregon, has seen high levels of bark beetle activity during the past decade. Large sugar pines and ponderosa pines of all sizes throughout the watershed have been killed by mountain pine beetles (Dendroctonus ponderosae) and western pine beetles (D. brevicomis). The major contributing factors to the high levels of mortality are overstocking and the recent period of below "normal" precipitation. In the last two years, bark beetle activity has declined. This is probably because of higher levels of precipitation during the last two winters. However, in the future, pines will continue to be killed by bark beetles as long as they are in stands that are overstocked.

Woodborers (family Buprestidae), Douglas-fir beetles (D. pseudotsugae), and fir engraver beetles (Scolytus ventralis) have also killed many large Douglas-fir, white fir, and Shasta red fir of all sizes. Mortality is most noticeable on ridgetops, south-facing slopes, and dry or rocky sites. Major factors contributing to mortality are drought, and invasion of Douglas-fir and white fir onto drier, lower elevation sites than they typically occupied prior to fire exclusion. Douglas-fir engraver beetles (Scolytus unispinosus) and Douglas-fir pole beetles (Pseudohylesinus nebulosus) have killed sapling and pole size Douglas-fir growing in dense, overstocked clumps. These beetles and woodborers are also

attracted to trees that are weakened by root diseases.

Bark beetles act as thinning agents and reduce the amount of live conifer biomass on a site. Prior to Euro-American settlement, frequent, low intensity fires were probably the primary thinning agent and consumer of biomass in low to mid-elevation Douglas-fir/hardwood and mixed conifer forests. Historically, unlike bark beetles, frequent fires tended to kill smaller trees and leave larger ones. Thus, the activities of bark beetles may create forests that have a different structure than was created by frequent fires.

Dwarf mistletoes: Dwarf mistletoes are found on Douglas-fir, white fir, Shasta red fir, and ponderosa pine in this watershed. This plant parasite is by far most widespread and most severe on Douglas-fir. There are few areas of this watershed with Douglas-fir where dwarf mistletoe does not occur. Many large Douglas-fir that were heavily infected with dwarf mistletoe have been killed by woodborers. Douglas-fir dwarf mistletoe (Arceuthobium douglasii) has significant effects on the growth and survival of its host when more than half of the crown is infected. Trees that are infected while they are small are unlikely to survive to a large size because infections involving most of the crown can develop rapidly in small trees.

Many stands that are severely infected with Douglas-fir dwarf mistletoe have heavy fuel loads created by mistletoe brooms that have fallen to the ground. This ground fuel, underneath living brooms in the lower branches of trees, may provide a ladder for ground fires to move into the canopy.

Western dwarf mistletoe (A. campylopodum) is widespread on ponderosa pine in a few locations, including the area around Bloomfield Pass. Otherwise, it occurs sporadically around the watershed on individuals or small groups of pines. Severe infections cause significant growth loss and mortality, especially in young, infected trees. Severely infected trees may be vulnerable to bark beetle attack.

Dwarf mistletoes, by themselves in white or Shasta red fir, do not normally have severe effects on tree vigor. However, the mistletoe-infected branches are often invaded by canker fungus (Cytospora abietis). The combination of infection by both of these organisms reduces tree vigor and predisposes them to attack by fir engraver beetles. Severe infections of both white fir or Shasta red fir dwarf mistletoe (A. abietinum f. sp. concoloris and A. abietinum f. sp. magnificae) and Cytospora canker occur in scattered locations at higher elevations, including the areas around Cook and Green Pass, Whiskey Peak, and Low Gap. (Dwarf mistletoe that infects white fir will not infect Shasta red fir and vice versa).

Open stands and multi-layered stands are most favorable for development of high levels of dwarf mistletoe infection. Partial cutting of infected stands, and the exclusion of fire have probably increased the extent and severity of dwarf mistletoe infections in the watershed above that of pre-Euro-American times.

White pine blister rust: White pine blister rust (caused by a fungus, Cronartium ribicola, that was introduced to North America in the early 1900s) is affecting the survival of sugar and western white pines, especially at the higher elevations. Small trees are killed outright by this disease. Large trees are weakened when their tops and branches are killed. Weakened trees are then vulnerable to attack by mountain pine beetles, especially if they are also growing in overstocked stands.

Blister rust hazard is highest in areas where moisture persists during the summer and fall, such as along

high ridges and in riparian areas. Certain years have environmental conditions that are especially favorable for the disease, resulting in "waves" of infection. High levels of mortality caused by the combination of severe blister rust and mountain pine beetles can have dramatic effects on species composition and stand structure. This is evident in areas such as the Siskiyou Crest west of Cook and Green Pass, where western white pine was, until recently, a significant component of the stocking. The likelihood that many naturally regenerated white pines will survive here to replace those that were killed is poor because of the high level of seedling mortality due to blister rust.

On some drier, low-elevation sites in this watershed the blister rust hazard may be relatively low. Here natural sugar pine regeneration may have a better chance to survive and replace large sugar pines that have been killed by mountain pine beetles if stocking levels are controlled.

Root Diseases: Blackstain root disease, annosus root disease, and laminated root rot are all present in this watershed. These diseases are caused by three species of fungi, respectively: Leptographium wageneri, Heterobasidion annosum, and Phellinus weirii.

Blackstain root disease was found in small patches of two to six infected Douglas-fir. Most of the infected trees were sapling or pole size. Douglas-fir is the major host of blackstain in western Oregon. This disease is associated with soil compaction and disturbance common along roads, skid trails, and edges of landings. Infection centers are established by root-feeding bark beetles and weevils that carry the fungus. They are attracted to wounded roots, stumps, and thinning slash. The fungus then spreads outward from the established center via root contacts or short distances through the soil. The centers can enlarge at a rate of three to five feet per year in plantations. However, once trees reach 30 to 35 years of age, their susceptibility seems to decrease(unless they are under stress as a result of being wounded or growing on sites that have been severely disturbed or compacted).

Laminated root rot was found killing groups of Douglas-fir and white fir in several locations. Both of these tree species are highly susceptible to the disease. Susceptible hosts become infected, regardless of vigor, when their roots contact infected material in other roots or stumps. Other conifer species may be infected, but are much less likely to be killed. The fungus can survive for up to 50 years in large stumps.

Stumps with fruiting bodies and decay caused by H. annosum are very common in areas where true firs have been partially cut, such as Whisky Ridge and Low Gap. Wind-thrown white fir with annosus decay in the roots are also found in these areas. This disease kills young white and Shasta red fir that are adjacent to large, infected trees and stumps. Older infected trees are often killed by fir engraver beetles or eventually blown over. The fungus spreads via both root contact and airborne spores. Fresh stumps are infected by airborne spores, which then become a long-term source of inoculum. The extensive partial cutting in true fir stands has provided conditions that favor the spread of this disease from stumps to true fir regeneration.

Stem decays: Trees with stem and butt decays are widespread in mature stands throughout the watershed. They are caused by numerous species of fungi. The three most common are Phellinus pini, Phaeolus schweinitzii, and Echinodontium tinctorum. These fungi attack the living heartwood of infected trees. The trees may live for many years, but are eventually killed when the rotted wood fails. In partially harvested stands, particularly in true fir stands with large numbers of wounded residual trees, the number of trees infected with stem decay fungi may be very high. However, harvesting may also have removed many of the large trees with advanced decay which are most valuable to wildlife.

Madrone canker: This disease, caused by the fungus Botrysphaeria dothidea, is killing the branches and tops of madrone trees in some locations. According to McDonald and Tappeiner (1990), the incidence of this disease appears to have increased in northern California, Oregon, and Washington during the last 15 years. A number of factors, including wounds, drought, competition, and other diseases such as leaf spots may predispose trees to damage from this disease.

Root Disease and Dwarf Mistletoe in Brewer Spruce: In some areas of its range, many Brewer spruce have been found to be infected with annosus root disease and/or dwarf mistletoe (Thornburgh, 1990). Brewer spruce with annosus decay in the roots or butt are more susceptible to wind-throw than uninfected trees. Severe dwarf mistletoe infections will affect growth and survival, especially in small, infected trees.

1.2.10.2 Implications for Future Management:

At endemic levels, insects and diseases have important roles in creating small openings that are characteristic of mature and old-growth stages of forest development. They are also responsible for many of the snags, cavities, and platforms that various species of wildlife use for food and shelter. Death and decay caused by insects and diseases is part of the process of decomposition and recycling of nutrients contained in trees. However, at higher levels, the effects of insects and diseases can cause significant changes in forest structure, species composition, and stocking levels. Such changes may affect management objectives that are based on a desired sequence of tree, stand, or landscape development. (See Map 20 for At Risk Stands)

Bark beetle activity has already altered stand structure and species composition in many areas of this watershed by killing large numbers of pines. Even with "normal" moisture, if stand densities remain high, the level of bark beetle activity is also likely to remain high, and the number of large pines will be reduced even further in the future. High stand densities will also make it unlikely that pine regeneration will survive. This is true in plantations as well as natural stands. Bark beetles have killed large numbers of trees in densely stocked ponderosa pine plantations in eastern Oregon once the trees reached fifty years of age. Controlling the stocking will be necessary if it is desirable to maintain pines in these plantations.

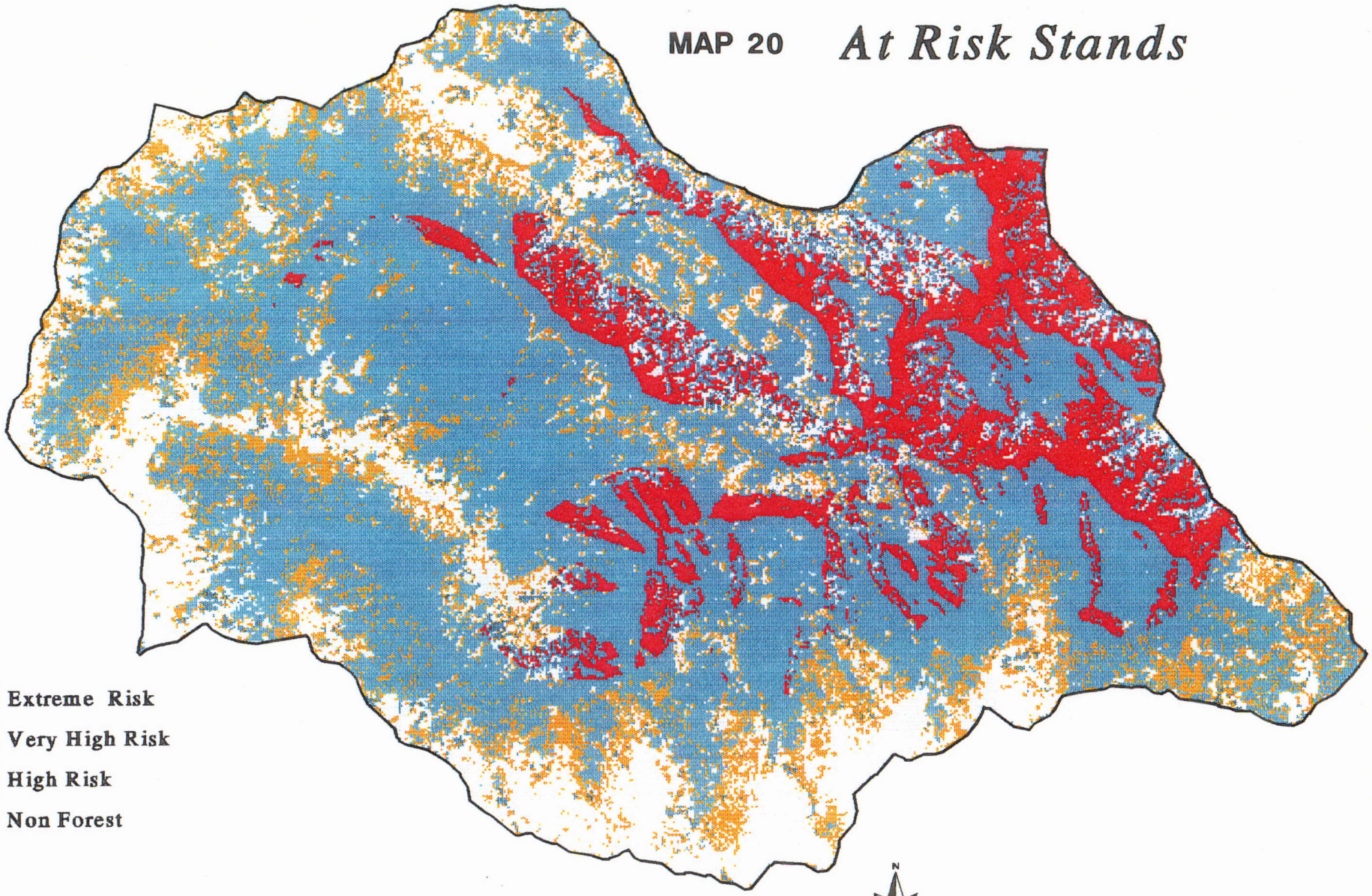
Woodborers, Douglas-fir beetles and the fir engraver beetle will continue to kill Douglas-fir and white fir that have invaded marginal sites or are infected by root diseases and dwarf mistletoes. Where these diseases are present, and on dry, low elevation or south-facing slopes, it may be advantageous to favor other species, especially if large, long-lived trees are desired.

Successful natural regeneration of sugar and western white pine on high hazard sites is unlikely due to the high levels of seedling mortality caused by white pine blister rust. Use of rust-resistant planting stock will increase their chances of survival. Root disease centers are excellent places to plant these seedlings because they are rarely affected by root diseases and competition from more disease-susceptible species is reduced.

Douglas-fir dwarf mistletoe brooms provide nesting and hiding cover for a wide variety of small mammals and birds, including the northern spotted owl. The seeds of larger dwarf mistletoe plants, such as those found on ponderosa pine, are an important source of food. However, severe dwarf mistletoe infections can result in growth losses and mortality that are undesirable in stands where a closed canopy

Middle Fork Watershed Analysis Area

MAP 20 *At Risk Stands*



of large trees is desired. Management of the level of Douglas-fir dwarf mistletoe in spotted owl nest stands may be necessary to provide future nest trees and the level of canopy closure that owls require.

Low levels of root disease may create species and structural diversity that might otherwise be lacking in relatively uniform stands. However, large active root disease centers, in stands composed primarily of highly susceptible species, may make it difficult to develop closed canopies of trees that are larger than pole size. Root disease centers with large numbers of wind-thrown trees, standing snags, and dense regeneration, contain large amounts of fuel that can contribute to hot fires.

Regeneration of root disease centers with pines or cedars, either planted or natural, will stock these sites with conifers that can survive to large sizes and reduce the level of inoculum. The level of inoculum will also be reduced in root disease centers that fill in with hardwoods or shrubs. In stands where root diseases are present, the level of disease should be assessed before thinning is prescribed. In mixed species stands with low levels of root disease, it may be possible to manipulate species composition to minimize the impact. In severely infected stands that are stocked primarily with highly susceptible species it may be better not to thin.

Hollow trees, broken stems, and decayed wood created by stem decay fungi are extremely valuable as habitat for many species of wildlife. Second growth stands that are managed on short rotations may not have time to develop the hollows and minimum diameter of decayed heartwood needed by cavity nesting wildlife species. On the other hand, stands that are managed on long rotations, with multiple harvest entries or underburning may have higher levels of stem decay than are currently present. Table 12 below shows insects and disease observed in the analysis area.

Table 12. Insects and Diseases Observed in the Middle Fork Watershed

Insects	Scientific name	Plants Affected
Cooley spruce gall adelgid	Adelges cooleyi	DF
wood borers	family Burestidae	DF,WF
mountain pine beetle	Dendroctonus ponderosae	WWP, SP, PP
western pine beetle	Dendroctonus brevicomis	PP
Douglas-fir Beetle	Dendroctonus pseudotsugae	DF
Douglas-fir pole beetle	Pseudohylesinus nebulosus	DF
Douglas-fir engraver beetle	Scolytus unispinosus	DF
fir engraver	Scolytus ventralis	WF
Diseases		
white fir dwarf mistletoe	Arceuthobium abietinum f.sp. concoloris	WF
red fir dwarf mistletoe	Arceuthobium abietinum f.sp. magnificae	SRF
Douglas-fir dwarf mistletoe	Arceuthobium douglasii	DF
western dwarf mistletoe	Arceuthobium campylopodum	PP
madrone canker	Botrysphaeria dothidea	PM
white pine blister rust	Cronartium ribicola	WWP,SP
Cytospora canker	Cytospora abietis	SRF,WF
brown stringy rot	Echinodontium tinctorum	SRF,WF
annosus root disease	Heterobasidion annosum	SRF,WF
blackstain root disease	Leptographium wageneri	DF
red-brown cubicle butt rot	Phaeolus schweinitzii	DF
red ring rot	Phellinus pin	DF,PP
laminated root rot	Phellinus weirii	DF,WF
incense cedar mistletoe	Phoradendron libocedri	IC

DF = Douglas-fir IC = incense cedar PM = Pacific madrone PP = ponderosa pine
SP = sugar pine SRF = Shasta red fir WF = white fir WWP = western white pine

1.2.11 WILDLIFE

The Middle Fork watershed offers many unique habitats and thus, potentially has several species of concern.

Historically, the habitat was shaped not only by climatic and geomorphologic patterns but also by fire. Current stand densities and species composition are different to those historically found in this landscape. Canopy closure and multi-layered stands would have been more open in nature due to fire, especially in the mid to upper portions of the slopes. Dense, early successional vegetation found in the northern and eastern portions of the watershed, and the decadent stands of browse would have been less distributed than today.

Any species that came into direct conflict with man as he entered the area were virtually eliminated. Large predators such as the grizzly bear and wolf have been extirpated, although anecdotal information of the presence of large canids exists throughout southwestern Oregon. Historically, timber harvest, farming practices, mining practices, government management practices, and intrusion have all impacted the habitat in this watershed. (See Applegate River Watershed Assessment: Aquatic, Wildlife, And Special Plant Habitat, 1995.)

1.2.12 TERRESTRIAL WILDLIFE SPECIES

Wildlife species currently found in the watershed that are listed under various management categories, are shown in Table 13 below.

Table 13 - Wildlife Species List

SPECIES	SCIENTIFIC NAME
THREATENED & ENDANGERED	
Peregrine Falcon	Falco peregrinus anatum
Bald Eagle	Haliaeetus leucocephalus
Northern Spotted owl	Strix occidentalis caurina
REGION 6 SENSITIVE	
California Wolverine	Gulo gulo luteus
Northwestern Pond Turtle	Clemmys marmorata marmorata
Northern Red-legged Frog	Rana aurora aurora
White-footed Vole	Arborimus albipes
California Mountain Kingsnake	Lampropelis zonata
SURVEY & MANAGE	
Red Tree Vole	Arborimuis longicaudus
Siskiyou Mountain Salamander	Plethedon stormi
Oregon shoulderband	Helminthoglypta herleini
Oregon Megomphix	Megomphix hemphilli
Siskiyou sideband	Monadenia chaceana
Tehama Chaparral	Trilobopsis tehamana
Blue-grey tail-dropper	Prophysaon coeruleum
Papillose tail-dropper	Prophysaon dubium
PROTECTION	
Long-eared Myotis	Myotis evotis
Fringed Myotis	Myotis thysanodes
Long-legged Myotis	Myotis volans
Townsend's Big-eared Bat	Corynorhinus townsendii
Silver-haired Bat	Lasionycteris noctivagans
Pallid Bat	Antrozous pallidus
PROTECTION BUFFER	
Great Gray Owl	Strix nebulosa

(Table 13 continued)

REGION 5 SENSITIVE	
Pacific Fisher	Martes pennanti pacifica
American Marten	Martes americana
Great Gray Owl	Strix nebulosa
Willow flycather	
Northern Goshawk	Accipiter gentilis
OTHER SPECIES OF CONCERN	
Yuma Myotis	Myotis yumanensis
Little Willow Flycatcher	Empidonax trailli brewsteri
Tailed Frog	Ascaphus truei
Foothill Yellow-legged Frog	Rana boylii
Southern Torrent Salamander	Rhyacotriton variegatus

Threatened and Endangered Species:
There are 12 known northern spotted owl (Strix occidentalis caurina) activity sites. These sites were used to designate the 100 acre Late-Successional Reserves (LSR) under the Record of Decision for the President's Northwest Forest Plan (unless the sites were already protected by Late-Successional Allocation). All of the existing habitat within the home range radius of these sites is on Forest Service land. All sites are located in the lower elevations within or very near riparian habitat. Six sites are within the wilderness (four of these are located along Butte Fork), three are found in the Applegate/Oak Knoll LSR, two are near Upper Middle Fork, and one is located along Whisky Creek. The three sites outside of the Applegate/Oak Knoll LSR and the Red Buttes Wilderness may have access to only a limited amount of old-growth habitat outside of the LSR. The other sites within these designated areas are surrounded by more acres of old-growth habitat which the spotted owl requires. This is especially true for the site at Whisky Creek and the lower site along the Upper Middle Fork.

The "50 mile" inland boundary for the marbled murrelet (Brachyramphus marmoratus) encompasses thirty-two percent (10,361 acres) of the watershed (see Map 21). Although it is highly unlikely that murrelets are present, this boundary has not been changed (Dillingham et al. 1995). A murrelet survey has been conducted on the Applegate District, but only in the most suitable habitats. Currently, the second year of a two year protocol survey is underway. In the 1996 Final Programmatic Biological Assessment, there were no mandatory project design criteria for activities occurring in suitable murrelet habitat.

