United States Department of Agriculture

Forest Service

Pacific Southwest Region

Lower South Fork of the Salmon River

ECOSYSTEM ANALYSIS

Salmon River Ranger District

KLAMATH NATIONAL FOREST

July 1997

TABLE OF CONTENTS --LOWER SOUTH FORK *Ecosystem Analysis*

FIGURE NO. AND TITLE

TABLE NO. AND TITLE

TABLE NO. AND TITLE

Acknowledgements

Lower South Fork

Ecosystem Analysis

MARK REICHERT	**Project Team Leader/Forest Ecosystem Analysis Team**
MARC WILLIAMS	**District Liaison/Wildlife Biologist**

Forest Ecosystem Analysis Team

Jim Davis	Vegetation/Wildlife
Judy Hahn	Writer/Editor
Jeff Keiser	Fire/Fuels
Fran Smith	Fisheries
Bob Talley	Ecosystem Management Coordinator/ Human Resources

District Interdisciplinary Team

Bill Bailey	Timber
Al Buchter	Recreation
Orion Dix	Fisheries
Mike Journey	Fire/Fuels
Brenda Olson	Fisheries
John Schuyler	**District Ranger**
Robbie Van de Water	Hydrology
Bill Wais	Silviculture

Other Agency Participation

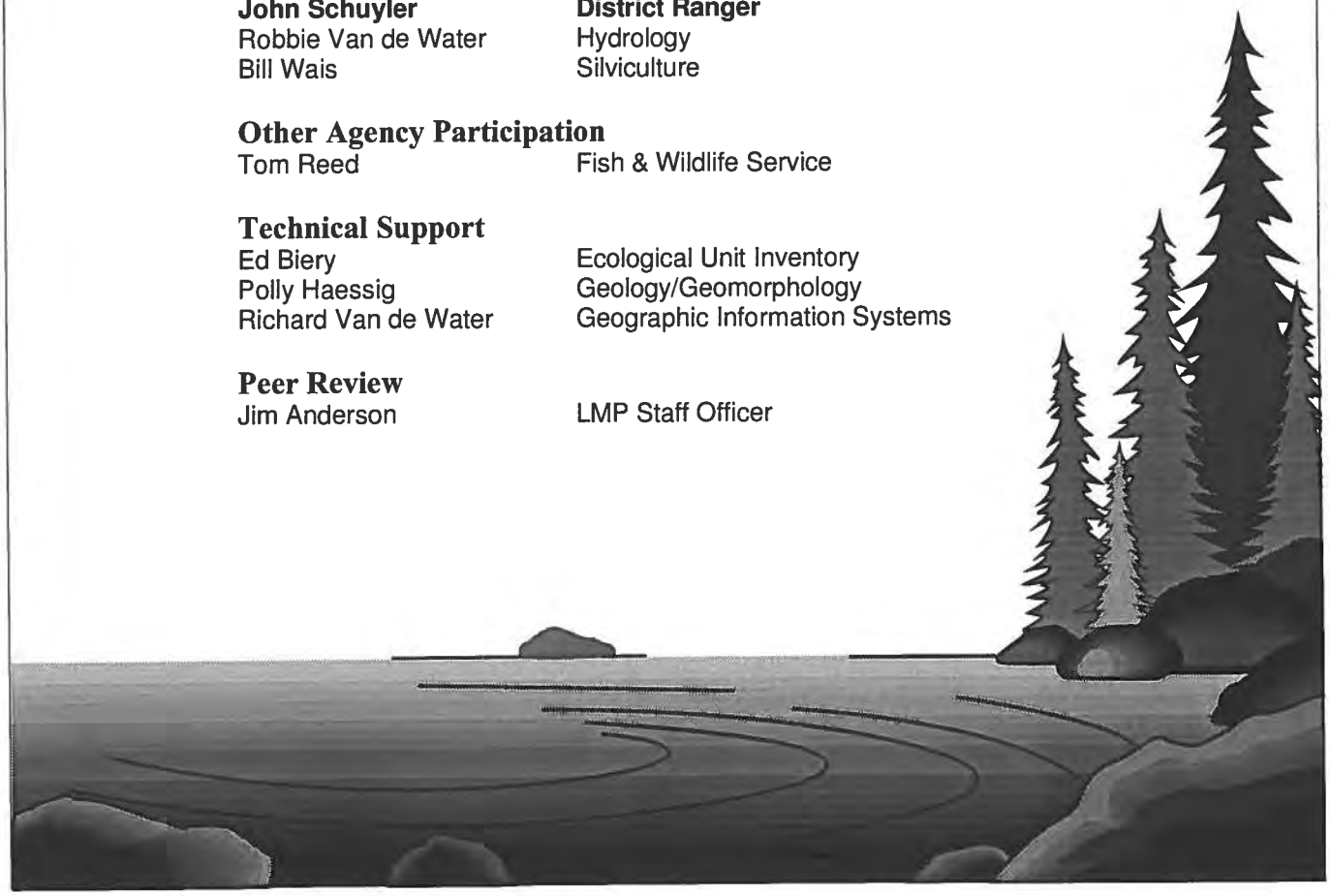
Tom Reed	Fish & Wildlife Service

Technical Support

Ed Biery	Ecological Unit Inventory
Polly Haessig	Geology/Geomorphology
Richard Van de Water	Geographic Information Systems

Peer Review

Jim Anderson	LMP Staff Officer



Introduction

ANALYSIS OVERVIEW

Watershed analysis is ecosystem analysis at the watershed scale; it is both an analysis and an information gathering process. The purpose is to provide a means by which the watershed can be understood as an ecological system and to develop and document an understanding of the processes and interactions occurring within. That is the purpose of this analysis of the Lower South Fork watershed (refer to Figure 0-1 Klamath Basin and Lower South Fork Watershed Vicinity Map, located on Page 0-3.

This analysis focuses on the issues and Key Questions specifically identified for this watershed. They are assessed in terms of biological, physical, and social importance. Some aspects may include beneficial uses, vegetative patterns and distribution, wind, fire, wildlife, migration routes, dispersal habitat, human use patterns, and the importance of vegetative corridors, streams, and riparian corridors. The analysis also includes an identification of management opportunities which will provide background for the development of management decisions in the future.

The analysis process is also used as a vehicle for implementation of Forest planning direction. It is an intermediate analysis between land management planning and project planning. It is purely an analysis step and does not involve *National Environmental Policy Act* (*NEPA*) decisions. It provides a means of refining the desired condition of the watershed, given the Goals and Objectives, Management Areas and Standards and Guidelines from the Forest Land and Resource Management Plan (*Forest Plan*), current policy, and other applicable State and Federal regulations.

The *Forest Plan* was updated in 1994 to reflect direction contained in the *Record of Decision* (*ROD*) for the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (*FSEIS*), also known as the *President's Northwest Forest Plan*. There are six different Management Areas contained within the Lower South Fork analysis area: Wilderness, Special Habitat (Late-Successional Reserve and Eagle/Falcon), Riparian Reserves, Scenic/Recreational Rivers, Partial Retention VQO, and General Forest.