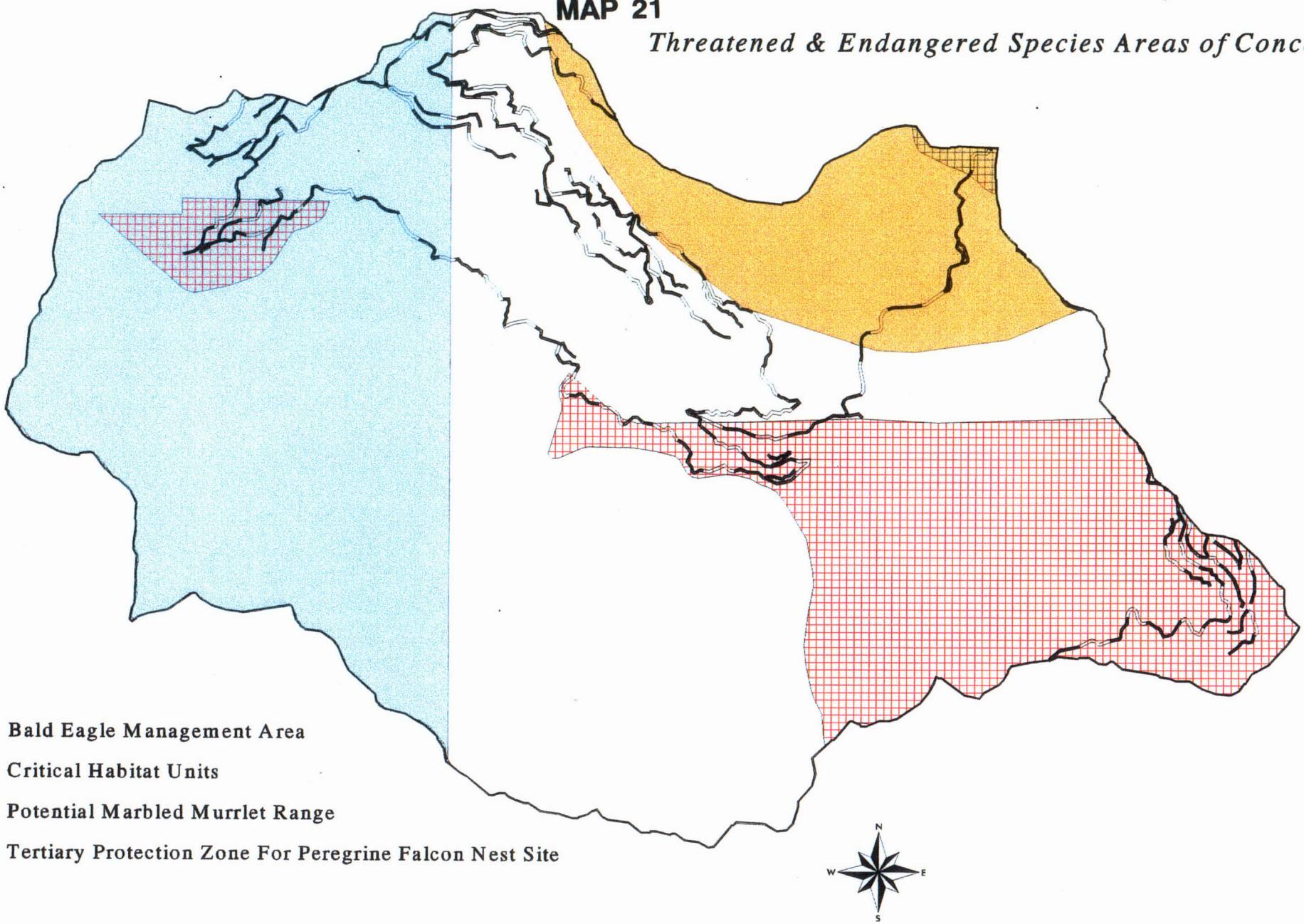
The Middle Fork watershed Analysis area contains one known peregrine falcon (Falco peregrinus anatum) site located in the Red Buttes Wilderness. The site has 3,318 acres of its tertiary protection zone located in the watershed (see Map 21). (There is also a possibility of another site existing on Whiskey Peak). The Red Buttes nest site has been monitored since 1986. It has been continually active with the exception of 1993 and 1994. Six young have been successfully fledged from the site. Prey remains have been collected from the site between 1987 and 1990 and consisted primarily of small passerine species. A management plan does not exist for this nest site, due to its protection by the wilderness allocation.

A known northern bald eagle (Haliaeetus leucocephalus) nesting site exists at the Applegate Reservoir, adjacent to the north east corner of the watershed. The nest site is protected by the Bald Eagle Management Area which overlaps 102 acres of the northeastern portion of the watershed (see Map 21). The entire 102 acres is overlapped by the peregrine tertiary protection zone which is more restrictive. The bald eagle management guidelines can be found in the site plan (ARBEMA Draft).

Middle Fork Watershed Analysis Area

MAP 21

Threatened & Endangered Species Areas of Concern



Region 6 Sensitive Species:
Wolverine (Gulo gulo luteus) presence has not been detected in southern Oregon for over 50 years. Anecdotal information places historical locations for the wolverine in and around the Marble Mountain Wilderness to the south, on the Klamath National Forest, and the Sky Lakes Wilderness, on the eastern portion of the Rogue River National Forest/Crater Lake National Park. A potential location exists on the Umpqua National Forest, north of Crater Lake. The likelihood of wolverine being present within the Middle Fork watershed is extremely small.

The lower 1 to 2 miles of the Middle Fork contains a population of northwestern pond turtles (Clymmys marmorata marmorata). They have also been found in a small pond along the 1035-200 road along Whisky Creek.

The northern red-legged frog (Rana aurora aurora) could potentially be located within the watershed, however, to date no sightings have occurred.

The white-footed vole (Arborimus albipes) has not been found this far inland in Oregon. It is typically a coastal species with only a few sightings in Oregon. It is highly unlikely that it would be present within the watershed.

The California mountain kingsnake (Lampropeltus zonata) has been observed in the lower portions of the watershed. Activities that would impact the riparian reserves and immediately upslope could affect the kingsnake. However, adhering to the Riparian Reserve strategy should give adequate protection for most situations.

Survey and Manage Species:
There are at least 50 known locations for the Siskiyou Mountains Salamander (Plethodon stormi) within the Middle Fork watershed, which is the center of its known distribution. Some of these sites have been monitored annually for almost two decades. The species is a talus obligate, having been found only in association with talus substrates (Herrington 1988; Stebbins 1966; Nussbaum 1974). Known sites ,as well as potential habitat, have been mapped, however, a considerable amount of habitat remains unsurveyed. Surveys are required and must be completed "prior to ground disturbing activities" (ROD C-5). This work needs to be referenced prior to a project design. If surveys are necessary they will then need to be conducted (Draft PLST Management Plan). (This species is also listed as Threatened in California).

The Del Norte salamander (Plethodon elongatus) could possibly occur within the watershed. This species has been found north of O'Brien Creek, just less than 12 miles to the north of the watershed boundary, and west on the Siskiyou National Forest and in the Illinois Valley. It is a talus obligate of coniferous forest and, if present, is subject to the same survey status as the Siskiyou Mountains salamander.

The red-tree vole (Arborimus longicaudus), is likely to inhabit the watershed. Bone fragments of red-tree voles have been identified in the pellets of owls located on BLM lands about 8 miles north of the watershed. The watershed lies within the known range for this species. Little is known of this species habitat associations. Generally, there is a trend of high species abundance with increasing age of stands. They have limited dispersal capabilities and connectivity of older forests may be important for long-term viability of the species (Thomas et al. 1993).

Most of the red-tree vole habitat in the watershed is found within the wilderness area, on northern aspects and along riparian corridors. In the northern and eastern portion of the watershed habitat has been highly impacted by management activities. It is likely that silvicultural treatment could help improve these stands towards suitable habitat for the future. A fifth field watershed analysis of the Upper Applegate watershed (which includes the Middle Fork watershed) was conducted as directed by the draft protocol for the red tree vole. The analysis was run in December 1996. The results showed seventy-two percent of the capable red tree vole habitat acres are currently functional. Therefore, surveys prior to ground disturbing activities are not necessary.

Six terrestrial mollusk species are required to be surveyed for and an additional five more may occur within the watershed, but do not requires surveys unless found. The Oregon shoulderband (Helminthoglypta hertleini), Oregon Megomphix (Megomphix hemphilli), Siskiyou sideband (Monadenia chaceana), Tehama Chaparral (Trilobopsis tehamana), blue-gray tail-dropper (Prophysaon coeruleum), and papillose tail-dropper (Prophysaon dubium) will need to be surveyed for prior to any ground disturbing activities in the watershed after October 1, 1998.

Protection Buffer Species:
Historically, the great gray owl (Strix nebulosa) is known to occur in the watershed, in and around Fir Glades. A pair was confirmed in 1995 at Toolhouse near the Butte Fork Trail. Audio confirmation of these owls have occurred along Bear Wallow ridge, and there is a anecdotal information of sightings at Whiskey Peak. Surveys for great gray owls within the Middle Fork watershed began in 1997. This species prefers pine and fir forests adjacent to montane meadows (Hayward 1994). However, they can also utilize man-made openings, such as clearcuts.

Protection Species:
One sighting of Townsend's big-eared bat (Plecotus townsendi) is known for this watershed. However, several locations exist in the adjacent Carberry watershed, located immediately to the north. The individual was found in an active hard rock mining shaft and is thought to have been a transient. Townsend's big-eared bats have been known to use buildings and caves for roosting habitat. However, it is more likely that they will use caves within the watershed based on availability. Several mines and natural caves exist in the watershed that could provide habitat. Arnold mine is an example of an inactive mine that is potential habitat if an iron "bat friendly" gate was installed. Currently it is protected with a solid wooden gate. Over a dozen natural limestone caves are found just south of Towhead Lake and are known to harbor bats. However, inventory of these bats has not yet been conducted.

There is also high potential for several of the five other bat species, identified as protection buffer species in the ROD, to be present. The Myotis species are known primarily as snag dependent, that is, they utilize snags as maternity sites and roost sites. The silver-haired bat (Lasionycteris noctivagans) is a foliage roosting bat, and the pallid bat (Antrozous pallidus) utilizes snags and rock outcrops. There are many unmapped and unsurveyed mine shafts in the watershed that date back to the mid to late 1800s.

Other Species of Concern:
(Species that were listed as Category II, under the ESA, are listed on Table 13 under Other Species of Concern. Viability of these species needs to be addressed before land management activities are conducted that could have deleterious impacts to the species. Many of these species occur on other lists).

The following species are primarily Forest Service Region 5 sensitive species:

The only documented pacific fisher (Martes pennanti) sighting in the Siskiyou Mountains, occurred in 1994 on Steve's Fork, in an adjacent watershed. This species is directly associated with older forests (Ruggiero 1994). Forest components such as snags, large live trees and downed logs are all required habitats for fishers. Consideration for this sensitive furbearer is needed when planning for activities that could negatively impact the habitat of this species.

Anecdotal information exists of sightings of marten (Martes americana) in the wilderness area. Marten have been documented in the Coast Range to the west and in the Cascades to the east, but have not yet been documented in the watershed or in relative proximity to it. Martens tend to utilize similar forest structure as do fishers. Typically martens occur at higher elevations than fishers, but may overlap in portions of their home range.

The little willow flycatcher (Empidonax traillii brewsteri) is known to occur in the Carberry watershed, immediately to the north of the Middle Fork, and also to the south, on the Klamath National Forest. They nest in willow and alder glades which exist within the Middle Fork watershed. Livestock grazing may negatively affect willow flycatchers and their habitats.

Northern goshawks (Accipiter gentilis) are a forest dwelling raptor that has created considerable concern over the past several years. This species breeds in older forest habitat with open understories, and forages along edges and interspersed openings. Although not yet listed under the Endangered Species Act (ESA) they are on the Region 5 sensitive list and documented sightings exist for the watershed. Surveys need to be completed for the northern goshawk prior to implementation of activities that could impact this species.

Neotropical migratory birds include all land birds that winter south of the United States - Mexico border and breed in temperate North America. This is a diverse group in which there is widespread concern for their future (Andelman and Stock, 1994). The watershed provides diverse habitats utilized by neotropical migratory birds.

1.2.12.1 Wildlife Habitat

The watershed is primarily composed of steep west-east drainages with lateral drainages running north-south. Elevations run from 2,000 feet at the lowest point on the north east corner, to 6,739 feet atop Red Butte on the southern edge. Vegetation communities are closely tied with aspect and elevation, as well as past management and fire activity. Brush fields, which make up about ten percent of the watershed are primarily located on southern aspects and on harsher sites on ridges. Only 134 acres of these brushfields are found below 3,000 feet in elevation. This suggests that not much winter range exists within the watershed and the number of animals that winter here are minimal. Brushfields that occur in the watershed above 3,000 feet are probably supplying browse and/or berries for species in late spring, summer, and fall. Although these may not function for winter range their value to wildlife at other times of the year is high. The majority of over 3,000 acres of shrubs are decadent and in need of revitalization, especially in connection with deer browse. Patch burns or mechanical treatments would help to rejuvenate these stands and their value to wildlife.

Approximately thirty-four percent of the watershed falls into mature successional stage forest, approximately half of which is diameter classes between 11-17 inches dbh and half 17-24 inches dbh.

Over 11,000 acres of mature forest is found within the watershed. Late-successional forest is found on approximately twenty-six percent of the watershed (over 8,000 acres). Early successional forest stands covers approximately twelve percent of the watershed and grass/forbes covers only four percent. The early successional vegetation occurs over about 3800 acres of the landscape and is primarily, but not exclusively, the result of timber harvest, especially where it is found outside of the wilderness area. Another eleven percent of the area is made up of open canopy (less than sixty percent canopy closure) stands that are greater than 11 inches dbh. These stands are typically found at higher elevations in the wilderness and in the more roadless areas of Cook and Green. However, for the purposes of analysis these areas will not be considered mature or late-successional although they may function as such in any given situation. See Map 22 for successional stages of vegetation in the watershed.

Habitats are fragmented throughout the watershed. This can be seen by the visual representation of the successional stage and/or plant community maps. Most of the late-successional vegetation is found in the lower elevations of the wilderness or in the upper reaches of Whisky Creek. Logging has had the greatest impact to the areas outside the wilderness. Currently, blocks of contiguous, unfragmented late-successional and mature habitat can only be found in the upper elevations of Cook and Green Creek, in the MA 5 land allocations and in the wilderness. Smaller patches occur along the upper and lower reaches of Whisky Creek and have an Old Growth MA 15 designation (see Map 23).

Roads not only directly impact species mobility but also impact habitat continuity and thus fragmentation. It can be seen that three of the five subwatersheds have road densities above the rate desired for wildlife purposes (Refer to Table 8, under Current Watershed Condition). Lower Middle Fork and Butte Fork are the only two subwatersheds that are within the levels deemed acceptable for many wildlife species. Upper Middle Fork, Cook and Green Creek, and Whisky Creek are all over the 1.0 miles per square mile often used for wildlife purposes. However, Upper Middle Fork and Cook & Green are both at the lower ends of road densities. Upper Middle Fork is at 1.21 and Cook & Green is at 1.38. Both of these subwatersheds are close to acceptable ranges. However, Whisky Creek at 4.31 is beyond the range deemed acceptable for most wildlife species. Approximately 12 miles, of the 55 miles of road within the watershed, are within Riparian Reserves. Roads paralleling or crossing riparian zones further complicate the road density issue. Butte Fork is virtually unimpacted by roads, the subwatersheds of greatest concern are Upper and Lower Middle Fork and Whisky Creek. Open road density often results in illegal taking of game and nongame species.

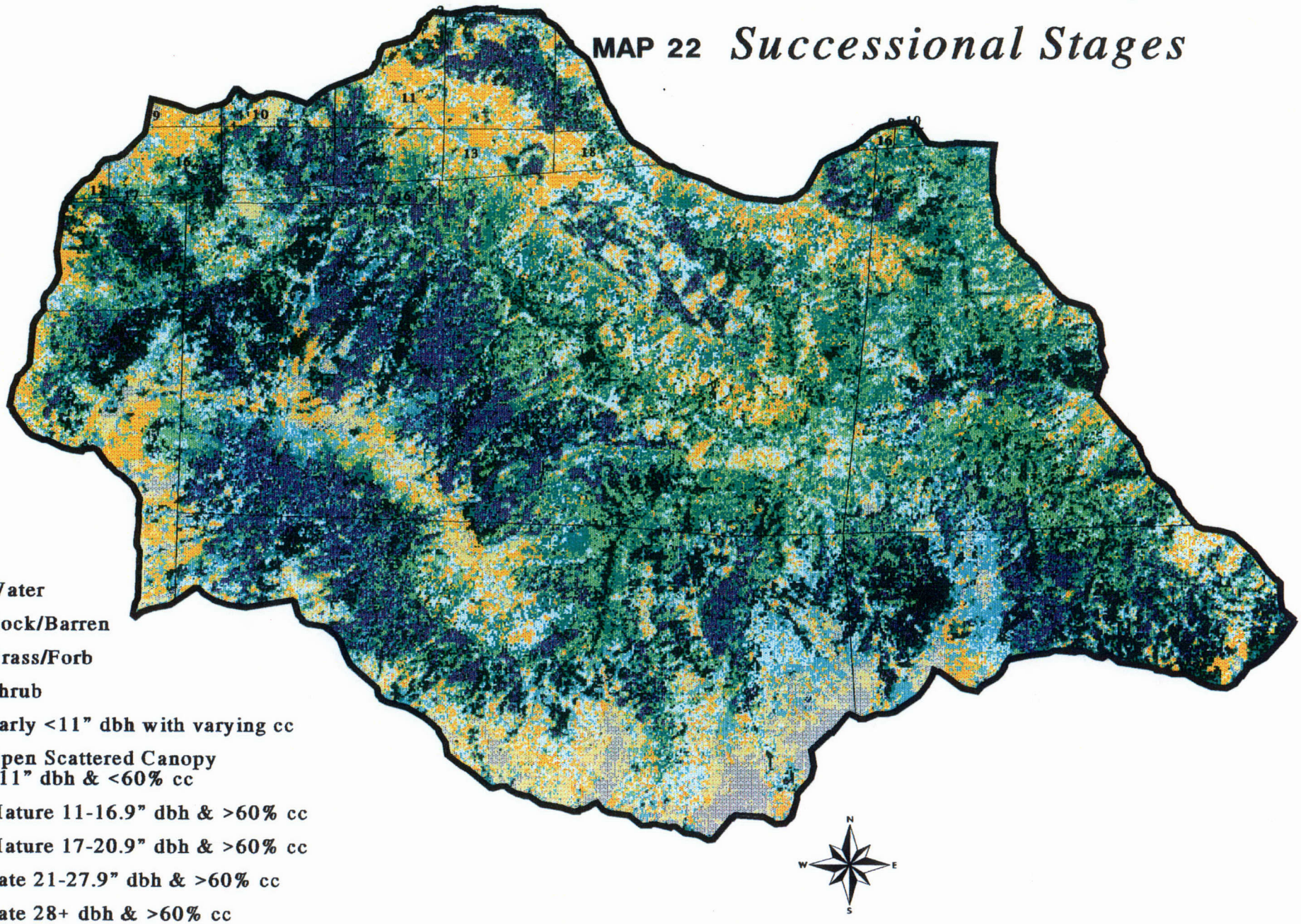
1.2.12.1.1 Habitat Areas of Concern

Late-Successional Habitat:

Although late-successional habitat accounts for about twenty-six percent of the watershed's vegetation, it is extremely fragmented. If the mature 17-21 inch category is viewed in conjunction with the late-successional approximately four areas within the watershed appear to be large enough to function as viable habitat for species such as the northern spotted owl. Most of the fragmentation occurring in the watershed appears to be natural. Ridgetops, soils, exposure, and various other topographical factors appear to be the primary causative factors. Only in the Whisky Creek subwatershed does the fragmentation appear to be the result of management activities. Historically, this area's vegetation was shaped by topographical factors and fire. With fire temporarily removed, much of the overstory still reflects the topography to a large degree. With this fragmentation that occurs across the landscape areas that allow for connectivity and species movement become very important. Riparian Reserves can provide some of this function. However, they too, are fragmented along the reaches. Other areas that need to be studied are areas where vegetation will provide dispersal habitat over topographical features