PROCESS AND DOCUMENT ORGANIZATION

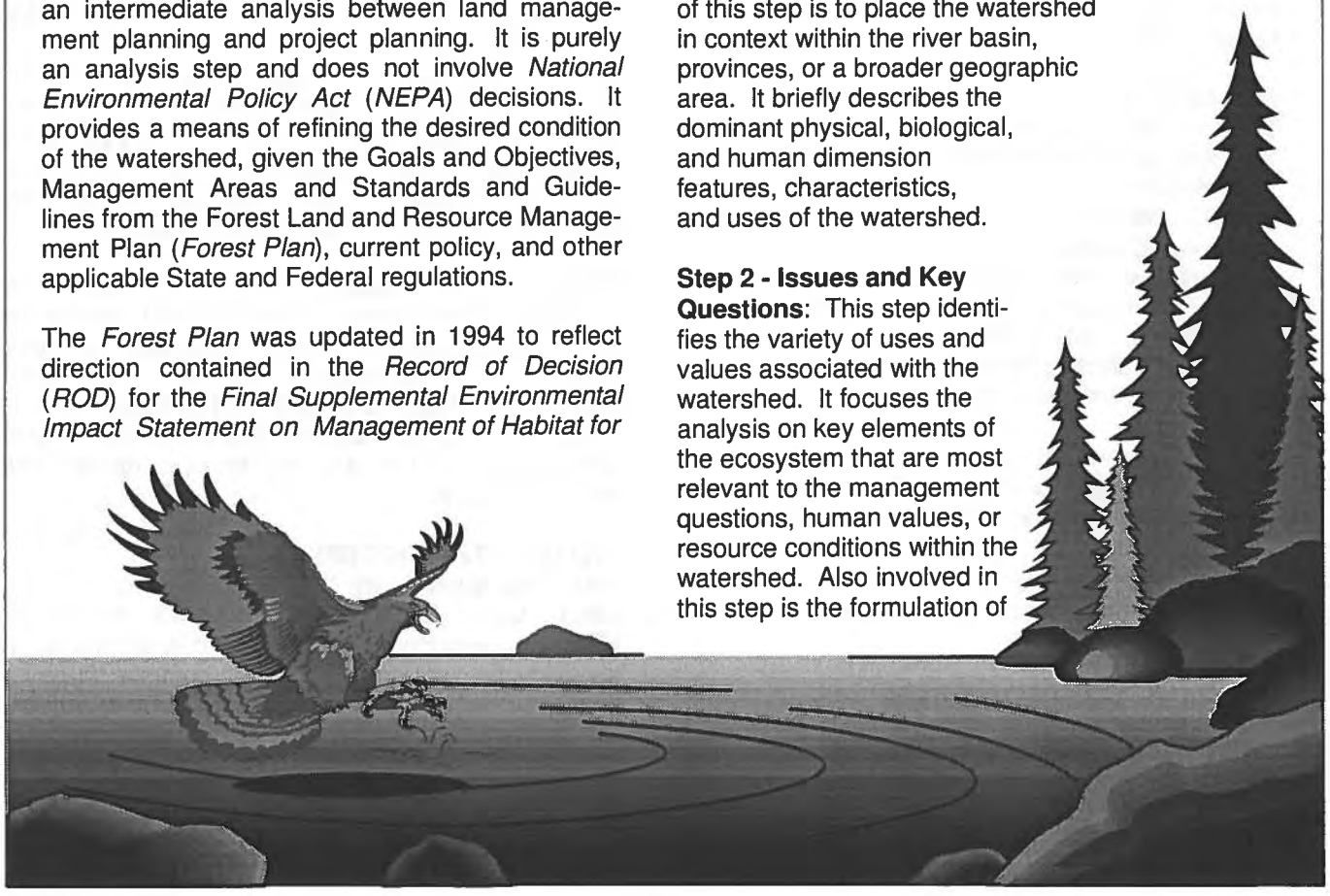
The analysis was conducted by a core Forest Ecosystem Analysis Team (FEAT) and an expanded team of District resource specialists. During the analysis phase, participation and involvement of other Federal agencies was encouraged.

Following is a summary of the six steps utilized in conducting ecosystem analysis:

Step 1 - Characterization
Step 2 - Issues and Key Questions
Step 3 - Current Conditions
Step 4 - Reference Conditions
Step 5 - Interpretation
Step 6 - Recommendations

Step 1 - Characterization: The purpose of this step is to place the watershed in context within the river basin, provinces, or a broader geographic area. It briefly describes the dominant physical, biological, and human dimension features, characteristics, and uses of the watershed.

Step 2 - Issues and Key Questions: This step identifies the variety of uses and values associated with the watershed. It focuses the analysis on key elements of the ecosystem that are most relevant to the management questions, human values, or resource conditions within the watershed. Also involved in this step is the formulation of



analysis questions using the indicators most commonly used to measure or interpret these ecosystem elements.