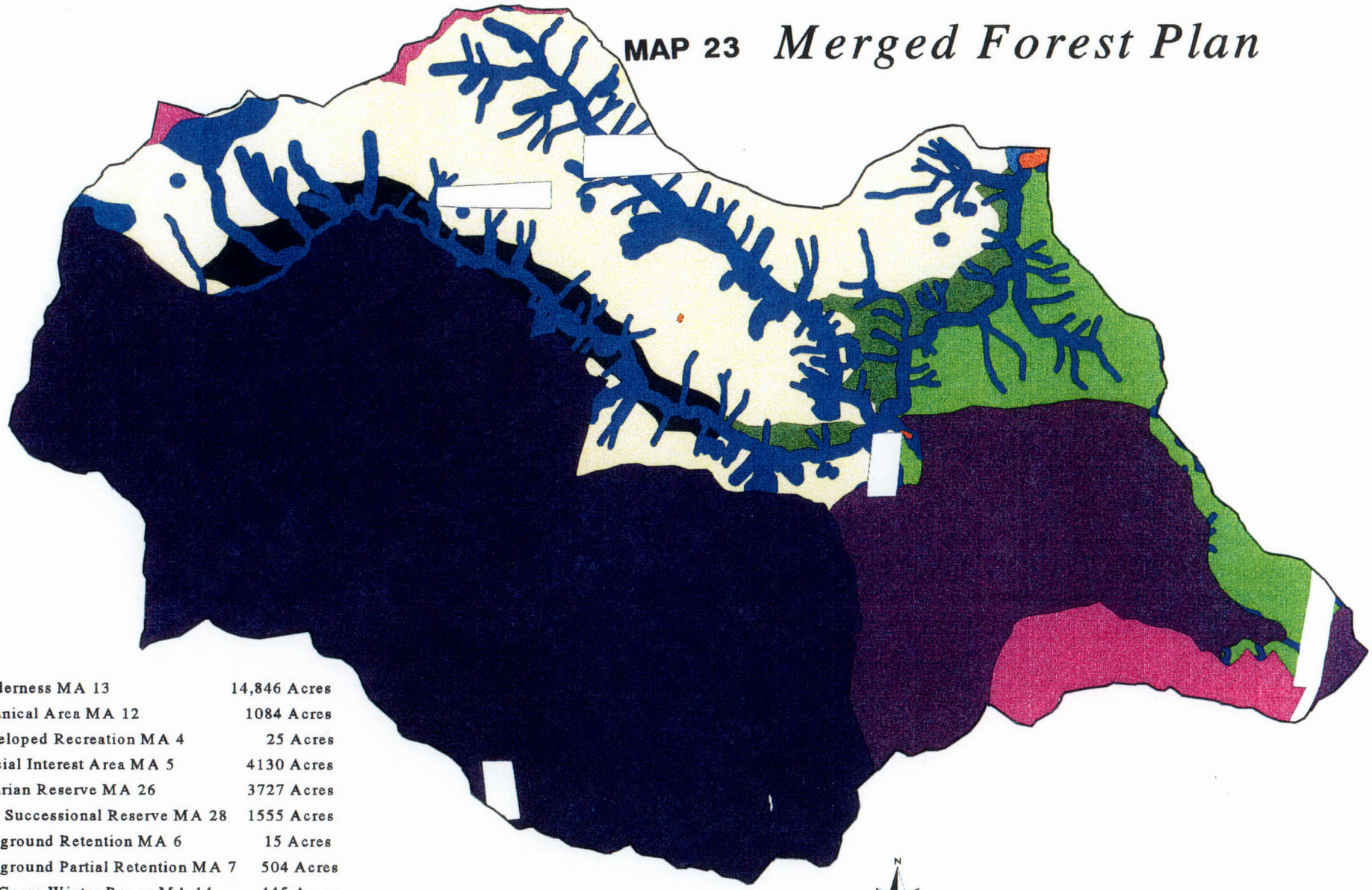
Middle Fork Watershed Analysis Area

MAP 22 *Successional Stages*



Middle Fork Watershed Analysis Area

MAP 23 *Merged Forest Plan*



Wilderness MA 13	14,846 Acres
Botanical Area MA 12	1084 Acres
Developed Recreation MA 4	25 Acres
Special Interest Area MA 5	4130 Acres
Riparian Reserve MA 26	3727 Acres
Late Successional Reserve MA 28	1555 Acres
Foreground Retention MA 6	15 Acres
Foreground Partial Retention MA 7	504 Acres
Big Game Winter Range MA 14	445 Acres
Adaptive Management Area MA 27	5276 Acres
Other Ownership	625 Acres

for various species. About five areas exist that need to remain protected from management activities that could reduce the integrity of these areas from functioning as connectivity between watersheds (see Map 24).

Older forest connections exist that are conducive for the movement of species into and out of the watershed. Connectivity within the watershed, appears best along the Butte Fork and Cook & Green Creeks. These stream corridors are protected from most management activities as a result of their land allocations. Butte Fork is isolated in the Red Butte Wilderness, while Cook & Green Creek is located in the Applegate/Oak Knoll LSR. Habitat along Butte Fork and Cook & Green Creek are composed of mature with some late-successional vegetation. Both streams have hiking trails along most of the length of their mainstem. Recreational use on these trails is moderate during the summer months. Roads occur only along the headwaters of Cook & Green Creek, and at the confluence of Butte Fork. Very little human disturbance has occurred in these areas, thus allowing these areas to continue to function as migrating and dispersal areas. In addition, older forest connections exist along the headwaters and upper reaches of these two streams providing travel routes into adjacent watersheds.

The Middle Fork of the Applegate River provides habitat for species movement within the watershed. The lower reaches contain more miles of open road and experiences more recreational use, in the forms of swimming and camping, while the upper reaches are basically impacted by hiking trails. Most of the lower reaches border the Big Game Winter Range strategy MA 14 or the Applegate Oak Knoll LSR. These allocations may assist in maintaining the corridor's integrity. The upper portion is protected by Foreground Retention strategy MA 7 and Wilderness allocation. About a 2.5 mile section in the middle portion of the Middle Fork has Adaptive Management Strategy on the south side of the riparian reserve. This area is, also, very fragmented. In addition, older forest connections exist west and south of the Middle Fork. The west connections flow out of the watershed, into Steve's Fork (which contains a roadless area. The flow to the south allows movement into the Grider/Thomas LSR.

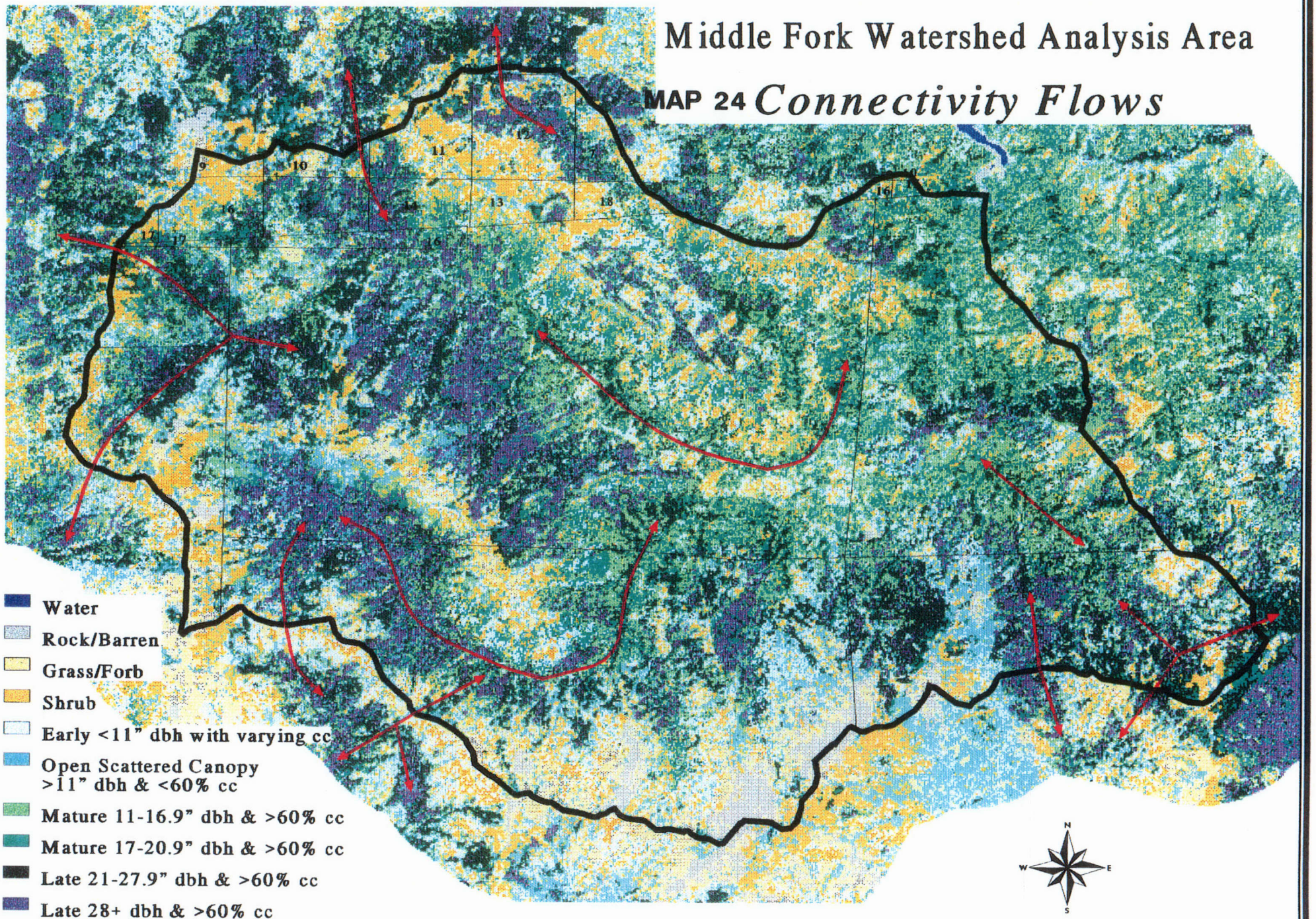
Whisky Creek has been impacted most by management activities. There are some remnant stands of late-successional vegetation in the headwaters and along the lower 2 miles of the stream. The corridor in the Riparian Reserve has been highly impacted and currently can not properly function for wildlife. Actions need to be taken to help promote the recovery of late-successional vegetation throughout the Riparian Reserve, thus connecting the fragmented stands that exist. This area is currently requires the most attention to restore the riparian areas to proper functioning state. Currently, connectivity between Whisky and Steve's Fork exists in the headwaters of Whisky Creek. Old forests remain intact in this area and will need to be protected to help ensure proper movement of species in and out of the watershed and across the landscape.

There is no older forest habitat flow to the northeast. This results in poor dispersal potential. Opportunities for intra watershed movement of species is reduced. This is especially true of movement into and out of the Squaw/Elliott watershed to the east.

Dispersal Habitat:
Dispersal habitat or 50-11-40 that meets spotted owl dispersal habitat needs, exists throughout the watershed. The abundance of this dispersal habitat allows no greater than 0.75 mile distance between blocks of dispersal/suitable owl habitat.

Middle Fork Watershed Analysis Area

MAP 24 *Connectivity Flows*



Critical Habitat:
This watershed is bordered on the southwest by Critical Habitat Unit (CHU) CA-15. A total of 6,944 acres of CA-15 is in the watershed. A small block of CHU is located in the center of the west half of the watershed between Fir Glade and Camp Gulch, north of the Wilderness boundary and south of the Oregon/California state line, while a much larger block encompasses Cook & Green Creek area and southeast portion of the wilderness. This last portion of CA-15 extends up from the Klamath National Forest in California (Map 23).
The Applegate/Oak Knoll Late-Successional Reserve (LSR) overlaps CHU CA-15. The LSR is a land allocation under the ROD for the President's NW Forest Plan. The southwest side of the watershed is bordered by the Grider/Thomas LSR.

Big Game Winter Range:
Under the Rogue River National Forest Land and Resource Management Plan (LRMP) MA-14, Big Game Winter Range, was set aside "to provide forage, hiding/thermal cover for deer and elk during the winter season." Most of these areas were designated around 3000 feet in elevation. Throughout the watershed 612 acres are designated to be managed as set forth under MA-14 in the LRMP (Map 23). (Refer to the Carberry Watershed Analysis for an explanation of the thermal cover on big game winter range in the Klamath Province.

The Middle Fork watershed big game winter range allocation is only 612 acres, lying north and west of the 1040 road on the east and south facing slopes above the Middle Fork. Less than fourteen percent of the area is in browse and most of these acres are likely to be in need of regeneration and thus fairly poor in nutrition. About ten percent of the area is early successional vegetation, which is an unusually small amount to provide adequate nutritional needs during the winter. The greater portion of the allocation is forested, with mature stands being the largest component and late-successional stands being slightly more than ten percent of the allocation. The forested mature and late-successional acres make up seventy-five of the 612 acres allocated for big game winter range.

Within the 612 acres of MA-14 land in the watershed the shrub component is about 141 acres in total with 134 acres below 3,000 feet. The grass/forb is 3 acres, the early successional is combined with the shrub acres, the open scattered forest is 6 acres while the remaining almost 459 acres is mature or late-successional forest. Ideally within this allocation rejuvenated or young, healthy brush stands, grassy opening and areas of quality forbes would exist for the purpose of meeting nutritional needs. Historically, fire regimes and burn patterns probably created a mosaic across the landscape that helped the herds meet their nutritional requirements. Currently, we are forced into maintained given land allocations for this purpose and are possibly forcing animals into non-historical winter ranges to maintain basic nutritional needs.

Big Game Summer Range:
As a result of the hot dry summers both deer and elk herds often need to use late-successional stands in the mid and higher elevations during these summer months. In addition, the nutrition provided by graminoids, forbs, and browse at these elevations plays an important role in the conditioning of does and the survival of fawns. Therefore, the brushfields outside the MA-14 strategy need to be managed on a similar scheme to those occurring within the MA-14 strategy. Above 4,000 feet elevation are about 2,757 acres of brushfields, all virtually decadent and in need of rejuvenation. Planning needs to occur that would allow for burning of about 1,000 acres per decade, or 100 acres per year, if summer/fall forage quality needs are to be maintained.

Miscellaneous:
In the late 1980's two black bears were radio collared in the upper portions of the Little Applegate on the Ashland Ranger District. Telemetry showed these bear spent about 11 months out the year in and around the McDonald Basin area, near Wagner Butte, and the month of September in the Red Buttes Wilderness. There was no explanation for this event other than the Middle Fork watershed obviously provided something either dietary or otherwise needed by the bears. Areas like these need to be maintained. This particular area is within the wilderness boundary and this awareness hopefully will allow the values sought by this species to be kept (Wolfer 1998).

1.2.13 RANGE MANAGEMENT

The Middle Fork Watershed Analysis Area encompasses about one third of the Upper Big Applegate Allotment (see Map 25). This area represents high elevation range for one of the permittees of the allotment. The entire allotment is divided by tow permittees from April 1 through October 31. Cattle are released in the low elevation lands and are moved up in elevation as the feed becomes less palatable in the lower elevation. Cattle reach the watershed by about July 1. The subwatersheds most preferred by cattle are Upper Middle Fork and Whisky Creek. This is because of the large road system that provides easy access. However, all of the sub watersheds are used to some degree.

1.2.13.1 History

Historically, as the Applegate Valley became settled, unmanaged cattle and sheep grazed wherever feed was available. As the population grew and the demand for summer forage increased, stock were put up on the range as soon as the snow melted and remained until the fall/winter snows forced them off. It is estimated that grazing began around 1855 in the lower elevations and 1910 in the higher elevations. Livestock numbers ranged from 10-300 head annually.

During the years of mining, settlement, logging and farming, little was done in the way of land management or rangeland improvement. Fences or other barriers to control livestock were not built due to dense timber, deep snow pack, and steep terrain. In 1956 the first rangeland analysis was completed by the Forest Service. It was determined that due to the lack of fences and other constraints, means of controlling cattle use needed to be developed. Range managers were finding unmanaged cattle concentrating in key areas (such as meadows with water sources). The solution was to limit the number of cattle and the season of grazing. It is important to remember that during this time, the area did not have the road system or seeded logging units as it does today. The 1956 analysis recommended 50-80 head of cattle within the area of this watershed.

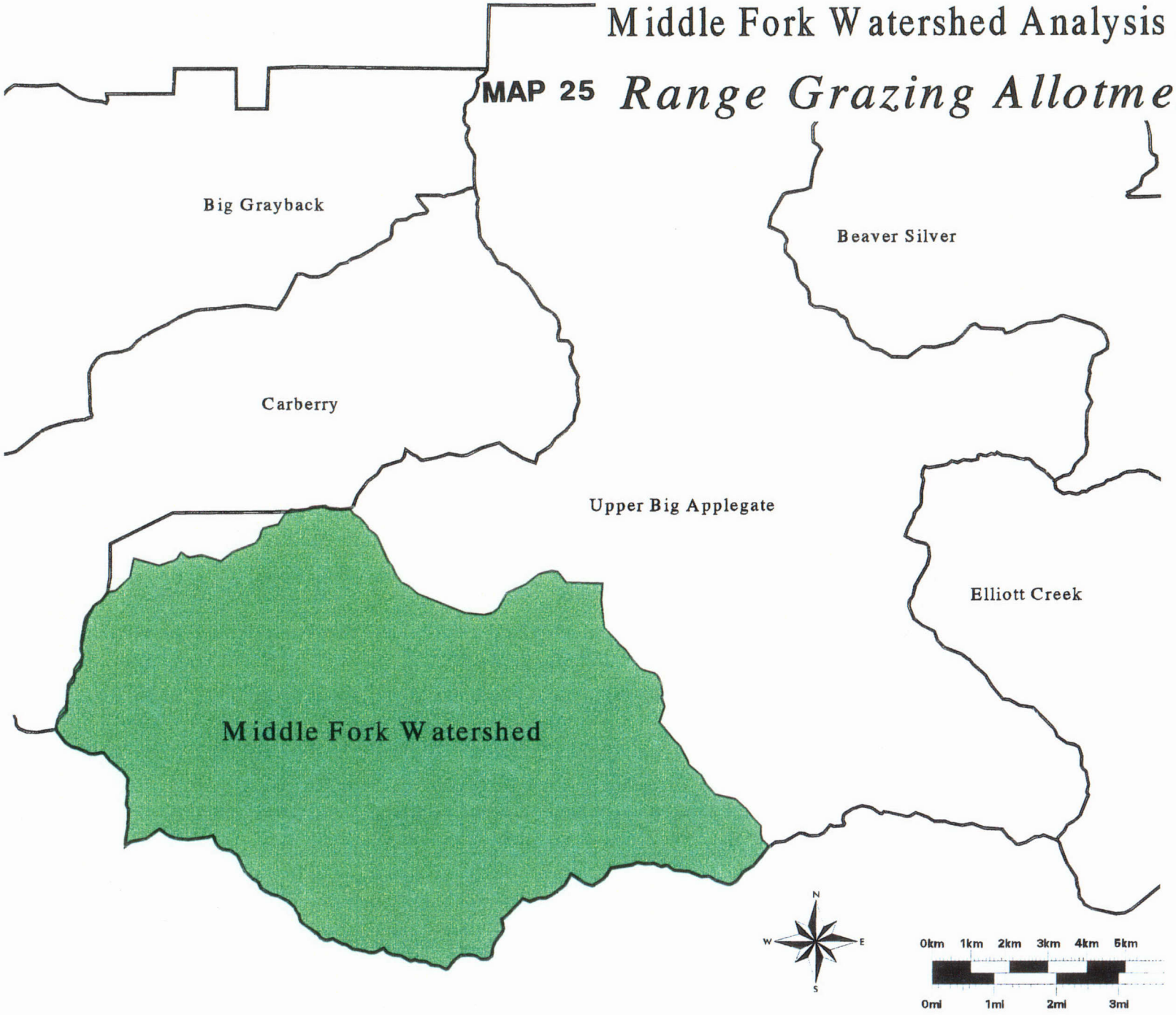
1.2.13.2 Current Management

Currently, 140 head of cattle are allocated to use the Upper Big Applegate Allotment from April 1 to October 31. Of these, only about 35-75 head use the watershed from July 1 through October 31. In the Red Buttes Wilderness, about 5-25 head use the areas of Bee Flat and Frog Pond Gulch to some degree on their own. They are not encouraged by herding or salting to use the wilderness area.

Due to logging in the last 30 years, more opportunities for animals are available than before. Logged units were seeded with palatable, native and introduced grasses following harvest to hold soil and provide livestock forage. In addition, ponds were constructed for cattle, wildlife and fire prevention near these units. These ponds have provided an opportunity for animals in areas that, historically, receives little to no use. In some cases, the logged units have provided more forage per acre than the meadows.

Middle Fork Watershed Analysis Area

MAP 25 *Range Grazing Allotments*



The extensive road system that developed from logging helps cattle move easier and more quickly. Historically, many trails were built and maintained by permittees to provide access to forage in remote areas.

1.2.13.3 Management Challenges

There are number of range management challenges within the watershed. The current challenges that are actively under analysis are:

- Preventing cattle from entering the high elevation range too early,
- Distributing cattle over the landscape to prevent areas from being overgrazed,
- Eliminate cattle use in developed recreation sites,
- Continue collaborating with the Klamath National Forest on the Siskiyou Crest Strategy to eliminate KNF cattle from entering Towhead Basin in the Red Buttes Wilderness

All of the above situations are addressed in the Siskiyou Crest Strategy Plan and/or the Upper Big Applegate Range Annual Operating Plans. Prior to each grazing season, management alternatives are developed and modified with the permittees. From these alternatives, progress is being made in meeting these challenges.

1.2.14 RECREATION

1.2.14.1 Access Travel Management

The demand for remote and challenging mountain bike and motorcycle trails is increasing, putting pressure on many wilderness, botanical, and special interest areas within the Middle Fork watershed. There are currently 42 miles of regularly maintained trails within the watershed; 21.8 miles in wilderness, 11.1 miles in special interest areas, 2.0 miles in botanical areas, 5.9 miles in Riparian Reserves, and 1.2 miles in Late-Successional Reserve and Adaptive Management Areas. Approximately 8.5 miles of trail are not maintained within wilderness and riparian reserve areas. Plans are to remove these trails from the system in order to preserve pristine characteristics of wilderness and to maintain desired conditions of riparian reserves. All trails mentioned are on public land.