Step 3 - Current Conditions: This step documents the current range, distribution, and conditions of the relevant ecosystem elements.

Step 4 - Reference Condition: Step 4 develops an historic reference for comparison with current conditions. This step explains how existing conditions from Step 3 have changed over time as the result of human influence and natural disturbances.

Step 5 - Interpretation: This step compares existing, historical, and reference conditions of specific landscape elements, and explains significant differences, similarities or trends, and their causes. Desired conditions for each issue are discussed.

Step 6 - Recommendations: This step identifies those management activities that could move the ecosystem towards management objectives or desired conditions, as appropriate. Management Opportunities specified in Step 6 are expressed in general terms; they identify what needs to be done and why, but not how. This step ultimately provides the purpose and need for implementation of individual projects designed to achieve desired conditions.

Appendices A through I are included in support of information and findings contained within the analysis and are as follows:

A - LMP Feedback
B - Cumulative Watershed Effects
C - Road Issues and Concerns, and Resource Concerns
D - EUI Defined
E - Fire and Fuels
F - Endangered Species Act and Other Species Considerations Questions and Answers
G - Numerical Listing of Roads and Their Status
H - Visual Condition Levels
I- Timber Yield Calculations

The final portion of this document is the Map Packet containing the majority of maps (Figures 1-1 through 6-4) referred to within the text of this analysis.

For ease of reading, common names for wildlife and plant species have been used throughout the document, for the most part.

As part of the process, an appendix was created for feedback to the *Forest Plan*, e.g., changes in land allocations, refinements to existing data layers, etc. Refer to Appendix A - LMP Feedback for details specific to the Lower South Fork analysis area. Reference to other appendices appear as appropriate throughout the document.

RELATIONSHIP TO OTHER ANALYSES AND PLANNING

As stated previously, this level of analysis occurs between the *Forest Plan* and project-level analysis. A more detailed assessment is necessary for *NEPA* sufficiency, therefore, individual project analyses will focus on site-specific issues and their potential effects.

The Lower South Fork Ecosystem Analysis provides coverage for all remaining acreage not included in previous analyses for the Salmon River Ranger District; see Figure 0-2 Completed Landscape Analyses, located on Page 0-4 for a display of completed analyses on the Forest.

INFORMATION AND DATA SOURCES

Data and information used in this analysis have come from several different sources. The set of Klamath National Forest Planning Map Layers, updated as appropriate, and additional map layers and Ecological Unit Inventory (EUI) data were the source for the following geographic information system (GIS) layers which were used during the process; **Watershed Layer** (with analysis area and subwatersheds delineated), **Geologic Layer** (with rock types and geomorphic terranes), **Digital Elevation Data Layer**, **Precipitation Layer**, **Soils and Existing Vegetation Layer** (derived from EUI), **Fire Layer** (includes past fire perimeters, starts, and intensity), **Stream Layer** (watercourses delineated to approximate the extent of annual scour), **Land Allocations** (from Forest Plan), and **Roads Layer**. From these data layers, information such as fire hazard, current vegetation communities, and Riparian Reserve vegetation were derived.

Additional non-GIS sources of information were incorporated into the analysis. Stream surveys and fisheries habitat typing data were available for some streams within the analysis area. Other information was obtained from Forest planning documents, aerial photo interpretation, County museum records, published reports and papers, and also through personal communications.