Foot and horse travel were the main modes of transportation during the time most of these trails were constructed in the watershed. Motorized use increased as roads began to be extended into the watershed in the 1950s and 1960s. The sport of mountain biking began its rise in popularity in the late 1970s. With congressional designation of the Red Buttes Wilderness area in 1984, motorized and mechanized use was curtailed from much of the watershed, reducing the trails available to these user groups by forty percent. Since 1984, illegal motorized use within the wilderness has decreased, however, a few encounters with mountain bikers in the wilderness continues to occur each year.

Access and Travel Management (ATM) will be an important issue for this area. New trail construction may occur to connect existing trail systems (providing loop opportunities), to minimize resource impacts, or to take advantage of existing routes that reduce user and resource conflicts. From a management standpoint, trail maintenance is a long term concern because of reducing amounts of financial support and the increase in recreation use. Trail systems will be analyzed considering these trends and the cost benefit relationships. Other factors of concern are the impacts of trails on Threatened and Endangered species, aquatic resources and wilderness values.

1.2.14.2 Dispersed Recreation

There are 19 known dispersed recreation sites within the Middle Fork watershed that cumulatively account for approximately 10 acres within the Riparian Reserves. Heavy use of these dispersed recreation sites for camping and picnicking occurs annually throughout the summer months. Many of these sites are flat with easy access to the river and were originally mining claims used in the late 1800s.

Human use is increasing, impacting vegetation and plant distribution. The associated need for firewood, tent pads, and parking areas contribute to expansion of barren-core areas in and around camp sites. Currently, almost every spur road and turn-out is used for recreation access along the Middle Fork, increasing the concern for sanitation and water quality.

Barren areas are also created by large groups on the Middle Fork. Large groups are often concentrate in small parking areas. Attractive swimming holes, waterfalls, trails, and dispersed camp sites focus use, leading to trampled vegetation and new paths. Bank instability, loss of vegetation and erosion resulting from concentrated use is a concern. (Refer to Map 26 Human Uses).

1.2.14.3 Red Buttes Wilderness

The Red Buttes Wilderness is located in Josephine County, Oregon and Siskiyou County, California. For the most part, it occupies the northern slope of the Siskiyou Mountains' crest, from near Cook and Green Pass on the east, to near Sucker Creek Gap on the west. This portion comprises the headwaters of the Applegate River. Smaller sections of the Wilderness are located in the Illinois River drainage and the Klamath River drainage.

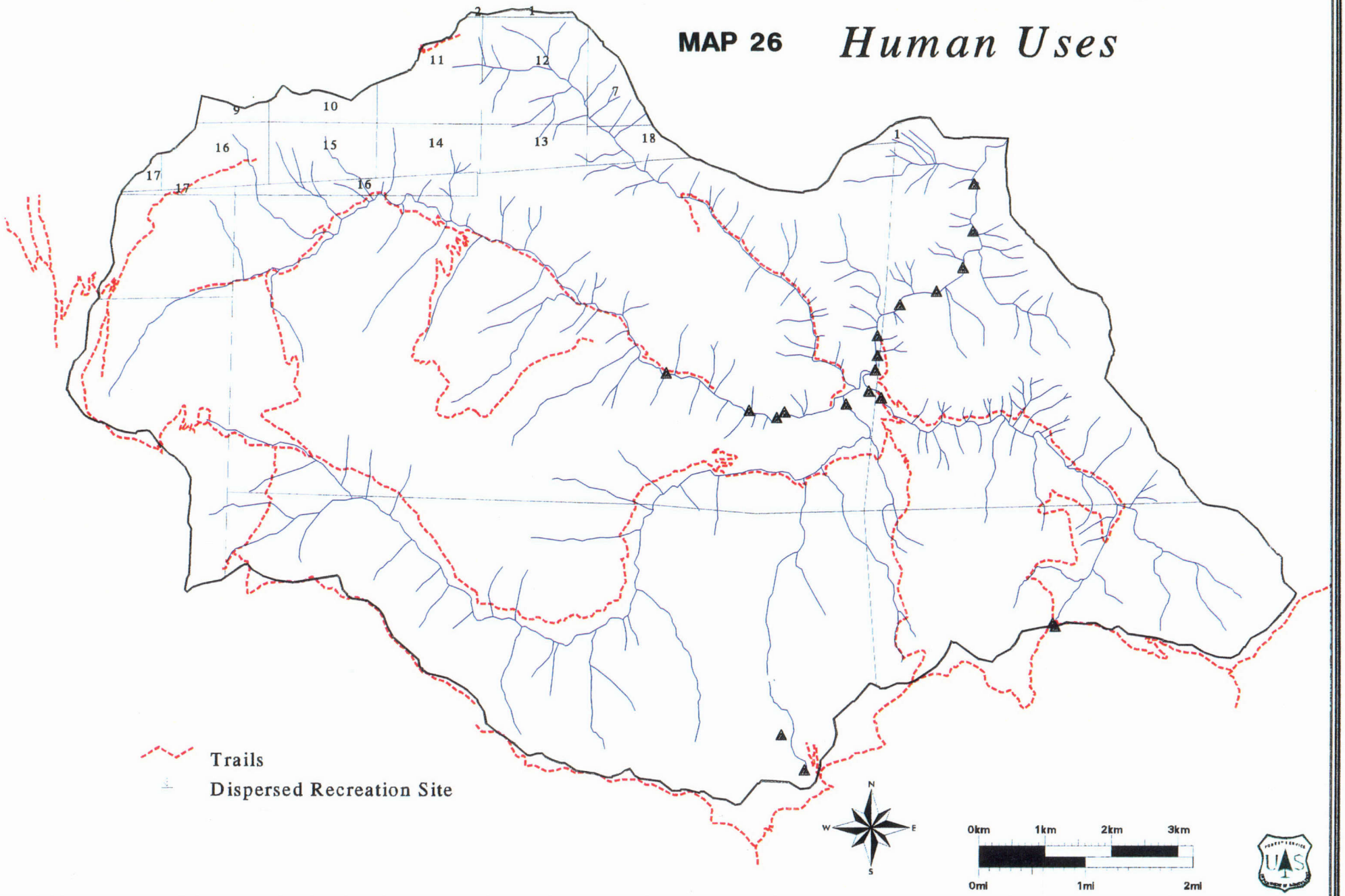
The Red Buttes Wilderness includes land administered by three Ranger Districts on three National Forests (Applegate RD/Rogue River NF, Illinois Valley RD/Siskiyou NF, Scott River RD/Klamath NF). The Rogue River NF is the lead forest for planning purposes for the Wilderness.

The area has elevations ranging from 2,800 to 6,739 feet, which includes the jagged crest of the Siskiyou Mountains for about 15 miles along the divide between the Rogue /Klamath drainages. It is characterized by steep ridges and mountains and is dominated by Red Butte (6,739 feet) and Kangaroo Mountain (6,694 feet), the highest peaks in the area. Although the rugged terrain was formed largely by uplift and gradual downcutting by streams, glacial erosion has occurred in the higher elevations. Botanically diverse, the Red Buttes Wilderness contains old-growth forests, small meadows, extensive brushfields, and rocky, open slopes, all with an abundance of plant species that are endemic to the Siskiyou Mountains. There are also several small lakes and ponds in the Wilderness. (Ref. RRNF LMP, RBW Implementation Plan, 1989).

Towhead Basin, an extended cirque adjacent to the pinnacles of the Red Buttes, was historically a prime mining and grazing site. Now encompassed within the boundaries of the RBW (mining claims are withdrawn) the area is a popular recreation destination. However, concern still exists over grazing in the basin by cattle from a Klamath NF allotment and fish socking attracting campers and fishermen to Towhead Lake. Due to the fragile nature of the upper basin and lakeshore ecosystem, both of these influences are concerns.

Middle Fork Watershed Analysis Area

MAP 26 *Human Uses*



Past fire suppression in the Red Buttes Wilderness has created an unnatural condition in an environment where desired conditions should display naturally occurring ecosystems, as designated by the 1964 Wilderness Act:

> "Federal land...which is...managed so as to preserve its natural condition and which generally appears to have been affected primarily by the forces of nature with...man's work substantially unnoticeable..."

Increased fuel buildups of understory and overstory vegetation alters fire behavior. Historical patterns show stand maintenance fires occurring more frequently than today. Risk increases for more high-intensity, stand maintenance fires as fires continue to be suppressed,. (Refer to 1.2.14 Fire).

1.2.14.4 Recreational Mining

The Middle Fork of the Applegate River has long been known to have some mineralization in its' placer gravels. The Cook and Green recreational mining site is located along Cook and Green Creek and the Middle Fork of the Applegate River. This site is located in California, requiring dredgers to have a California Dredge Permit. Mining claims extend both up and downstream of the recreational mining site. Approximately 400 linear feet of Cook and Green Creek and 1600 feet of the Middle Fork are available for recreational mining activity.

1.2.14.5 Wild and Scenic Rivers

The 1968 Wild and Scenic Rivers Act established a system and set of procedures by which state and federal governments may assess and designate rivers to be protected in the Wild and Scenic River Act. In 1993, a screening process was started to study potential eligibility of all the tributaries of the Applegate River. Butte Fork and Middle Fork were identified as potential candidates possessing one or more of the outstanding remarkable values (stated in the act) for a free-flowing river (ref: Tributary Screening Criteria Appendix II).

Both tributaries are considered potentially eligible for Wild and Scenic River status based on early studies. However, some concern exists over the impact of Applegate Dam (constructed 1980) on fishery values. It is located approximately 4 miles below the Middle Fork tributary outside the analysis area. Anadromous fish no longer move freely upstream. Other outstanding qualities remain that will be managed to maintain eligibility status.

1.2.15 FIRE

The Middle Fork watershed is well known for its fire dependent ecosystems. Within the mixed conifer and evergreen forests, lightning is very common. The incidence of the highest lightning occurrence in the pacific Northwest are somewhat coincident with these forests. The fire cycle model of Agee and Fiewelling (1983) shows the Siskiyou Mountain area to have more than twice as many ignitions as the McKenzie river at the southern end of the Tsuga heterophylla series (Agee 1991). The variable fire history of this area, together with complex geology, land use history, and "steep" environmental gradients, has prevented generalizations about fire and its ecological effects. The Native American activities before 1850; the activities of miners, settlers, and trappers in the mid-nineteenth century; and twentieth century fire suppression policies have influenced fire history and current conditions in southwest Oregon forests.

A major portion of the analysis area is designated as the Red Buttes Wilderness. For this total wilderness area (20,323 acres), fire is identified as the key natural disturbance mechanism shaping the landscape of the area. Until recently, society expected land management agencies to suppress all natural fires. This suppression of most fires without a corresponding application of prescribed fire to maintain ecosystems has resulted in ecological changes in forest and range conditions. These changes are not desirable, considering wilderness objectives of preserving and protecting natural processes and conditions.

More than one-half of the sensitive plant species known to occur on the Rogue River National Forest are found within the Red Buttes Wilderness. This fact will influence the timing, location and ability to use "prescribed natural fire," in the future. Many of these plant species are dependent upon fire for their perpetuation.

1.2.15.1 Historic Fire Effects - Before Organized Fire Suppression

Before organized fire suppression began for this area, fires within ponderosa pine vegetation communities were described as frequent, low-intensity, ground/surface fires that spread over periods of weeks or months in Siskiyou Mountain forests (James K. Agee, 1993).

Generally, fire maintained a set of vegetative conditions:

- Relatively open stands dominated by shade intolerant and fire resistant species such as ponderosa pine and Douglas-fir.
- Pine dominated stands generally, had little dead and down woody fuel on the forest floor as compared with today.
- Low elevation sites burned more frequently than higher elevation sites (Morrison and Swanson, 1990).

Tom Atzet (area Ecologist for the Forest Service) estimates natural fire return intervals on a landscape basis before fire exclusion for the eastern Siskiyou Mountains (see Table 14).

Table 14. Fire Return Interval by Plant Series for the Eastern Siskiyou Mountains

Plant Series	Average Stand Age	Average Fire Return Interval	Estimated Return Range
Douglas-fir (driest sites, Douglas-fir/Ponderosa pine association)	230	10	8-15
Douglas-fir	230	30	15-60
White-fir	213	25	10-60
Shasta-fir	214	40	25-75
Mountain Hemlock	313	115	100-300

1.2.15.2 Fire Environment; After Organized Fire Suppression

Today's fire regime of southwestern Oregon and northwestern California is very different from the historic regime. Fires are generally described as infrequent, inconsequential or extreme during extended-duration drought, and they are not easily extinguished.

The success of the fire exclusion policy of this century led to changes in the amount and distribution of vegetation.

- The absence of fire over time has resulted in heavily stocked stands of shade tolerant species encroaching upon ponderosa pine and drier Douglas-fir plant communities. This has produced

heavier fuel loads as competition and moisture stress cause the stands to self thin. Much of the Watershed Analysis Area and surrounding drainages are out of the natural range of variation for this forest type.

- Fuels (live and dead) have built up to an unnatural state. As a consequence fire usually results in "stand replacement" when it occurs during dry weather conditions, especially in dense vegetation with multi-layered canopies and heavy accumulations of dead and down fuels. Fires are now estimated to result in stand replacement for a greater portion of the area. Much of the Watershed Analysis Area and surrounding drainages are out of the natural range of sustainability for this forest type. Most large fire episodes for interior southwestern Oregon occur during the months of August and September.
- Shrub species are decadent (greater dead to live ratio), due to fire exclusion, thus less palatable and nutritious for herbivores.
- Mountain and valley meadows are decreasing in size due to the encroachment of conifers. This is partially brought about by fire exclusion.

1.2.15.2.1 Conditions and Trends

Below approximately 4,800 feet elevation within the fire analysis area, moisture stress brought about by vegetation competition, and 9 years of drought conditions throughout 1994, continues to increase tree mortality. Trees that die from moisture stress ultimately fall to the forest floor. The continued accumulation of dead and down fuels increasing at a faster rate than the rate of deterioration or "assimilation" within soil is increasing the flammability of forested landscapes. Regional aerial detection surveys show that mortality levels in the Applegate watershed over the last 10 years were the highest ever recorded for bark beetles in western Oregon (Forest Pest Management, Region 6, unpublished data). Ultimately the dead trees will fall and increase the build-up of dead and down fuels. The increase in such fuels in areas of multi-layered live vegetation, will contribute to higher fire intensity during a wildfire, increasing the chance of crown and stand-replacement fires.

Within the Red Buttes Wilderness fire exclusion over many years has allowed the forest successional process to develop towards a climax state. This is evidenced by the lack of variation of age and size classes within forest stands and the lack of seral stage diversity within each plant association. In many locations where conifers grow, the absence of fire has also allowed large amounts of dead woody material to accumulate on the forest floor (amounts that probably exceed that which is sustainable over the long term).

1.2.15.3 Fire Hazard and Risk Assessment

A fire hazard and risk assessment provides insight from a landscape perspective, as to potential areas of concern. In such areas, fire specialists then focus attention on where fuels management, fire prevention, and forest health recommendations should take place.

- **Fire hazard** is defined as: vegetation by the kind, arrangement, volume, condition, and location that forms a special threat of ignition, spread, and difficulty of control.
- **Fire risk** is defined as: the chance of various ignition sources (lightning or human-caused) causing a fire that threatens valuable resources, property, and life. The chance of fire ignition to occur is determined through the analysis of historic fire occurrence records.

1.2.15.4 Fire Hazard Analysis

Environmental conditions were characterized across the landscape considering vegetation, topography, and climate. A process overlaying an aspect, slope, and fuel model map was used to develop a fire hazard map for the Middle Fork WAA. Vegetative conditions were assigned to the National Forest Fire Laboratory fuel models. These models characterize major physical properties of vegetation and how they react to fire.

This information is then run through the *BEHAVE* computer model. The outputs are used to determine resistance to control, and the correlation to fire hazard ratings occurs. Fire hazard ratings of low, medium, and high are assigned (Map 29).

Adjustments are made for enhanced fire behavior. Stands located on steep slopes (greater than forty percent), with south facing aspects, and greater than seventy percent canopy closure, are assumed to have an eighty percent chance of crown fire. Areas that have a high probability of running crown fires are given a higher level of hazard rating. This classification is known as "enhanced" fire behavior. (Read "enhanced" as "serious fire hazard").

1.2.15.5 Fire Risk Assessment

A total of 86 fires occurred within the watershed during a 35 year period, from 1960 to 1995: 58 lightning and 28 human-caused ignitions.

From this information a fire risk occurrence rating was developed using the following formula. The formula used to calculate the risk numerical rating:

$$\{(x/y)10\}/z = \textbf{Fire Risk Rating}$$

where:
x = number of ignitions recorded for area from fire history records
y = period of time records cover (35 years for this analysis)
z = number of acres analyzed (displayed in thousands)

Using G.I.S. mapping, fire occurrence ignitions were plotted for the years 1960-1995. The fires on the map were grouped by their location by like densities. Based on the location of both lightning and human-caused fires, a fire occurrence zone map was developed to display high, moderate, and low zones of occurrence. The result is a fire occurrence zone map for the Middle Fork WAA area. (See Map 29). For each zone the number of fires are counted to determine the x value in the above formula.

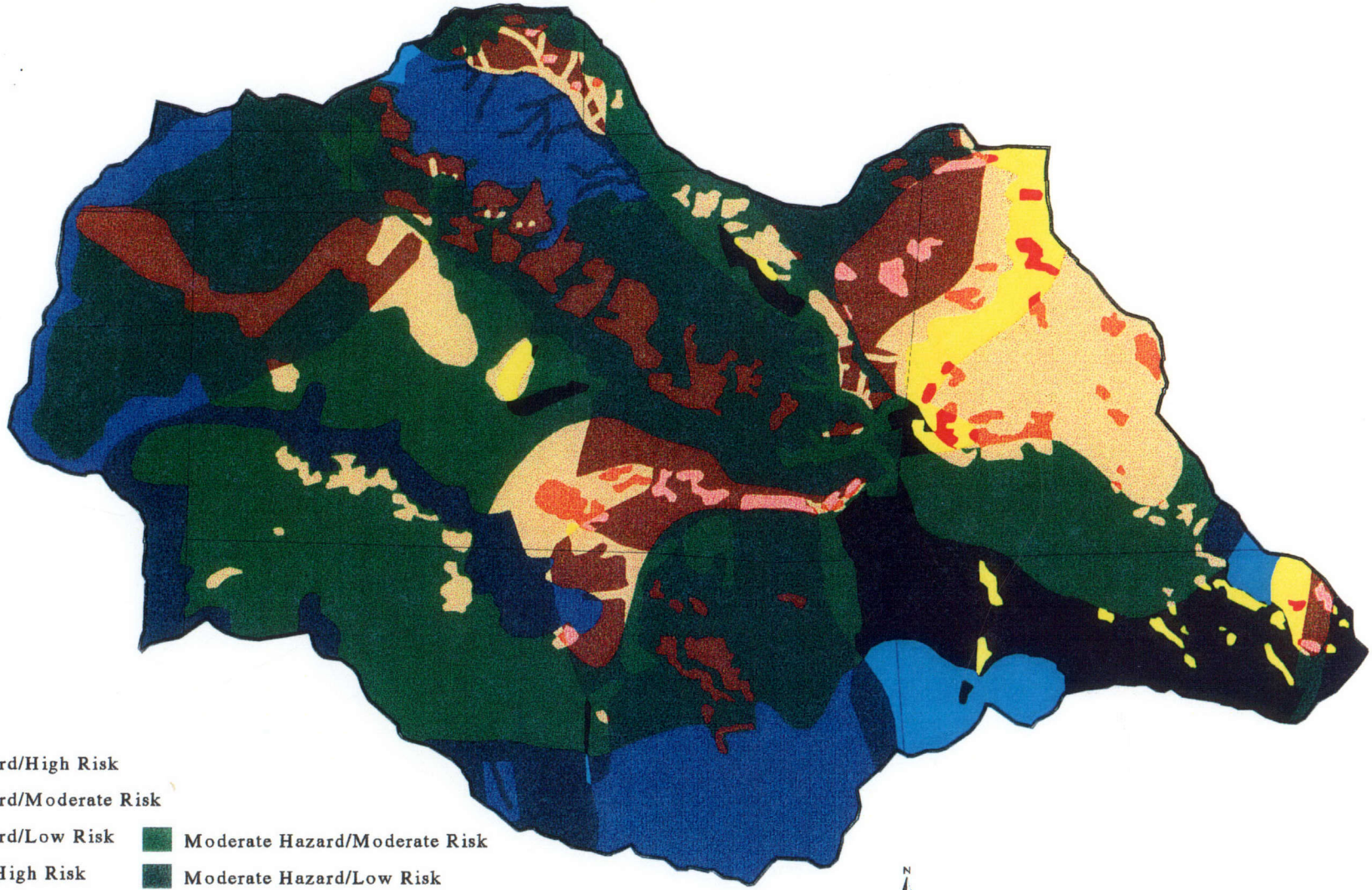
The Middle Fork WAA represents 32,258 acres or stated in thousands, 32.2. Using the above formula the fire risk rating for the complete WAA is 76. This is considered a moderate risk. The "High"" rating zone within the WAA is located along road corridors. A significant number of these fires within the "High" occurrence zone were human caused. (Low Risk = 0.0-0.49, Moderate Risk = 0.5-0.99, High Risk = >1.0). (See Tables 15 -16).

Table 15. Fire Occurrence Risk Ratings - Entire Watershed Analysis Area

	Low	Medium	High	Total
Acres	15,666	7,782	8,808	32,258
Number of Fires	11	22	53	86
Rating	0.2	0.81	1.72	0.76

Middle Fork Watershed Analysis Area

MAP 27 *Fire Hazard / Fire Risk*



- Extreme Hazard/High Risk
- Extreme Hazard/Moderate Risk
- Extreme Hazard/Low Risk
- High Hazard/High Risk
- High Hazard/Moderate Risk
- High Hazard/Low Risk
- Moderate Hazard/High Risk
- Moderate Hazard/Moderate Risk
- Moderate Hazard/Low Risk
- Low Hazard/High Risk
- Low Hazard/Moderate Risk
- Low Hazard/Low Risk

N W E S

0km 1km 2km 3km

0mi 1mi 2mi

Table 16. Fire Occurrence Risk Ratings - Red Buttes Wilderness Area
(Rogue River, Siskiyou and Klamath National Forests)

	Low	Medium	High*	Total
Acres	10,879	7,850	1,594	20,323♦
Number of Fires	4	23	12	39
Rating	0.11	0.84	2.15	0.55

♦Rogue River N.F. 16,900 acres; Siskiyou 3,413 acres and Klamath N.F. 10 acres.
*The establishment of fire occurrence zones solely for the Red Buttes Wilderness is in anticipation of the preliminary work necessary for ultimately establishing a "Fire Management Plan" for the Red Buttes Wilderness. The "High" fire occurrence risk rating for the Red Buttes Wilderness is within the Siskiyou National Forest portion of the wilderness. Within this "High" zone a significant number of the fires were human-caused. This may be explained by the proximity of roads parallel or adjacent to the wilderness boundary. Roads facilitate human access.

The trends in fire occurrence risk rating show:
- Within the WAA there were a total of 86 fires 28 were human caused.
- The majority of the 58 lightning caused fires were located above the 3,000 feet in elevation and on higher terrain such as ridge tops.
- The majority of human-caused fires occurred within the lower elevations of the analysis area primarily near roads, and places of frequent outdoor recreation (day use or camping). The greater the road density or proximity of travel access, or ease of access the greater the number of human caused fires.

From the fire occurrence map (see Map 30) a fire risk to resource values map is developed using local "values" at risk. The final step of developing the "Fire Risk Map" (Map 29) is through the intersection of values at risk with the high, moderate, and low fire occurrence zones. The values at risk within the Middle Fork WAA are:

- human life and property,
- terrestrial wildlife habitat,
- riparian and aquatic habitat,
- commercial timber values.
- wilderness esthetics and philosophies or feelings.

1.3 ANALYSIS AREA MANAGEMENT STRATEGIES

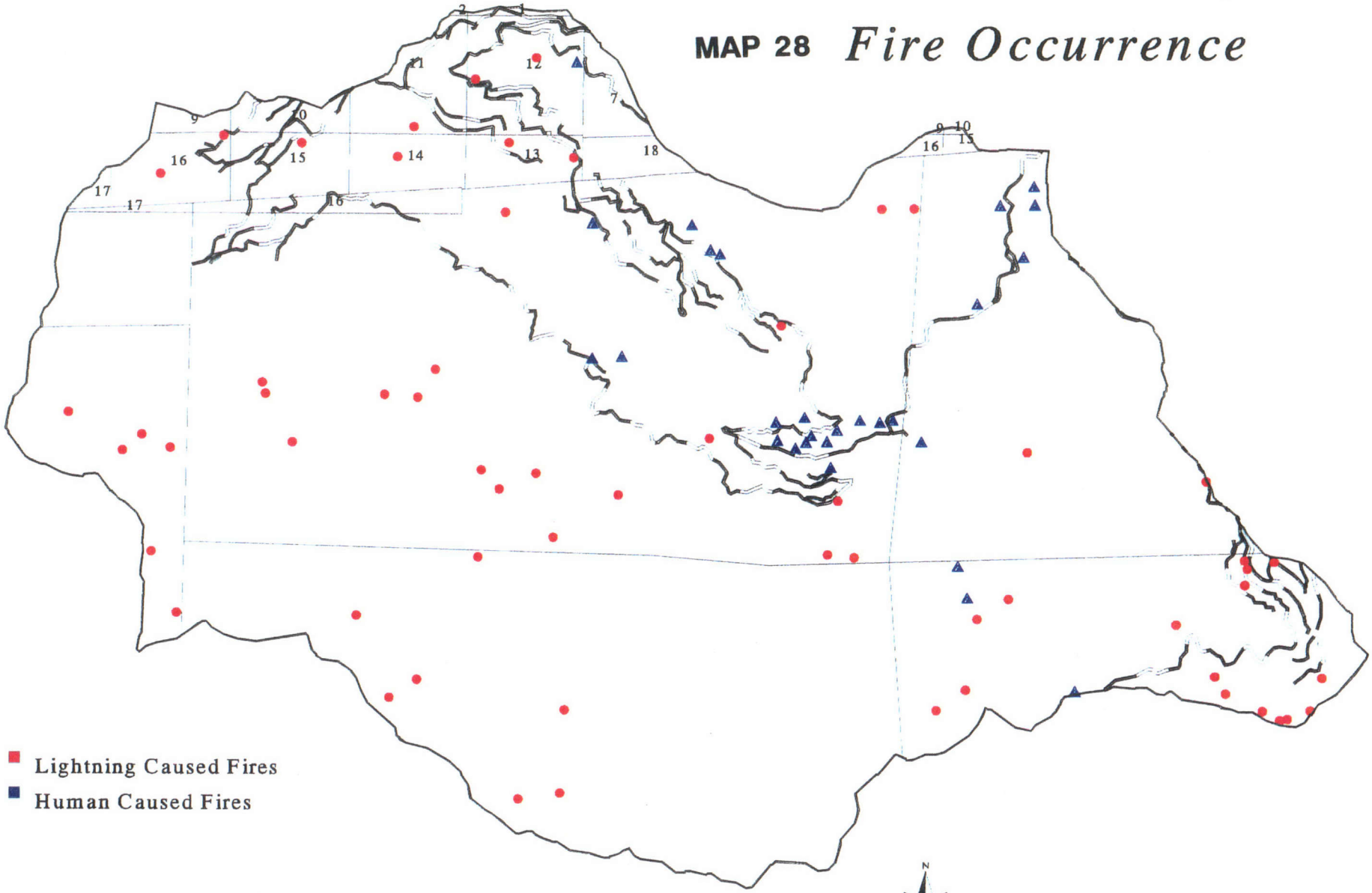
The following provides guidance for the management of lands within the Middle Fork Watershed Analysis Area.

The current Forest Plan for the Rogue River National Forest is the Land and Resource Management Plan (LRMP), which was approved in 1990. Under this plan, National Forest land within the RRNF was divided into Management Areas, each with an accompanying Management Strategy. Each area has different goals, opportunities and Standards and Guidelines. In essence, each area amounted to a unit of land to be managed to achieve a desired future condition. Since the LRMP was approved, additional direction has amended the RRNF LRMP and its Management Strategies.

The Record of Decision (ROD) for amendments to Forest Service and BLM Planning Documents within the Range of the Northern Spotted Owl was implemented on May 20, 1994. This ROD and its associated Standards and Guidelines have become known as the Pacific Northwest Forest Plan (a.k.a. the

Middle Fork Watershed Analysis Area

MAP 28 *Fire Occurrence*



President's Plan). Under the Northwest Plan, only where existing Forest Plan direction is more restrictive, or where Northwest Plan direction is lacking, does the previous direction for Management Areas and Management Strategies take precedence.

Map 23 displaying Merged Forest Plan land allocations is a dynamic product and minor changes are expected as ground verification of land allocations, such as Riparian Reserves, takes place.

1.3.1 NORTHWEST FOREST PLAN LAND ALLOCATIONS

1.3.1.1 Adaptive Management Area

Approximately twenty-five percent of National Forest lands within the Middle Fork Watershed Analysis Area is allocated by the Northwest Forest Plan to Adaptive Management Area (AMA). AMA's are designated to encourage the development and testing of technical and social approaches to resource management while achieving conservation objectives outlined in the Northwest Forest Plan and associated Standards and Guidelines. It is hoped that local, individualized approaches that rely on the ingenuity of resource managers and communities rather than traditionally derived and tightly prescriptive approaches can be pursued.

Technical Objectives of the AMA: "The Adaptive Management Areas have scientific and technical innovation and experimentation as objectives. The guiding principals is to allow freedom in forest management approaches to encourage innovation in achieving the goals of these standards and guidelines." (NWFP, p. D-3)

Social Objectives of AMA: "The primary social objective of Adaptive Management Areas is the provision of flexible experimentation with policies and management. These areas should provide opportunities for land managing and regulatory agencies, other government entities, non-governmental organizations, local groups, landowners, communities, and citizens to work together to develop innovative management approaches."

"Innovative approaches include social learning and adaptation, which depend upon local communities having sufficient political capacity, economic resources, and technical expertise to be full participants in ecosystem management." (NWFP, p. D-4)

1.3.1.2 Interim Riparian Reserves

Interim Riparian Reserves are allocated by the Northwest Forest Plan primarily to protect and restore the health of aquatic systems and their dependent species. Riparian Reserves will also help to maintain and restore riparian structures and functions, conserve habitat for organisms dependent on the transition zone between riparian and upland areas, improve travel and dispersal corridors for terrestrial animals and plants, and provide for a greater connectivity of late-successional forests. Riparian Reserves occur within all land allocations and generally parallel the stream network. Unstable and potentially unstable lands, wetlands, and areas adjacent to lakes, ponds, and reservoirs are also designated as Riparian Reserves. Riparian Reserve widths vary by stream type.

1.3.1.3 Non-Key Watershed

All watersheds within the Analysis Area are recognized as non-key watersheds (ROD).

1.3.1.4 Late-Successional Reserve

Late-Successional Reserves are identified with an objective to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth forest related species including the northern spotted owl. Limited stand management is permitted, subject to review by the Regional Ecosystem Office.

1.3.2 MANAGEMENT STRATEGIES

The RRNF LRMP divides the Forest into Management Areas, each with an accompanying Management Strategy (MS). Within the AMA, RRNF LRMP Management Strategies (i.e. those not replaced by the Northwest Forest Plan) are to be considered concurrently with AMA guidelines. Management Areas occurring within the Middle Fork Watershed Analysis Area are shown in Map 31.

Within the AMA, land allocations of existing Forest plans are to be considered during the planning and implementation of activities within AMA's. Current RRNF, LRMP land allocations may be modified in the AMA plans based on site specific analysis. Coordination with the Regional Ecosystem Office is required (NWFP, C-3).

Roadless Areas: Portions of the Kangaroo Inventoried Roadless Areas (6166 acres) and the Condrey Roadless Area (112 acres) (Rare II) occurs within the Analysis Area. The total roadless areas comprises an estimated 6278 acres (nineteen percent) of the Watershed Analysis Area and overlap other land allocations.

2. KEY ISSUES & KEY QUESTIONS

Key Issue: Overstocked forest and brush stands are leading to insect and disease vulnerability, declining forest health, and increased fire hazard in the watershed (including wilderness and LSR).

Key Questions:

- What areas within the watershed are currently in over-stocked conditions, and/or declining forest health?
- What are the causes of over-stocked stands and/or declining forest health?
- What is the priority for treatment?
- What potential treatments exist to reduce the potential?

Key Issue: High potential for large scale high intensity fire threatening values at risk (late-successional habitat, T & E species, and water quality).

Key Questions:

- What areas have high potential for catastrophic wildfire?
- What potential treatments exist to reduce the potential?
- What is the priority for treatment?

Key Issue: Dispersed Recreation Sites on the lower section of the Middle Fork.

Key Questions:

- Are the dispersed recreation sites along the lower section of the Middle Fork of the Applegate River meeting the Aquatic Conservation Strategy Objectives (ACS)?
- If not, how are they not meeting the ACS?
- What are the potential remedies to the situation?

Key Issue: Habitat connectivity within the watershed, specifically between Whisky Creek subwatershed and adjacent watersheds.

Additional Non-Key Issues and Questions:

- There is high decadence of summer range browse stands.
- Is progress being made with excluding unauthorized cattle from Towhead Basin in the Red Buttes Wilderness?
- Does the Middle Fork and Butte Fork of the Applegate River meet Wild & Scenic river status?
- Where is water quality and aquatic habitat an issue in the WAA?
- Where is embeddedness a concern in the WAA?

3. DESIRED FUTURE CONDITION

This section presents a desired range of future conditions for the Middle Fork Watershed Analysis Area: Recommendations for changing the ecosystem conditions towards the desired future conditions are contained in Section 4 Recommendation

3.1 GEOLOGY AND SOILS

Southern Oregon has had several consecutive drought years ending in 1994. These dry conditions have helped stabilize soils. When moist conditions return, soils could develop a short-term increase in erosion and landslide potential. It is desired there be no accelerated mass movement over natural levels due to management practices.

3.2 WATER

3.2.1 STREAMFLOW

There should be sufficient flows in all fish-bearing streams to maintain habitat conditions including summer stream temperatures.

3.2.2 WATER QUALITY

Sediment yields should be maintained at pristine levels in subwatersheds. Where this does not occur, levels are reduced to approach historic (pre-European settlement) levels. Sediment levels should be maintained so stream aggradation and embeddedness do not significantly affect fish habitat and populations. It is desired that channels with gradients under two percent will have less than thirty-five percent embeddedness.

Water Temperature: Summer stream temperatures should attain historic temperatures in all perennial fish-bearing and non fish-bearing streams where this does not currently exist (Lower Middle Fork and Whisky Creek). In addition they will be maintained at current conditions where they meet desired temperatures for cold water fisheries (Butte Fork, Cook and Green, and Upper Middle Fork). The short-term goal is to attain a maximum 7-day average high temperature, below 64 degrees F, in all perennial streams. The long-term goal is to reduce the maximum 7-day average high to the historic range of 56 to 62 degrees.

Toxic metals are maintained at their current non-detectable/non-detrimental levels; they will not be allowed to attain toxic levels to where they degrade beneficial uses of water.

Fecal coliform, Giardia, and **Cryptosporidium** do not exceed current levels.

3.3 AQUATIC SPECIES AND HABITAT

3.3.1 AQUATIC HABITAT

- Ensure riparian zones are in proper functioning ecological condition (discussed in more detail under Riparian Zones, Desired Future Conditions).
- Where appropriate, achieve an average of 25 to 40 pieces of large wood per mile in the stream channel (see Applegate Assessment, 1995). Instream wood should be greater than or equal to 24 inches dbh and 50 feet or two times the bank full width in length. This will vary by channel morphology and vegetative conditions. This condition will not be achieved for 100-300 years in some stream segments unless wood pieces are placed in the stream.
- Channels with gradients of less than 2 percent will have adequate interspaces in cobbles and gravels available for insects, fish, and amphibians.

- Culverts will allow for 100-year events and facilitate fish passage for all species and age classes.

3.3.2 AQUATIC SPECIES

- Ensure aquatic habitat is healthy with components that maintain diverse and robust populations of fish, macroinvertebrate, and amphibians.
- Spatial and temporal connectivity within and between subwatersheds be maintained/developed as required.
- Ensure individuals of all life stages of resident rainbow trout, rainbow/cutthroat hybrid and sculpin populations are maintained throughout their habitat.

3.4 RIPARIAN RESERVES

Where Riparian Reserves historically possessed late-successional forest characteristics associated with large conifers, they are allowed to revert to and be maintained in that condition. This may include a range of stand conditions possessing late-successional characteristics, from those with open park-like conditions where fire was a frequent occurrence to dense multi-layered stands where fire was less frequent.

Riparian Reserves not capable of supporting conifer vegetation but which have the capability of supporting hardwood or non-forest type (grass, herbaceous, shrub, or barren), should be allowed to revert to and/or be maintained in those conditions to provide a diversity of habitats for a variety of wildlife species. Riparian Reserves will support a diversity of native plants that will:

- provide canopy closure that maintains stream temperatures;
- provide connecting habitat;
- support healthy populations of wildlife species;
- serve as effective filters of sediment from upslope sources;
- stabilize stream banks, contributing to high quality aquatic habitat.

3.5 OVERALL WATERSHED CONDITION

Watershed condition should not decline from current conditions. Within 30 years all subwatersheds should attain a "good" condition rating where it does not currently occur.

3.6 VEGETATION

3.6.1 SITE PRODUCTIVITY

A better understanding of trends in site productivity for the analysis area is gained through research and monitoring of all factors contributing to site productivity. Areas where site productivity has been reduced as a result of soil compaction from skid trails and landings have been restored. Management activities are implemented in a manner to reduce areas impacted by soil compaction.

3.6.2 TERRESTRIAL VEGETATION

Landscapes are relatively resistant to large insect and disease infestations and resistant to large-scale high-severity stand replacing fires. Site productivity is restored and maintained to levels conducive to healthy vegetative growth and survival.

3.6.3 WILDLIFE

- Maintain and improve current connectivity flows within Middle Fork watershed and adjacent watersheds.
- Rejuvenate decadent browse stands in summer range through natural fire or prescribed fire.
- Restore riparian vegetation to improve wildlife movement within the Whisky Creek subwatershed and between adjacent subwatersheds.
- Decrease open road density within Whisky Creek subwatershed to about 1.8 miles/per square mile and to assure Cook and Green Creek and Upper Middle Fork road densities are not increased above current levels.
- Protect known caves or mine shafts providing habitat to bat species.

3.7 RANGE MANAGEMENT

- Provide forage from suitable rangelands for domestic livestock in a manner consistent with other resource objectives and environmental constraints.
- Adjust grazing practices to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives.
- Maintain an Allotment Management Plan to address current conditions, management strategies and monitoring objectives.
- Distribute and manage livestock aggressively to ensure riparian communities are in proper functioning ecological condition.
- Manage meadow systems to ensure vegetative, soil and hydrology integrity is not comprised.
- Ensure that utilization standards are met and plants are not grazed to the point that plant vigor is suppressed.

3.8 RECREATION

3.8.1 ACCESS TRAVEL MANAGEMENT

- Provide high quality recreation trails in a manner that will be compatible with management of botanical, wilderness, late-successional reserve, and special interest area objectives as identified in the Record of Decision of the Northwest Forest Plan and Rogue River National Forest Land and Resource Management Plan.

3.8.2 DISPERSED RECREATION

- Manage dispersed recreation opportunities within riparian reserves, in accordance with Aquatic Conservation Strategy objectives as identified in the Record of Decision.

3.8.3 WILDERNESS

- Allow natural processes to occur particularly in the Towhead Basin area.
- Resolve grazing and fish stocking issues and restore impacted areas as per RBW Implementation Plan Guidelines.
- After the completion of a fire management plan and a prescribed natural fire plan allow fire to assume its natural role, where appropriate, in wilderness ecosystems, while meeting objectives as described in the Northwest Forest Plan and Rogue River National Forest Land and Resource Management Plan. Values at risk, such as private land and structures, should also be protected.

3.8.4 WILD AND SCENIC RIVERS

- Maintain integrity of Wild and Scenic River corridors until final wild and scenic designation is determined.

3.8.5 SCENERY

- Maintain landscape character and scenic integrity by minimizing the deviations of the character valued by constituents.

3.9 FIRE

Important values, such as the protection of life and property, riparian and aquatic values, and various wildlife habitats and species, should be highest priority for protection from a loss through large catastrophic wildfire. It is desired that landscapes are relatively resistant (within a natural range of sustainability) to large-scale, high-severity, stand-replacing fires.

3.10 LATE-SUCCESSIONAL RESERVE

- Fuel and vegetation conditions allow fire to play its natural role in the Late-successional Reserve (LSR).
- LSR continues to provide habitats for late-successional forest dependent-species as described in the Northwest Forest Plan and Rogue River National Forest Land and Resource Management Plan.

4. RECOMMENDATIONS

4.1 WATER QUALITY - SEDIMENT

A Watershed Improvement Needs (WIN) inventory has not yet been initiated as part of this watershed analysis. This is a dynamic process wherein specific restoration opportunities will be inventoried and tracked through the implementation stage. With that in mind, and based on above observations on sediment sources (see Map 29), a watershed restoration prioritization scheme is recommended :

Very High Priority

- Removal or stabilization of roads and yarding impacts (skid trails, landings, etc.) that are within Riparian Reserves on soils with high erosion potential.
- Where applicable, replace existing culverts, bridges, and other stream crossings of Class 1 and 2 streams to accommodate at least the 100-year flood, including associated bedload and debris.

High Priority

- Removal or stabilization of roads and yarding impacts (skid trails, landings, etc.), that are within Riparian Reserves, on soils with moderate erosion potential.
- Removal or stabilization of roads and yarding impacts outside of Riparian Reserves on soils with high erosion potential.
- Where applicable, replace existing culverts, bridges, and other stream crossings of Class 3 streams to accommodate at least the 100-year flood, including associated bedload and debris.