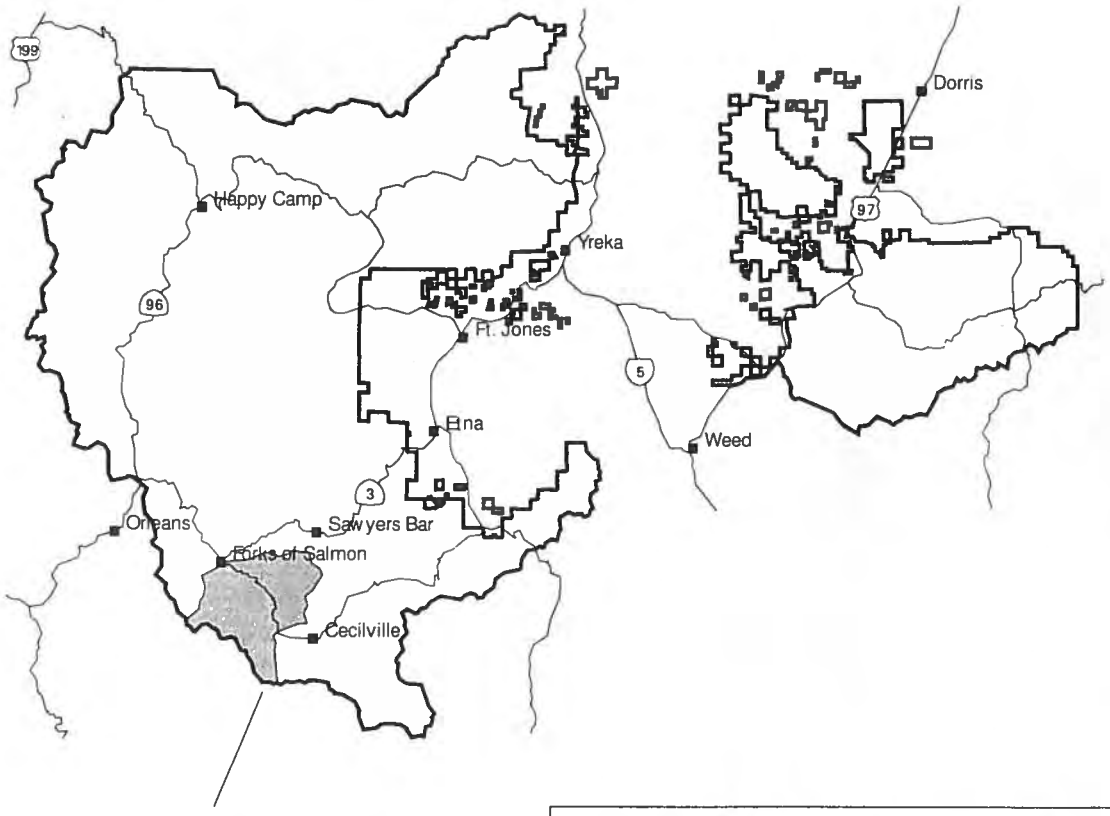
AN ITERATIVE PROCESS

Watershed analysis will be an ongoing process. The initial analysis report will serve as a foundation onto which new information will be added in the future. In addition, the analysis process will continue to be refined as new methods and strategies are developed and applied.