Moderate Priority

- Removal or stabilization of roads and yarding impacts (skid trails, landings, etc.) that are within Riparian Reserves on soils with low erosion potential.
- Removal or stabilization of roads and yarding impacts outside of Riparian Reserves on soils with moderate erosion potential.
- Removal or stabilization of roads and yarding impacts harvest units, grazed sites, or other disturbed sites with high erosion potential whose area-wide effective ground cover (aside from roads and yarding) is less than 85 percent.
- Where applicable, replace existing culverts, bridges, and other stream crossings of Class 4 streams to accommodate at least the 100-year flood, including associated bedload and debris.

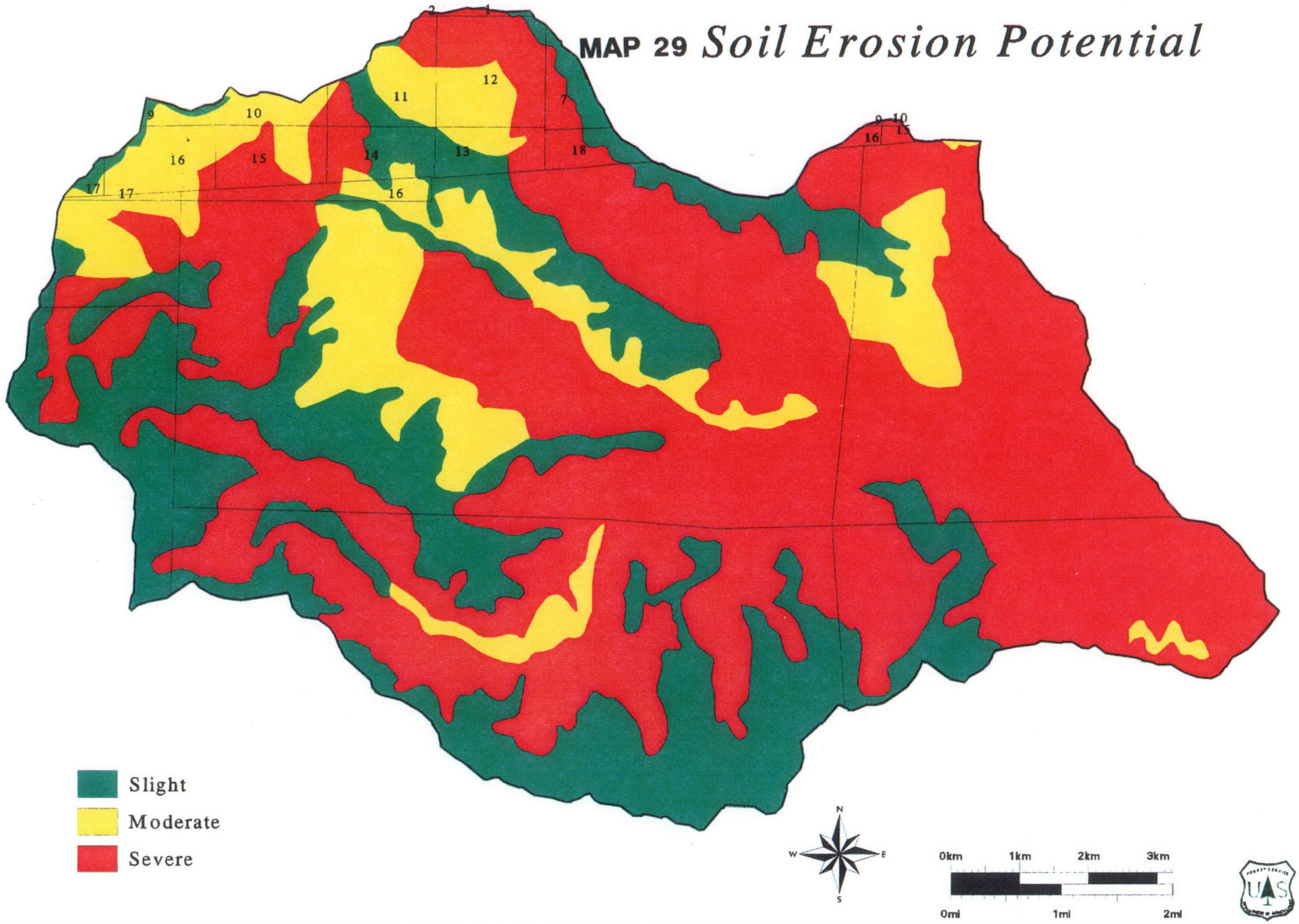
Low Priority

- Removal or stabilization of roads and yarding impacts (skid trails, landings, etc.) outside of Riparian Reserves on soils with low erosion potential.
- Removal or stabilization of roads and yarding impacts harvest units, grazed sites, or other disturbed sites with low-moderate erosion potential whose area-wide effective ground cover (aside from roads and yarding) is less than seventy percent on moderate erosion potential sites and sixty percent on low erosion potential sites.

Where it is not practical to obliterate and restore roads within Riparian Reserves to native vegetation conditions it is recommended they become sites for stabilization of sediment sources; road surfacing, improved drainage and proper culvert sizing.

Middle Fork Watershed Analysis Area

MAP 29 *Soil Erosion Potential*



Whisky Creek subwatershed should be the highest priority area for the above restoration scheme. Map 29 displays soil erosion potential for the analysis area. It is based on groupings of data from the Forest soil resource inventory (SRI) into three broad erosion classes - high, moderate, and low. This map should be used with other resource data (e.g. the GIS road layer) to identify general areas to focus restoration efforts. It should also be used to help prioritize specific restoration opportunities that are identified in the WIN inventory.

4.2 WATER QUALITY - TEMPERATURES

In order to expedite recovery of stream temperatures to approach historic levels it is recommended:

- Silvicultural activities be encouraged within Riparian Reserves. This will hasten the progression of current conifer stands, which now have early or mid successional characteristics, into stands with large conifer late-successional characteristics.

Whisky Creek subwatershed is the highest priority for this management. (Discussed in more depth under Riparian Reserves).

4.3 AQUATIC HABITAT AND ASSOCIATED SPECIES

Overall priority should be given to retaining unique riparian and aquatic habitats and niches in tributary streams, wetlands, seeps and general headwater areas. This will continue to provide species with refugia until downstream habitats are restored. Little or very conservative direct manipulation of these habitats, as recommended by the Northwest Forest Plan, will accomplish this goal. Identification of important sub-watersheds or smaller drainages and subsequent riparian/stream corridors will direct restoration activities to areas where cost-effective and biologically-effective work can be done.

It is recommended that habitat restoration be accomplished in critical watersheds that are the most intact systems. These critical watersheds - Middle Fork of Applegate River and Whisky Creek - supply high quality cool water. Inventory and prescribe restoration measure for roads in hyperzohic zones and unstable side slopes.

High Priority:

- Conduct riparian silviculture outside of the wilderness within Middle Fork of the Applegate River watershed to create and maintain a mature, diverse riparian conifer forest. The dominant overstory, provides stream shade, bank stability, and future large wood recruitment
- Reduce stream substrate embeddedness by minimizing erosion.
- Identify and repair roads accelerating sediment delivery to *fish-bearing* streams.
- Analyze roads adjacent to stream courses in riparian reserves.
- Correct road drainage to reduce sediment delivery to aquatic habitats.
- Replace culverts in streams identified as insufficient to carry 100-year flood events. Highest priority is in sub-watersheds outside of the wilderness boundary identified as critical for production of high quality water: 1) Middle Fork of the Applegate River 2) Cook and Green Creek, 3) Whisky Creek.
- Review recreation and fish objectives for Towhead Lake and other wilderness lake fish population; stocking vs. natural production. (Ref: RRNFLMP,RBW Implementation Plan, 1989)

Medium Priority:

- Restore and/or diversify fish habitat and floodplain connectivity.

- Place large wood into streams to maintain pool habitat, fish cover, bank stability. The high priorities for restoration are the "flats" in Middle Fork of the Applegate River. These stream segments have potential to produce large trout. Recreate some complexity and maintain side channel habitat adjacent to low gradient (<2%/Rosgen C type) main stem channels of Middle Fork of Applegate River.
- Monitor areas to validate effectiveness.
- Replace existing stream crossings where fish passage for all fish species and age classes is limited - at all flow conditions.

Other Recommendations:

- Continue limnological surveys in the lakes conducted by the Rogue Community College. It is recommended that such surveys be conducted on all larger wilderness lakes (e.g., Azalea, Lonesome, Hello and Towhead Lakes).
- Continue collecting baseline summer temperature data on Middle Fork of Applegate River and Butte Fork.

4.4 RIPARIAN RESERVES

It is recommended that those subwatersheds whose Riparian Reserves were most impacted by previous logging receive the highest priority for restoration to late-successional characteristics. This primarily applies to Whisky Creek subwatershed.

Recommended actions which will maintain, improve, or hasten attainment of the DFC are detailed in Section C of the Standards and Guidelines (S&Gs) in Attachment A to the Record of Decision pertaining to the Northwest Forest Plan. These S&Gs address specific constraints to timber management, roads, grazing, etc. on public lands. Some of the more important S&Gs pertaining to the Middle Fork Applegate River Watershed Analysis Area are highlighted and prioritized as follows:

High:

- Where possible, obliterate existing roads within Riparian Reserves and reroute them to less sensitive areas; replant these road corridors with native species. Candidate roads may be identified through the access and travel management planning process and added to the Forests Watershed Improvement Needs (WIN) inventory. The Watershed Restoration Prioritization Scheme previously described to reduce sediment should be used to prioritize road obliteration. While it is recognized that many roads within Riparian Reserves will not be removed (e.g. main roads adjacent to the Middle Fork), these should receive high priority for stabilization to control sediment (see Water Quality -Sediment Recommendations);
- Obliterate skid trails and landings located within Riparian Reserves and plant with native vegetative species;
- Encourage density management and pine management in Riparian Reserves where this will hasten reestablishment of historic, late-successional characteristics;

Medium:

- Identify specific grazing impacts in riparian areas, especially wetlands and stream bank.. Institute corrective measures;
- Plant conifers within Riparian Reserves where they were historically established but are now absent or understocked;

- Utilize fire as a tool to attain Desired Future Conditions in Riparian Reserves as long as Aquatic Conservation Strategy objectives and LRMP S&Gs are met;
- Implement instream habitat improvements as recommended in the Aquatic Habitat section

Low:
- Allow salvage removal from Riparian Reserves only of logs that are in excess of that needed to meet present and future coarse woody debris needs;
- Encourage vegetative recovery on mine tailings and openings.

It is recommended that the Riparian Reserve widths outlined in the ROD be followed until site-specific analysis occurs at the project level. Only upon site-specific project level review should any Riparian Reserve boundary be changed, finalized and entered in GIS. Any changes in Riparian Reserves from the Interim locations must consider all riparian and terrestrial values associated with these areas (Northwest Forest Plan). As such, any changes should be determined by an interdisciplinary team that, at a minimum, includes a fishery biologist, wildlife biologist, geologist, hydrologist, and silviculturalist. This team may be expanded to include other disciplines such as when visual and recreational values warrant.

The following criteria should be used when considering site-specific changes to Interim Riparian Reserves:
- Needs of specific species listed in the Northwest Forest Plan and FEMAT Report;
- Spotted owl dispersal needs;
- Connectivity through AMA to LSR, wilderness, and adjacent AMA and matrix lands outside the planning area (corridors of suitable width);
- Area-wide or watershed-wide abundance or deficiencies of snags, large green trees, and late-successional habitat;
- Verification of fish-bearing versus non-fish-bearing streams;
- Inherent potential erodibility of the landscape;
- Amount of effective ground cover within the Riparian Reserve;
- Verification of landscape stability or mass-wasting potential;
- Verification of wetland boundaries;
- Locations of natural slope breaks (inner gorges) and manmade features, such as roads, relative to the Interim Riparian Reserve boundary;
- Potential plant community.

4.5 VEGETATION - SITE PRODUCTIVITY

When planning and implementing harvest activities that will use ground-based equipment the following should be considered:
- Design a skidtrail system that will meet the needs of any future silvicultural prescriptions and record for future entries.
- On units that have already been logged by tractors, an on-site evaluation should be made to determine which existing skidtrails are suitable for use, and record for future entries.
- Skidtrail location should be avoided in draws, wet areas, steep slopes, and areas where surface water would be concentrated.

The probability of restoring an abandoned road surface and cut bank to previous productivity levels is nearly impossible because topsoil, organic matter, and porosity have been removed or reduced. Bringing these sites back to some level of productivity is still possible, yet how this is accomplished and to what degree, should be completed based on the objectives of benefiting other resources as well, such as watershed improvement, wildlife habitat, and range improvement.

The most common method of obliterating skid trails and road surfaces has been the use of the subsoiler. If used in the right conditions, this tool can reduce compaction. Unfortunately the lasting effects of this operation are not well understood. A monitoring project should be set up initially to study how these soils respond to this restoration activity.

When planning and implementing the restoration of skidtrails, and landings, or obliterating road surfaces using a subsoiler, the following should be considered:

- Evaluate the site for water drainage problems. Design road dips, waterbars and other structures necessary to alleviate water concentration.
- Use the appropriate subsoiling equipment needed to meet restoration objectives.
- Monitor the end results of the project to determine if project objectives are being met.
- Sites with over 40 percent of the area in skid trails, could be considered using the winged subsoiler.

4.6 VEGETATION MANAGEMENT

Vegetation would be managed according to recommendations in the *Applegate Adaptive Management Area Ecosystem Health Assessment,* Landscape and Stand Level Goals. Specific recommendations, in addition to these, include:

- Reduce stand densities by thinning and prescribed burning in overstocked natural stands where ponderosa pine, sugar pine, or black or white oak are desired.
- Consider thinning and favor stocking for higher proportions of pines and hardwoods on low-elevation, south-facing slopes where Douglas-fir mortality is high due to activities of woodborers and bark beetles.
- Thin plantations with ponderosa pine before trees reach 8-inch average diameter. Evaluate the effects of removing mistletoe-infected trees relative to wildlife values on a site-by-site basis.
- Thin around western white pines greater than 14-inch diameter in dense natural stands at higher elevations.
- Identify root disease centers before thinning in Douglas-fir or white fir natural stands and plantations.
- Take opportunities to plant blister rust resistant sugar and western white pines, especially above the 4000-foot elevation.
- Analyze existing soil conditions when designing vegetation management projects. Design new projects to restore or maintain soil productivity characteristics.

4.7 FOREST HEALTH

In stands where pines are desired in the future, control stand densities using the guidelines in the Applegate AMA Ecosystem Health Assessment:

- Stands with basal areas greater than 120 square feet per acre, below 3500 feet elevation, on southeast to southwest facing slopes and within one mile of recent bark beetle activity are the highest priority for treatment.
- Reduce the stocking around sugar and ponderosa pines in these stands to a level that will not exceed

120 square feet before the next entry.

- Reduce the stocking around western white pines greater than 14 inches in diameter to levels that will not exceed 140 square feet per acre before the next entry.
- Treat slash to prevent infestation by Ips beetles.
- Discriminate against white fir that has invaded the understory of mixed conifer stands on dry sites.
- Manage for higher proportions of pines and hardwoods on low elevation sites and south-facing slopes where Douglas-fir have been killed by woodborers and bark beetles. (Thinning dense clumps of Douglas-fir on these sites may prevent future insect-induced tree mortality, but will probably not save trees in groups that are already infested).
- Minimize the level of dwarf mistletoe in stands where tree vigor and growth is threatened. The highest priority for treatment (e.g. pruning or thinning)of stands with infected overstories above a manageable understory of the same species, or around the edges of plantations.
- Identify root disease centers before thinning or other intermediate entries in natural stands or plantations of Douglas-fir or white fir.
- Plant blister rust-resistant sugar and western white pines. Root disease centers are particularly appropriate sites because the pines are resistant and therefore competition from more disease-susceptible species is reduced.
- Where hardwood trees are a desirable stand component, maintain their vigor by avoiding wounds and by thinning around trees that are being overtopped.
- Assess the level of annosus root disease and dwarf mistletoe prior to management activities in stands containing Brewer spruce.

4.8 WILDLIFE

- Use Access and Travel Management (ATM) planning to achieve an open road density within the subwatersheds to about 1.8 miles/per sq. mile.
- Survey for the Survey and Manage species listed prior to any ground-disturbing activities, and reference this work prior to project design.
- Survey known and suspected caves and adits for a complete inventory of bat habitat within the watershed. Once identified, take steps necessary to ensure protection of these habitats.
- Consider previously listed Category II species when planning activities that could negatively impact their habitat. This would ensure their viability is maintained and that activities do not trend these species towards Federal Listing.
- When planning timber sale activities, consider the identified older forest connections in and out of the watershed, in regards to improving/maintaining these dispersal avenues.
- Consider the identified areas that lack late seral habitat, when planning timber sale activities, in regards to improving/maintaining these patches for dispersal and improved distribution across the watershed.
- Plan for treatment of decedent brush stands in summer range.

4.9 RANGE MANAGEMENT

- Continue problem-solving efforts with the Klamath National Forest in regards to unauthorized livestock use in the Towhead Basin.
- Develop and complete a current Environmental Assessment and Allotment Management Plan.
- Continue efforts in meeting the Siskiyou Crest Strategy objectives.
- Maintain permittee involvement in all aspects of allotment management.

4.10 RECREATION

4.10.1 ACCESS AND TRAVEL MANAGEMENT

- Complete the Rogue River National ATM plan. Analyze and resolve motorized issue regarding use of Cook and Green, and Horse Camp Trails during ATM planning.

4.10.2 DISPERSED RECREATION

- Design dispersed sites that manage recreation use by designating vehicle access spurs and parking areas, establishing fire rings in pre-designated locations, and restoring remaining sites through watershed restoration projects. Over the long term consider controlling use/access through a permit or gate system.

4.10.3 WILDERNESS

- Begin analysis for implementing prescribed natural fire and management-ignited fire as options in wilderness management.
- Complete on the ground survey of Red Buttes Wilderness boundary.
- Limit fish stocking to those waters in RBW that were stocked historically. Towhead and Moraine (also known as Elk) lakes should not be stocked in the future.

4.10.4 WILD AND SCENIC RIVERS

- Manage the outstanding and remarkable values of Butte Fork and Middle Fork of the Applegate River so not to jeopardize eligibility for Wild and Scenic River Status.

4.11 FIRE MANAGEMENT

Areas should be managed to reduce fire hazard and risk in strategic locations in order to protect watershed values (i.e. timber, aquatic, riparian, soil, botanical, wildlife resources, and wilderness values).

The highest priority areas for management action (non-wilderness designations) are where high and moderate fire hazard areas intersect with moderate, high, and extreme fire risk areas (Map 27).

Each X in Figure 17 below, depicts possible priority areas for action where there is a high likelihood that values will be lost to fire.

Figure 17. Fire Priority Areas

		Moderate	High	Extreme
Fire Hazard	High	X	X	X
	Moderate	X	X	X
	Low	-	-	X

Fire Risk

4.11.1 FIRE HAZARD REDUCTION AND VEGETATION

Where appropriate, complete vegetation management activities to reduce fire hazard. Tools to be considered for the no-wilderness areas include density management, prescribed fire, and manual manipulation of live and dead vegetation. Over the long-term these types of management activities will reduce fire hazard and improve the growth and vigor of forested stands.

Solely reintroducing fire in Douglas-fir and ponderosa pine forests will not restore stands to historic old-growth conditions. This is due to the build up of ladder fuels from fire exclusion. Burning within dense stands with ladder fuels can kill or damage the overstory. In many areas, mechanical treatments may be necessary to reduce understory development prior to the use of prescribed fire (Arno, Scott, and Hartwell, 1995).

Modify the existing stand density and current/future surface fuel loads so that:

- Wildfires are primarily ground fires (as compared with group or running crown-fires);
- less than 3-4 foot flame lengths are generated from ground fire up to the 90th percentile of fire danger (based on historical data); and
- large woody material is managed to levels that are consistent with plant series and recommendations for protection zone (Table 17).

Integrate the analysis of habitat requirements (as well as other plant and animal habitat requirements), site productivity, riparian reserves, and other ecological considerations with site specific fire hazard and fire risk analysis. This integration must take place when making final decisions concerning vegetation management, including the amount of Coarse Woody Material and standing snags within a planning area.

Coarse Woody Material (CWM) will be managed where fire hazard reduction is the main objective of the management activity. Table 17 provides amounts (within the range of natural variation) of CWM determined to be reasonable when considering areas to be managed to reduce the fire risk to larger blocks of contiguous habitat. These amounts consider minimum wildlife needs (Appendix II).

The following table recommends the amount of CWM within vegetation zones based on aspect as influenced by the pre-fire suppression fire return interval. (Note: a piece of CWM is 16 inch diameter by 16 foot length).

Table 17. Recommended Amounts Within Forested Cover Types for Coarse Woody Material Considering Fire Hazard Reduction:

Vegetation Zones (a) (Series)	Desired Successional Phase	Average Fire Return Interval (b)	Pieces per acre of Woody Debris (Considering the Range of Variation Among Vegetation Zones)
Interior Valley Zone Douglas-fir/ponderosa pine (driest association of Douglas-fir series)	Seral	8 to 10 years	0 to 3 pieces on south aspects; 2 to 5 pieces on north aspects. Class I or II decay rate
Mixed conifer Zone (Douglas-fir and driest white fir series)	Mostly Seral	15 to 20 years	3 to 7 pieces on south aspects; 5 to 10 pieces on north aspects. Class I or II decay rate
White Fir Zone	Mostly Climax	25 to 35 years	ROD S&Gs 120 lineal feet
Shasta Fir Zone	Mostly Climax	40 years	ROD S&Gs 120 lineal feet
Mountain Hemlock Zone	Mostly Climax	100 to 115 years	ROD S&Gs 120 lineal feet
Perennial Stream, Riparian reserves and Wetlands			Manage to levels that are capable for respective plant series (McRimmon and Atzet,1993)

(a) taken from Jerry F. Franklin and C. T. Dyrness. Vegetation Of Oregon & Washington. - USDA Forest Service Research Paper PNW-80. 1969. (b) Fire return intervals are on a landscape basis. Intervals determined from personal discussion with Tom Atzet, Area Ecologist, 1994, concerning fire return interval for the forest/urban residence interface above Ashland, Oregon and the upper Applegate Valley eastern Siskiyous.