Figure 0-1 Klamath Basin and Lower South Fork Watershed Vicinity Map

Klamath Basin Vicinity

Lower South Fork Watershed



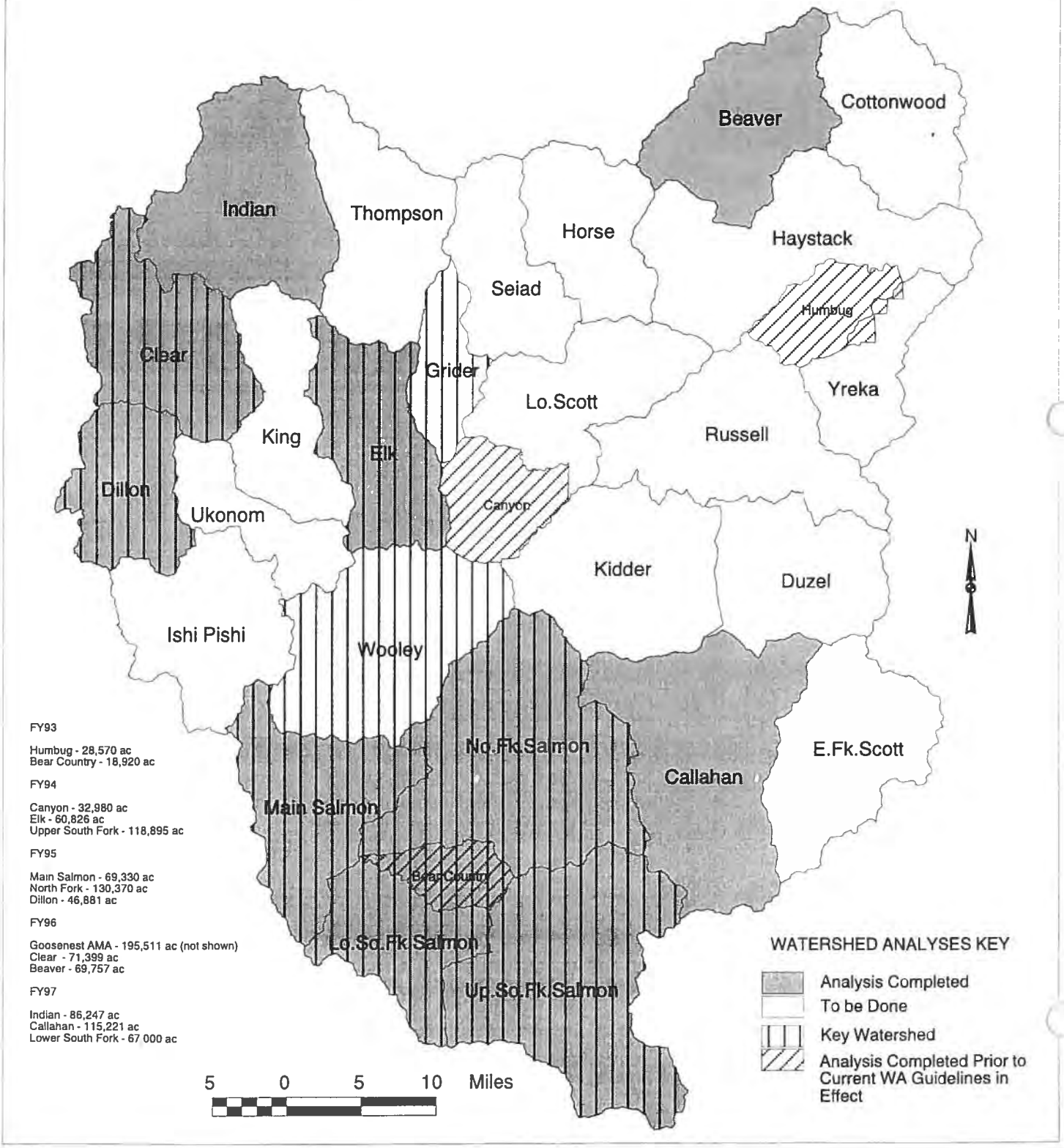
Lower South Fork Watershed

N
W E

20 0.0 20 *Miles*

Figure 0-2 Completed Landscape Analyses/Watershed Boundaries

Completed Landscape Analyses/ Watershed Boundaries Klamath National Forest



Step 1 - Characterization

This watershed includes the lower portion of the South Fork of the Salmon River and its tributaries. The upstream boundary occurs at the mouth of Plummer Creek and the downstream boundary is where the South Fork meets the North Fork at Forks of Salmon; a distance of about 12 river miles (see Figure 1-1 Base Map, contained in the Map Packet located at the end of this document). The two forks combine into the main stem of the Salmon River which flows approximately 17 miles to its confluence with the Klamath River. The watershed encompasses about 67,000 acres; all within Siskiyou County, California, the Klamath Mountains Physiographic Province, and totally within the boundaries of the Salmon River Ranger District, Klamath National Forest.