For all vegetation management activities, including the use of prescribed fire (as referenced in Appendix F of the AMA Forest Health Assessment), recommendations for maintaining healthy aquatic systems are as follows:

- Where maintenance or establishment of ponderosa pine overstory is desired, thin trees to 20-foot spacing or greater between trees (i.e. for sites with larger diameter, dense, multi-layered, conifer trees). This spacing ensures that pine trees remain in an open canopy condition for a longer period of time. Experience with fuelbreak construction has shown that when competing vegetation is eliminated pine trees grow at a much faster rate. They soon occupy the site and go into canopy closure. The spacing of greater than 20 feet considers this fact. (Also refer to recommendations contained in Appendix E of the AMA Forest Health Assessment for maintaining healthy ponderosa pine).
- Management activities expected to increase the dead and down or standing dead vegetation, should consider and address the increased potential for fire risk and fire hazard. Project plans should include the prescriptions for post-activity fuels treatments, including detailed discussion of how and when the work will be completed and the availability of funding. Activities within Mixed Conifer and Interior Valley Vegetation Zones have a higher level of concern for increasing dead-and-down or standing dead material, see Map18.
- Maintain open pine forests on south and west facing slopes and on ridges, generally below 5,000 feet elevation in the areas identified as high fire risk (Map 29).
- Use the Fire Species Database (Tom Atzet, 1995) to identify other vegetation types characterized as having a high resiliency and/or resistance to fire. Emphasize fire resistant/resilient species in high fire risk areas.

4.11.2 PRESUPPRESSION FACILITIES

For areas within the WAA outside of the Red Buttes Wilderness analyze the appropriateness for and establish adequate presuppression and pre-attack facilities such as helispots, and access and safety zones.

- Maintain existing or establish initial attack helispots.
- Pre-determine tractor fireline locations for implementation in the event of a large wildfire that are acceptable considering hydrology and soil conditions and Riparian Reserve management recommendations).
- Identify pre-determined tractor fireline locations on pre-attack maps.

When completing ATM planning, analyze for adequate suppression access response time. For example closing or decommissioning roads in the remote sections of the Middle Fork WAA area will influence the ability to effect initial or extended attack of wildfires in a reasonable response time.

4.11.3 SNAGS AND FIRE FIGHTER SAFETY

Fire fighter safety while suppressing wildfires is of utmost importance. One of the greatest threats to fire fighter safety is working around burning snags, burned snags, or fire weakened trees. Also, the greater the number of snags burning in a wildfire, the more difficult it is to control the fire.

- During fire suppression efforts, if snags are a safety concern they should be felled and removed.
- Where vegetation management is taking place to achieve the objective of "defensible space," or strategic presuppression hazard reduction, snag density is an issue. Appropriate amounts and locations need to be determined on a site-specific location, considering objectives

4.11.4 FIRE PREVENTION PROGRAM

Wildland fire prevention is the informing, educating, and regulating of human behavior or activities that influence the various types of potential ignition sources within flammable vegetation. As agency downsizing continues, the need to maintain a proactive fire prevention program will become a challenge, particularly with the increasing human activity in the forest/urban interface. To maintain the fire prevention program:

- Continue the coordination of cooperative fire prevention with the Oregon Department of Forestry and Jackson County fire agencies.
- Continue public use access restrictions as an option during certain fire danger criteria.
- Continue periodic public neighborhood fire prevention meetings, discussing defensible space, fire apparatus access, home construction materials (flammability)/design, etc.

To successfully protect the Middle Fork watershed area from catastrophic wildfire will require a coordinated effort by the Forest Service, and private land owners. This goal can be furthered by:

- Continuing to provide technical advice in urban/wildland fire planning to local land use planning agencies.
- Continuing efforts to standardize fire prevention regulations (such as campfire closures) across jurisdictions to better inform the public and maximize consistent aggressive fire prevention.

For new recreation opportunities, evaluate the potential for increasing fire risk (associated with increased access and human use with the ability to mitigate increased fire risk).

4.11.5 SUPPRESSION

Given the remote access (no roads) within much of the Middle Fork WAA, initial attack time of wildfires is an issue. Failure to reinforce initial or extended attack in a timely manner may determine the successful of fire containment and control.

Middle Fork WAA will receive aggressive wildfire suppression. Aggressive fire suppression considers appropriate suppression response, while considering fire fighter safety, environmental requirements, availability of equipment and personnel, and locations and methods of tactical implementation.

Mutual aid agreements should be reviewed and updated periodically by the various cooperating agencies. Updates and reviews would entail determining at the most efficient manner to help prevent or reduce destruction of life and property, watershed values, and wildlife habitats due to wildfire.

4.11.6 RED BUTTES WILDERNESS

The Red Buttes Wilderness was established by Congress to be part of the National Wilderness Preservation System to preserve natural conditions as required by the Wilderness Act of 1964. Given the Congressional intent the U.S. Forest Service has established the following objectives for prescribed natural fires (Forest Service Manual 2324.21) within designated wilderness areas:

- Permit lightning fires to play, as nearly as possible, a natural ecological role within wilderness.
- Reduce the risks and consequences of wildfire, originating from within the wilderness, to an acceptable level.

Achieving these objectives will result in:

- Increased diversity in fauna and flora;
- Enhancement of wildlife habitat;

- Increased public awareness of natural processes shaping wilderness;
- Decreased fuel accumulation that will reduce the chance of large fires or large stand replacing fires;
- Restoration and maintenance of natural ecosystems.

The use of "managed" ignitions (hand or aerial) to reduce fuels (vegetation) may take place only if one of the two wilderness fire management objectives and all of the following conditions are met:

- The use of prescribed fire or other fuel (vegetation) treatment measures outside of wilderness is not sufficient to achieve fire management objectives within the wilderness.
- An interdisciplinary team of resource specialists has evaluated and recommended to the deciding officer the proposed use of prescribed (managed) fire.
- The interested or affected public and others have been involved in the decision.

In order to achieve the objectives above a Prescribed Natural Fire (PNF) and Wilderness Fire Management Plan will need to be prepared for the Red Buttes Wilderness. After field reconnaissance and evaluation and completion of a Fire Management Plan, the appropriateness of a Prescribed Natural Fire Plan will be decided. An important alternative to a Prescribed Natural Fire Plan is a Prescribed Management Ignition Plan for the Red Buttes Wilderness area. Prescribed Management Ignition may be more applicable and appropriate than random natural ignitions.

The Fire Management Plan will be prepared before the decision is made to select prescribed managed ignition or random prescribed natural fire. This is to ensure proper procedures for preparation, and for making appropriate fire management wildfire suppression responses (strategies and operational tactics for the Red Buttes Wilderness), are in place before taking on prescribed fire managed or natural ignitions. The Forest Supervisor, District Ranger, and Staff must articulate clear expectations and decision space for fire management.

4.12 MONITORING & RESEARCH

The following monitoring recommendations are made in order to provide further information of watershed processes and conditions within the Analysis Area:

Aquatic Habitat and Water Quality -

- Monitor sediment impacts to fish habitat in all fish-bearing streams in the analysis area. This may address deposition and/or embeddedness.
- Collect baseline summer temperature data on Upper Middle Fork and Whisky Creek, and collect additional data to that already collected on the Lower Middle Fork, Butte Fork and Cook and Green Creek.
- At a minimum, monitor shading of fish-bearing and non fish-bearing perennial streams using the solar pathfinder or comparable method, with fish-bearing streams and streams in AMA lands receiving highest priority.
- Monitor and re-inventory aquatic/riparian habitats, stream temperatures, water quality and fish populations at regular intervals in mainstream of Middle Fork of Applegate River, Butte Fork, Cook and Green Creek and Whisky Creek. Assess project work.
- Monitor instream large wood material locations in Middle Fork of Applegate River, Butte Fork, Cook and Green Creek and Whisky Creek as related to site capability, aspect and species. Recalibrate, if necessary, desired large wood material per mile estimates in Middle Fork WAA.

- Establish permanent monitoring points to determine changes in channel morphology in Middle Fork of Applegate River and tributaries.

Aquatic Species -

- Conduct monitoring on fish populations in all streams of the analysis area not currently inventoried. Re-survey areas previously inventoried at suitable intervals and compare to baseline data.
- Monitor water withdrawals and effects on aquatic species in Middle Fork of Applegate River.
- Collect baseline data on macroinvertebrate populations to determine the biotic integrity of stream habitat and trends in the Middle Fork watershed analysis area.
- Conduct water quality testing, lake surveys, and fish populations census on Azalea Lake, Echo Lake, Lonesome Lake, Towhead Lake, and Elk Lake.
- Monitor effect of exotic species(e.g., effect of brook trout and bull frogs on salmonids, northwestern pond turtle and northern red-legged frog population) in the lakes.
- Collect baseline data on amphibians (e.g., tailed frog and foothill yellow-legged frog populations) to determine the biotic integrity of stream habitat and trends in the Middle Fork Watershed Analysis Area.

Riparian -

- Monitor Interim Riparian Reserves to assess the ability of the Aquatic Conservation Strategy and the RRNF Land and Resource Management Plan, standards and guidelines to provide the anticipated level of protection.
- Determine if vegetation management in selected portions of Riparian Reserves can be performed to enhance slope stability conditions by promoting healthy forest stands.

Site Productivity -

- Develop a sampling strategy to determine trends in site productivity by measuring depth of duff and litter and the extent and degree of soil compaction.

5. GLOSSARY

Accretion - The process, driven by plate tectonics, whereby the continental margin grows by addition of ocean crust and sediments at a subduction zone.

Aggradation - The geologic process by which stream beds, floodplains and the bottoms of other water bodies are raised in elevation by the deposition of material eroded and transported by water from other areas.

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

Adaptive Management Area (AMA)- Landscape units designated for development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives.

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

Anadromous fish - Fish that are born and rear in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, and shad are examples.

Aquatic ecosystem - Any body of water, such as a stream, lake or estuary and all organisms and non-living components within it, functioning as a natural system.

Aquatic habitat - Habitat that occurs in free water.

Aspect - The direction a slope faces with respect to the cardinal compass points.

Basal area - The area of the cross section of a tree stem including the bark, near its base, generally at breast height, or 4.5 feet above the ground.

Bedload - material moving on or near the streambed by rolling and sliding for brief excursions into the flow, three or four diameters above the bed.

Big game - Large mammals that are hunted by humans. Big game include elk, black tailed deer, and black bear.

Biological corridor - A habitat band linking areas of similar management and/or habitat type.

Biological diversity - The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

Biological legacies - Large trees, down logs, snags and other components of the forest stand left after harvesting for the purpose of maintaining site productivity and providing structures and ecological functions in subsequent stands.

Blowdown - Trees felled by high winds.

Candidate Species - Those plants and animals included in Federal Register "Notices of Review" that are being considered by the Fish and Wildlife Service for listing as threatened or endangered. Two categories that are of primary concern are:

> **Category 1.** Taxa for which there is substantial information to support proposing the species for listing as threatened or endangered. Listing proposals are either being prepared or have been delayed by higher priority listing work.
>
> **Category 2.** Taxa information indicates that listing is possibly appropriate. Additional information is being collected.

Canopy - A layer of foliage in a forest stand. This most often refers to the uppermost layer of foliage, but it can be used to describe lower layers in a multistoried stand.

Canopy closure - The degree to which the canopy (forest layers above one's head) blocks sunlight or obscures the sky. It can only be accurately determined from measurements taken under the canopy as openings in the branches and crowns must be accounted for.

Coarse woody debris (CWD) - Portion of a tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter.

Conifer - A tree belonging to the order Gymnospermae, comprising a wide range of trees that are mostly evergreens. Conifers bear cones (hence, coniferous) and needle-shaped or scale-like leaves.

Connectivity - A measure of the extent to which conditions among LS/OG forest areas provide habitat for breeding, feeding, dispersal, and movement of LS/OG-associated wildlife and fish species. (See LS/OG forest.)

Cumulative effects - Those effects on the environment that result from the incremental effect of the action when added to the past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Debris flow (debris torrent) - A rapidly moving mass of rock fragments, soil, and mud, with more than half of the particles being larger than sand size.

Debris slide - A slow to rapid slide, involving downslope translation of relatively dry and predominantly unconsolidated materials, with more than half of the particles being larger than sand size.

Diameter at breast height (DBH) - The diameter of a tree 4.5 feet above the ground on the uphill side of the tree.

Dispersal - The movement, usually in one direction and on any time scale, of plants or animals from their point of origin to another location where they subsequently produce offspring.

Ecosystem - A unit comprising interacting organisms considered together with their environment (e.g., marsh, watershed, and lake ecosystems).

Edge - Where plant communities meet or where successional stages or vegetative conditions with plant communities come together.

Edge effects - The drastically modified environmental conditions along the margins, or "edges," of forest patches surrounded partially or entirely by harvested lands. These conditions may extend 600 feet or more into the forest from the harvest boundary. Only forested areas at substantial distances from the edge (generally, the center of a forest patch of 100 acres or more) provide unmodified interior forest conditions.

Eligible river - A river or river segment found, through interdisciplinary team and, (in some cases), interagency review, to meet Wild and Scenic River Act criteria of being free-flowing and possessing one or more outstandingly remarkable values.

Embeddedness - The degree that larger particles (boulders, rubble or gravel) are surrounded or covered by fine sediment. Ususally measured in classes according to the percentage of coverage of larger particles by fine sediment.

Endangered species - Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and thus finding being published in the Federal Register.

Ephemeral streams - Streams that contain running water only sporadically, such as during and following storm events.

Extirpation - The elimination of a species from a particular area.

Fire Hazard - Vegetation by the kind, arrangement, volume, condition, and location that forms a special threat of ignition, spread and resistance control.

Fire regime - The characteristic frequency, extent, intensity, severity, and seasonality of fires in an ecosystem.

Fish-Bearing Streams - Any stream containing any species of fish for any period of time.

Floodplain - The area adjacent to a stream that is on average inundated once a century.

Forest Service - A division within the U.S. Department of Agriculture.

Forest Ecosystem Management Assessment Team (FEMAT) -As assigned by President Clinton, the team of scientists, researchers, and technicians from seven federal agencies who created this report.

Fuel loading - The amount of combustible material present per unit of area, usually expressed in tons per acre.

Geomorphic - Pertaining to the form or shape of and those processes that affect the surface of the earth.

Geographic Information System (GIS) - A computer system capable of storing and manipulating spatial (i.e., mapped) data.

Granitic - Any light-colored, coarse-grained rock formed at considerable depth by crystallization of molten rock.

Habitat - The place where a plant or animal naturally or normally lives and grows.

Habitat diversity - The number of different types of habitat within a given area.

Hiding cover - Generally, any vegetation used by wildlife for security or to escape from danger. More specifically, any vegetation capable of providing concealment (e.g., hiding 90 percent of an animal) from human view at a distance of 200 feet or less.

High severity fire - A wildfire event with acute ecological impacts; usually, but not always of high intensity.

Home range - The area that an animal traverses in the scope of normal activities. This is not to be confused with territory, which is the area an animal defends.

Hyporheic zone - The interface forming the boudary between groundwater and channel water in streams, important in the storage of dissolved gases and nutrients.

Interdisciplinary Team (IDT) - A group of individuals with varying areas of specialty assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze the problem and propose action.

Intermittent stream - Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Large woody debris - Pieces of wood larger than 10 feet long and 6 inches in diameter, in a steam channel.

Large woody material - Logs on the forest floor in pieces at least 24 inches in diameter at the large end.

Late-Successional Reserve (LSR)- A forest in its mature and/or old-growth stages that has been reserved under each option in the North West Forest Plan. (See Old-growth forest and Succession.)

Lava flow - A congealed stream of lava.

Limnology - The scientific study of bodies of freshwater (such as lakes).

Locatable minerals - Minerals subject to exploration, development, and disposal by staking mining claims as authorized by the Mining Law of 1872 (as amended). This includes valuable deposits of gold, silver, copper, and other minerals not subject to lease or sale.

Late-successional and/or old growth (LS/OG) - Forests or stands consisting of trees and structural attributes and supporting biological communities and processes associated with old-growth and/or mature forests.

Mass wasting - The downslope movement of earth caused by gravity. Includes but is not limited to landslides, rock falls, debris avalanches, and creep. It does not, however, include surface erosion by running water. It may be caused by natural erosional processes, or by natural disturbances (e.g., earthquakes or fire events) or human disturbances (e.g., mining or road construction).

Mitigating measures - Modifications of actions that (1) avoid impacts by not taking a certain action or parts of an action; (2) minimize impacts by limiting the degree or magnitude of the action and its implementation; (3) rectify impacts by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (5) compensate for impacts by replacing or providing substitute resources or environments.

Mixed-conifer forest - A forest community that is dominated by two or more coniferous species.

Monitoring - The process of collecting information to evaluate if objective and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Non-forest land - Land developed for nontimber uses or land incapable of being 10 percent stocked with forest trees.
Noxious plant - A plant specified by law as being especially undesirable, troublesome, and difficult to control.

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

Nutrient Enrichment - The addition of nitrogen, phosphorus and carbon compounds or other nutrients into a lake or other waterway that greatly increases the growth potential for algae and other aquatic plants. Most frequently, enrichment results from the inflow of sewage effluent or from runoff from farmlands.

Old-growth forest - A forest stand usually at least 180-220 years old with moderate to high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground.

Overstory - Trees that provide the uppermost layer of foliage in a forest with more than one roughly horizontal layer of foliage.

Peak flow - The highest amount of stream or river flow occurring in a year or from a single storm event.

Perennial stream - A stream that typically has running water on a year-round basis.

Physiographic province - A geographic area having a similar set of biophysical characteristics and processes due to effects of climate and geology that result in patterns of soils and broad-scale plant

communities. Habitat patterns, wildlife distributions, and historical land use patterns may differ significantly from those of adjacent provinces.

Prescribed burning - Controlled fire deliberately set to meet various resource objectives.

Prescribed fire - A fire burning under specified conditions that will accomplish certain planned objectives. The fire may result from planned or unplanned ignitions.

Presuppression - Activities organized in advance of fire occurrence to ensure effective suppression action and/or to minimize risk to humans and resource damage.

Record of Decision (ROD)- A document separate from but associated with an environmental impact statement that states the management decision, identifies all alternatives including both the environmentally preferable and preferred alternatives, states whether all practicable means to avoid environmental harm from the preferred alternative have been adopted, and if not, why not.

Refugia - Locations and habitats that support populations of organisms that are limited to small fragments of their previous geographic range (i.e., endemic populations).

Riparian area - A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it. This includes floodplain, woodlands, and all areas within a horizontal distance of approximately 100 feet from the normal line of high water of a steam channel or from the shoreline of a standing body of water.

Riparian Reserves - Legally designated riparian management zones on federal land designed to protect aquatic ecosystems and provide habitat for terrestrial species.

Riparian zone - Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.

Rosgen Classification - (see **Stream Type**)

Sedimentation - A broad term that pertains to the five fundamental processes responsible for the formation of sedimentary rocks: 1) weathering, 2) detachment, 3) transportation, 4) deposition, and 5) diagenesis; and to the gravitational setting of suspended particles that are heavier than water.

Sediment yield - The quantity of soil, rock particles, organic matter, or other dissolved or suspended debris is transported through a cross-section of stream in a given period. Measured in dry weight or by volume. Consists of dissolved load, suspended load, and bed load.

Sensitive species - Those species that (1) have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species or (2) are on an official state list or (3) are recognized by the U.S. Forest Service or other management agency as needing special management to prevent their being placed on federal or state lists.

Seral stages - The series of relatively transitory planned communities that develop during ecological succession from bare ground to the climax stage. There are four stages:

Early seral stage - The period from disturbance to crown closure of conifer stands managed under the current forest management regime. Grass, herbs, or brush are plentiful.

Mid-Seral stage - The period in the life of a forest stand from crown closure to first merchantability, usually ages 15-40. Due to stand density, the amount of brush, grass, or herbs rapidly decreases in the stand. Hiding cover may be present.

Late-Seral stage - The period in the life of a forest stand from first merchantability to culmination of mean annual increment. This is under a regime including commercial thinning, or to 100 years of age, depending on wildlife habitat needs. During this period, stand diversity is minimal, except that conifer mortality rates will be fairly rapid. Hiding and thermal cover may be present. Forage is minimal.

Mature seral stage - The period in the life of a forest stand from culmination of mean annual increment to an old-growth stage or to 200 years. This is a time of gradually increasing stand diversity. Hiding cover, thermal cover, and some forage may be present.

Serpentine soils - Soils developed on altered ultramafic rocks. These soils tend to lack key plant nutrients and contain relatively high portions of some chemicals that make growth difficult for many plant species. Therefore, serpentine soils often support unusual plant communities that are not found on other soil types.

Serpentinite/peridotite - The association of dark-colored, coarse-grained, iron and magnesium-rich igneous rock (peridotite) with the products of hydrothermal alteration and faulting of these rocks (serpentinite).

Slope stability - The resistance of a natural or artificial slope or other inclined surface to failure by landsliding (mass movement).

Snag - Any standing dead, partially dead, or defective (cull) tree at least 10 inches in diameter at breast height and at least 6 feet tall. A hard snag is composed primarily of sound wood, generally merchantable. A soft snag is composed primarily of wood in advanced stages of decay and deterioration, generally not merchantable.

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

Species - (1) A group of individuals that have their major characteristics in common and are potentially interfertile. (2) The Endangered Species Act defines species as including any species or subspecies of plant or animal. Distinct populations of vertebrates also are considered to be species under the act.

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

Stand (tree stand) - An aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition so that it is distinguishable from the forest in adjoining areas.

Stand density - An expression of the number and size of trees on a forest site. May be expressed in terms of numbers of tree per acre, basal area, stand density index, or relative density index.

Standards and Guidelines (S&Gs) - for management of Habitat for Late-Successional and Old Growth Forest Related Species within the Range of the Northern Spotted Owl.

Stand-replacement wildfire - A wildfire that kills nearly 100 percent of the stand.

Stand-replacing event - A disturbance that is severe enough over a large enough area (e.g., 10 acres) to virtually eliminate an existing stand of trees and initiate a new stand.

Standards and guidelines - The primary instructions (rules and limits governing actions) for the land manager. Standards address mandatory actions, while guidelines are recommended actions necessary to a land management decision. They also establish principles specifying the environmental conditions or levels to be achieved and maintained.

Stream Type (Rosgen Classification) - This system of delineation of stream types has been developed by David L. Rosgen, Wildland Hydrologist Consultant of Fort Collins, CO. This is a general description of stream types A, B, C and F:

A1	Steep bedrock channel
A2	Boulder channel
A3	Steep erodable, coarse-grained channel
A4	Steep, erodable, fine-grained channel
A5	Steep, silt/clay channel
B1	Moderate gradient, stable, small boulder/large cobble channel
B2	Moderate gradient, stable, large cobble/coarse gravel channel
B3	Moderate gradients, unstable, cobble/gravel channel
B4	Moderate gradient, unstable, gravel/sand channel
B5	Moderate gradient, silt/clay channel
C1	Gentle gradient, cobble bed meandering channel
C2	Gentle gradient, overfit cobble bed channel
C3	Gravel bed channel
C4	Sand bed channel
C5	Silt/clay channel
C6	Narrow and deep meandering, fine grained channel
F1	Flat gradient, confined, meandering, bedrock stream
F2	Flat gradient, confined, meandering, boulder bed stream
F3	Flat gradient, confined, meandering, cobble/gravel bed stream
F4	Flat gradient, confined, meandering, sand bed channel
F5	Flat gradient, confined, meandering, silt/clay stream

Stream reach - An individual first order stream or a segment of another stream that has beginning and ending points at a stream confluence. Reach end points are normally designated where a tributary confluence changes the channel character or order. Although reaches are variable in length, they normally have a range of 0.5 to 1.5 miles in length unless channel character, confluence distribution, or management considerations require variance.

Substrate - Particles on the streambed, both organic and inorganic.

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

Successional stage - A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax. For example, coniferous forests in the Blue Mountains progress through six recognized stages: grass-forb, shrub-seedling, pole-sapling, young, mature, old-growth. (See also Seral.)

Suppression - The action of extinguishing or confining a fire.

Talus - A slope landform, typically covered by coarse rock debris forming a more or less continuous layer that may or may not be covered by duff and litter.

Threatened species - Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Underburning - Prescribed burning of the forest floor or understory for botanical or wildlife habitat objectives, hazard reduction, or silvicultural objectives.

Ultramafic - Dark-colored igneous rocks composed of minerals which are enriched in iron and magnesium. (See Serpentinite/peridotite.)

Watershed - The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.

Watershed analysis - A systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Watershed analysis is a stratum of ecosystem management planning applied to watersheds of approximately 20 to 200 square miles.

Watershed Improvement Needs - Inventory used within the Forest Service to evaluate and record restoration needs (uplands, roads, riparian, instream) within the watershed.

Watershed restoration - Improving current conditions of watersheds to restore degraded fish habitat and provide long-term protection to aquatic and riparian resources.

Water yield - The quantity of water derived from a unit area of watershed.

Wetlands - Areas that are inundated by surface water or ground water with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetative or aquatic life that require saturated or seasonally saturated soil conditions for growth and reproduction (Executive Order 11990). Wetlands generally include, but are not limited to, swamps, marshes, bogs, and similar areas.

Wild and Scenic River System - Those rivers or section of rivers designated as such by Congressional action under the Wild and Scenic River Act (Public Law 90-542, 1968), as supplemented and amended,

or those sections of rivers designated as wild, scenic, or recreational by an act of the legislature of the state or states through which they flow. Each designated river may be classified and administered under one or more of the following categories:

Wild River Areas - Those rivers or section of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic River Areas - Those rivers or sections of rivers that are free of impoundments with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreation River Areas - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines. and that may have undergone some impoundment or diversion in the past.

Wilderness - Areas designated by Congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, education, scenic, or historical value as well as ecological and geologic interest.

Wildfire - Any wildland fire that is not a prescribed fire.

Windthrow - A tree or trees uprooted or felled by the wind.

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7. APPENDICES

7.1 APPENDIX I - Guiding Principles for Wilderness

Wilderness management is not "management" in the sense of "doing something," "manipulating," or "improving" the resource to maximize a particular human benefit. Wilderness management means controlling human activities so that natural processes function freely. Several specific principles can be used to implement this approach.

1. **Fulfill the purpose of the Wilderness Act.**
   Wilderness decisions should be made "to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States, leaving no lands designated for preservation and protection in their natural condition" (PL 88-577).

2. **Strive for less human interference.**
   Every management action should help move wilderness from existing condition to one of less human influence to meet the purpose and provisions of the enabling legislation. In doing this, managers must strive to increase public understanding of both short-term and long-term wilderness benefits. In order to maintain the broad base of public support on which wilderness designation depends, managers must not be too restrictive of opportunities for people to enjoy wilderness, but rather encourage visitors to assume personal responsibility for their actions.

3. **Become a steward.**
   A common flaw in wilderness management is adherence to the notion that humans can improve nature. Natural events such as fire, windthrow, and wildlife population fluctuations are neither good nor bad; they are natural. This premise must be incorporated as the true application of a land ethic, where humans are part of the natural community but do not dominate it.

4. **Understand the minimum tool concept.**
   This has often been interpreted as simply using a traditional or primitive tool, such as the crosscut saw. In reality, the minimum tool concept means that managers should scrutinize every planned action to determine if it is necessary to protect physical and biological resources or the wilderness experience. If the action is deemed necessary, it should be accomplished using methods and equipment that have the least impact on the physical, biological, and experiential characteristics of the wilderness. In wilderness, how you carry out management actions is as important as, if not more important than the end product. The minimum tool concept can be applied in evaluating trail or bridge construction projects, administrative structures, and fire suppression as well as determining the need for and extent of visitor regulations and requests for scientific uses. Administrators are not exempt from the Wilderness Act. Section 4(c) of the act states "except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act ....," which is very different from the common interpretation "except for the administration of the area."

5. **Resist the easy answer.**
   When making wilderness management decisions, it is often tempting to choose the fastest, easiest or least expensive actions. However, economy, comfort convenience, and commercial value are not the

touchstones for wilderness management decisions. There are times when. saving a life or property take priority, but administrators must guard against the temptation to routinely take the easy way out.

6. **Retain elements of surprise.**
   Wilderness is a place where surprise, discovery, and spirituality must remain important elements of the experience Studies of human growth and learning potential reveal that people learn the most by being stretched-through repetitive exposure and adaptation to new environments or situations. By retaining the elements of challenge, risk, and self-discovery, wilderness settings will continue to produce personal growth, improved creativity, self-esteem, and self-sufficiency (US Department of Agriculture 1990).

7. **Mange wilderness as one resource.**
   The wilderness resource is a composite of individual resources-soil, air, water, vegetation, fire, wildlife, cultural sites-that combine to produce human and societal benefits. Wilderness managers must ensure that these individual resources are not managed independently, but that each resource is managed to support overall wilderness goals and objectives.

8. **Ensure an inheritance.**
   It is imperative that decisions take a long-term view. To ensure benefits for future generations, wilderness management should consider how each decision will influence the wilderness character in 50 years. Will the judgment made today ensure the benefits and opportunities of unspoiled wilderness to citizens seven generations from now? Small wildernesses near large population centers will become valuable refuges within a "sea of civilization" if every decision helps to maintain or improve the wild character. In areas that have been altered by human activities, a wilderness character can be restored overtime if every decision reduces human intervention and allows natural processes to function freely.

Wilderness Environmental Analysis Process

Scoping

Identify central issues.

Create environment for open dialogue and mutual learning with your interested and affected publics.

Analysis

Analyze the situation using these tools as a guide: The Wilderness Act; enabling legislation; national and regional policy; land management plan; relevant legislation (e.g., Clean Air Act, Endangered Species Act); internal and external specialist advice; previous decisions made in similar situations; Memorandum of Understanding agreements with other agencies.

Alternatives

Determine the range of management options you can consider.

Choice

Evaluate the effects of each alternative (considering decision screen questions below) and select the preferred one.

Implement the decision and monitor the effects.

Decision screen questions (developed from Principles of Wilderness Management):

1. Does your action ensure that wilderness is not occupied or modified by humans?

2. Does your action maintain or move wilderness up the scale toward less human influence within legal constraints?

3. Does your rationale allow wilderness to retain spirituality and elements of surprise and discovery?

4. Did you avoid the traps of making a decision based on economy, convenience, comfort, or commercial value?

5. Did you look beyond short-term outputs to ensure that future generations will be able to enjoy the benefits of an enduring resource of wilderness?

6. Does the alternative support the wilderness resource in its entirety rather than maximizing an individual resource?

7. Do you recognize the unique character of this particular wilderness?

8. Does the action prevent the effects of human activities from dominating natural conditions and processes?

(from "Toward an Enduring Wilderness Resource, A stewardship primer" by Linda Merigliano and Tom Kovalicky in Journal of Forestry, Feb. 1993.)

7.2 *APPENDIX II* - Wild and Scenic River Tributary Screening Criteria

(DATE: 10-28-93)

NAME OF TRIBUTARY: Middle Fork Applegate River

TRIBUTARY TO WHAT STREAM: Applegate River

TRIBUTARY SEGMENT REVIEWED: Middle Fork Applegate River, Stricklin Gulch, Lick Gulch, Reservoir Gulch, Cook and Green Creek - Bear Gulch (tributary of Cook and Green Creek), Whisky Creek, Marble Gulch, French Gulch, Frog Pond Gulch, Knox Gulch, Camp Gulch, Bean Gulch, Sweaty Gulch.

ID TEAM MEMBERS INVOLVED: Jeff Walters Tom Dewy, Tom Lavagnino, Mario Mamone, Sarah Kelly, Barbara Mumblo, Su Maiyo, Mike Ricketts.

FREE FLOWING: Is the tributary "existing or flowing in a natural condition without impoundment, diversion, straightening, rip-rapping or other modification?" X YES NO

SCENIC:

1. Is there a high degree of diversity in the landscape? Yes
2. Has there been a high degree of cultural modification? Yes
3. Is the scenic value unique to the region? No

COMMENTS:

1. There is a high degree o f diverse vegetation, Plant communities and geology in this area. The Red Buttes Wilderness and Cook and Green Pass are extremely diverse areas.
2. This area has been impacted by road building, mining, and timber harvest.
3. Scenic values of the area are of high quality with the high peaks and diverse rock types (especially the banded amphibolite in the Middle Fork).

RECREATION:

1. Are the recreation opportunities unique enough to attract visitors from outside the geographic region and would visitors be willing to travel long distances to do so? Yes
2. Are interpretive opportunities exceptional? Yes
3. Are there opportunities for national or regional competitive events? No

COMMENTS:

1. Includes the Red Buttes Wilderness and the Middle Fork Trail - The Middle Fork Trail follows the Middle Fork River and has a scenic spot called the Emerald Pool which is a clear green pool of water.

2. Interpretive opportunities include botanical diversity at Cook and Green Pass, where the east and west Siskiyous meet (one of the most botanically diverse areas in the region), and the mining history and related cabins and cabin sites along the Middle Fork River.

WILDLIFE:

1. Does this tributary contain nationally or regionally important Populations of wildlife species? Yes

2. Are there known populations of unique or federal or state listed or candidate threatened, endangered and sensitive species? Yes

3. Is the diversity of species unique to the region? No

4. Does the tributary corridor provide exceptionally high quality or unique or a critical link in habitat conditions for wildlife of national or regional significance or federal or state listed or candidate threatened, endangered and sensitive species? Yes

5. Is the diversity of habitat unique to the region? No

COMMENTS

1. The area contains the Siskiyou Mountain salamander and the tailed frog.

2. Siskiyou Mountain salamanders are a California State listed species as well as the goshawk. There is also habitat for the willow fly catcher which is found in the nearby Klamath National Forest.

3. This is a major corridor for species on the Siskiyou Crest which connects the coast with the interior to the Great Basin.

FISHERIES:

1. Is the tributary a nationally or regionally important Producer of resident and/or anadromous fish species? No

2. Does the tributary contain wild stocks and/or federal or state listed threatened, endangered or sensitive species? No

3. Is the diversity of species or habitat unique to the region? No

4. Does the tributary provide or have the potential to provide exceptionally high quality habitat for indigenous fish species? No

COMMENTS:

1. The Applegate Dam prevents fish from moving upstream.

CULTURAL RESOURCES:

1. Does the tributary corridor contain known occupation sites used by native Americans that are unusual, have exceptional human interest values, have national or regional importance for interpreting prehistory, been used for sacred purposes or be listed or eligible for listing on the National Register of Historical Places? No

2. Does the tributary corridor contain a known site(s) or feature(s) associated with a significant event, important person or cultural activity of the past that was rare or unusual? Of particular importance are sites or features that are listed in, or eligible for inclusion in the National Register of Historic Places. Yes

COMMENTS:

1. Several mining cabins are potentially eligible to the National Register of Historic Places.

GEOLOGIC/HYDROLOGIC:

1. Does the tributary contain an example(s) of rare or unusual geologic or hydrologic features? Yes

COMMENTS:

1. Contorted banded amphibolites which is polished by water, is found in the Middle Fork of the Applegate River.

BOTANIC/ECOLOGIC:

1. Does the tributary corridor contain nationally or regionally important populations of indigenous plant species that are rare or unique or significant populations of federal or state listed or candidate threatened, endangered or sensitive species? No

2. Is the diversity of plant communities unique? Yes

COMMENTS:

1. Cook and Green Pass is where the east and west Siskiyous meet and is reported by Wayne Roderick of the University of California Botanical Garden, Berkeley to have "the largest single aggregation of native plant species known to occur in one limited area in California'. This area is designated as a botanical area on the Rogue River National Forest and a proposed botanical area on the Klamath National Forest.

WATER QUALITY:

1. Does the tributary have exceptionally puree clear and/or clean water when compared to other similar tributaries in the basin? Yes

2. Is this tributary recognized as providing exceptionally high quality water critical for fish, wildlife, recreation or community uses? No

COMMENTS:

1. Major water source for Applegate Lake. Exceptionally clear water in the upper parts of the Middle Fork where Emerald Pool is located.

2. Recreation and community use at the Applegate Lake.

(DATE: 10-28-93)

NAME OF TRIBUTARY: Butte Fork Applegate River

TRIBUTARY TO WHAT STREAM: Applegate River

TRIBUTARY SEGMENT REVIEWED: Echo Canyon Hello Canyon, Avalanche Gulch, Desolation Gulcho

ID TEAM MEMBERS INVOLVED:Jeff Walter, Tom Dew, Tom Lavagnino, Mario Mamone, Sarah Kelly, Barbara Mumblo, Su Maiyo, Mike Ricketts

FREE FLOWING: Is the tributary "existing or flowing in a natural condition without impoundment, diversion, straight, rip-rapping or other modification?" X YES *NO*

SCENIC:

1. Is there a high degree of diversity in the landscape Yes

2. Has there been a high degree of cultural modification? No

3. Is the scenic value unique to the region? Yes

COMMENTS:

1. There is a high degree of diverse vegetation, plant communities, and geology in this area.

2. The majority of the area is in the Red Buttes Wilderness.

3. The Red Buttes, a high elevation serpentine ridge of mountains, is very unique. It can be seen from long and stands out from the rest of the Siskiyou Crest.

RECREATION:

1. Are the recreation opportunities unique enough to attract visitors from outside the geographic region and would visitors be willing to travel long distances to do so? Yes

2. Are interpretive opportunities exceptional? Yes

3. Are there opportunities for national or regional competitive events? No

COMMENTS:

1. Includes the Red Buttes Wilderness and Butte Fork, a large flowing stream.

2. Interpretive opportunities include botanical diversity and wilderness ethics. Because most of the area is w wilderness the interpretation opportunities are limited.

WILDLIFE:

1. Does this tributary contain nationally or regionally important populations of wildlife species? Yes

2. Are there known populations of unique or federal or state listed or candidate threatened endangered and sensitive species? Yes

3. Is the diversity of species unique to the region? No

4. Does the tributary corridor provide exceptionally high quality or unique habitat or a critical link in habitat conditions for wildlife of national or regional significance or federal or state listed or candidate threatened, endangered and sensitive species? Yes

5. Is the diversity of habitat unique to the region? No

COMMENTS:.

1. The area contains the Siskiyou Mountain salamander and the tailed frog.

2. Siskiyou Mountain salamanders are a California State listed species as well as the goshawk. There is also h the willow fly catcher which is found in the nearby Klamath National Forest.

3. This is a major corridor for species on the Siskiyou Crest which is a connection for the coast with the interi Great Basin.

FISHERIES:

1. Is the tributary a nationally or regionally important producer of resident and/or anadromous fish species? No

2. Does the tributary listed contain wild stocks and/or federal or state threatened endangered or sensitive species? No

3. Is the diversity of species or habitat unique to the region? No

4. Does the tributary provide or have the potential to provide exceptionally high quality habitat for indigenous fish species? No

COMMENTS:

CULTURAL RESOURCES:

1. Does the tributary corridor contain known occupation sites used by native Americans that are unusual, have exceptional human interest value, have national or regional importance for interpreting prehistory, been used for sacred purposes or be listed or eligible for listing on the National Register of Historical Places? No

2. Does the tributary corridor contain a known site(s) or feature(s) associated with a significant events Important person or cultural activity of the past that was rare or unusual? Of particular importance are sites or features that are listed in, or eligible for inclusion in the National Register of Historic Places. Yes

COMMENTS:

1. The Butte Fork Tool Houses a site eligible to the National Register of Historic Places, is located here.

GEOLOGIC/HYDROLOGIC:

1. Does the tributary contain an example(s) of rare or unusual geologic or hydrologic features? Yes

COMMENTS:

1. This area has high elevation peridotites with glacial lakes and in one area, an unusual marble outcrop within the peridotite. There is also interesting water movement within this area which includes sinking water caves.

BOTANIC/ECOLOGIC:

1. Does the tributary corridor contain nationally or regionally important populations of indigenous plant species that are rare or unique or state listed or candidate threatened, endangered or sensitive species? No

2. Is the diversity of plant communities unique? Yes

COMMENTS:

1. Plant communities in the area are very diverse, from forested areas to rocky serpentine peaks with wet areas. Seven watch list species are associated with riparian or wetland communities.

WATER QUALITY:

1. Does the tributary have exceptionally pure, clear and/or clean water when compared to other similar tributaries in the basin? Yes

2. Is this tributary recognized as providing exceptionally high quality water, critical for fish, wildlife, recreation or community uses? Yes

COMMENTS:

1. Higher quality water than the Middle Fork of the Applegate River which the Butte Fork flows into. There are no roads in this tributary so no increase in sediments due to that type of impact.

2. Recreation and community use at the Applegate Lake.

7.3 *APPENDIX III* - Recommended Components of a Prescribed Natural Fire Plan for the Red Buttes Wilderness

Key Components

- Anticipated Long Term Outcomes
- Prescribed Natural Fire Analysis and Decision Process:
  - Identification of Approval Authority
  - Decision Timeframes -
    - Evaluation Criteria for go/no go i.e. national, regional, and local fire situation and long term fire episode, etc.

- Risk Considerations - life, private property, threat to non-wilderness land, sensitive environmental considerations, etc.
- Risk Assessment Process
- Development of Prescribed Natural Fire Burn Plan - Components

Specific Components

Wilderness Prescribed Natural Fire Plan should include:

A. General Information - Date and time of discovery
Probable date of ignition
Present size
Fuel (model & type of vegetation)
Elevation
Topography
Map (include present location, natural barriers, etc.)

B. Complexity - FSM 5141.2

C. Management Organization

D. Projections - Weather
"Worse case weather"-- realistic for area.
Fire behavior projections
Maps of projections.
Expected final fire size in acres

E. Maximum Manageable Area

F. Safety Issues

G. Costs

H. Risk Assessment

I. Strategy/Tactics and Monitoring

J. Contingency

K. Public Information and Involvement

L. Daily validation process

M. Approval Process

- Initial and Revised PNF plan execution