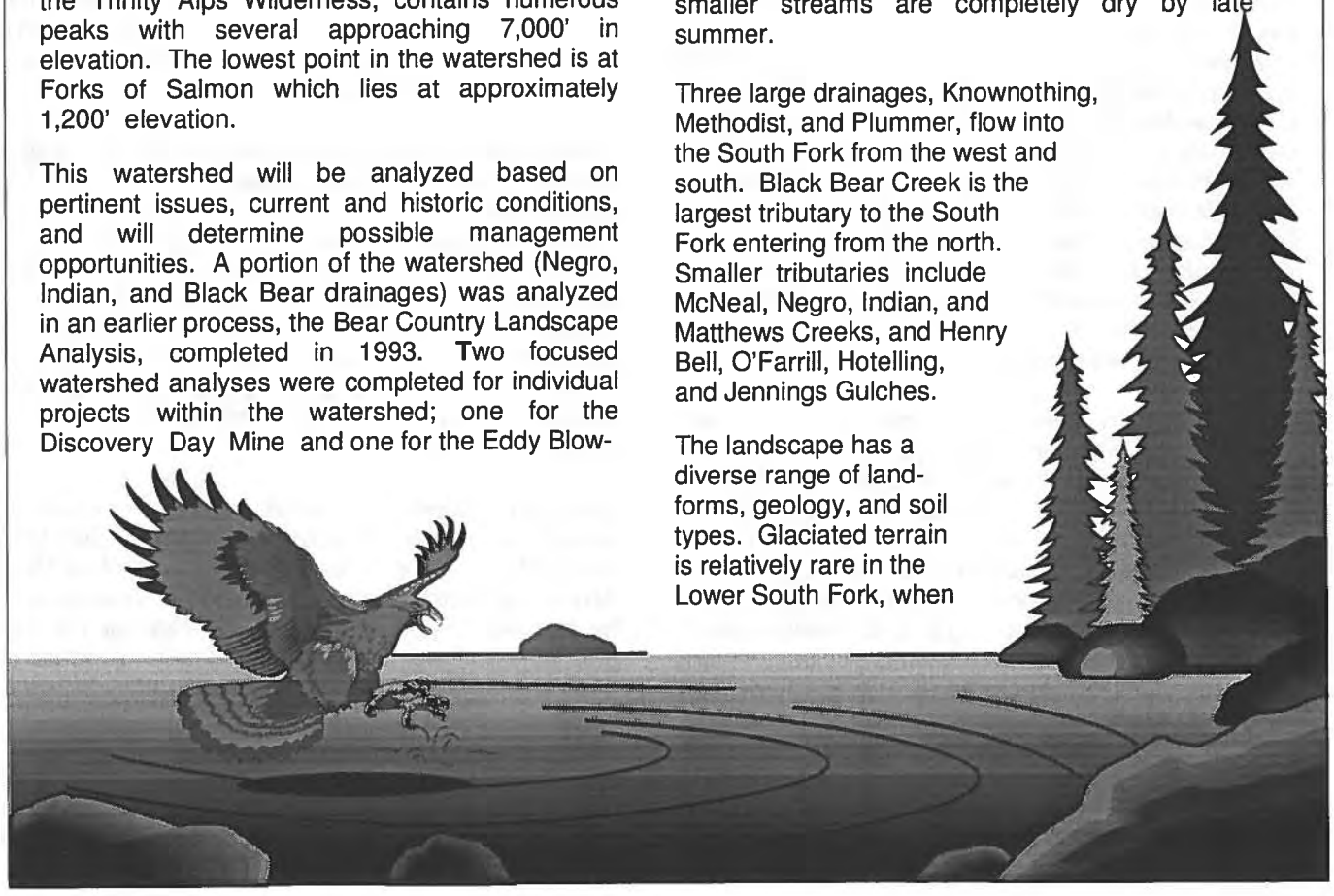
The adjacent watersheds are the Upper South Fork to the east, the North Fork Salmon River to the north, Main Salmon to the west, and watersheds in the Trinity River basin to the south. Picayune and Blue Ridges bound the watershed on the north with elevations reaching 6,000' at Blue Ridge Lookout. To the west and south the watershed is bounded by the divide that separates the Salmon River drainage from the Trinity River drainage. This portion of the Salmon/Trinity divide, southeast of Salmon Mountain and within the Trinity Alps Wilderness, contains numerous peaks with several approaching 7,000' in elevation. The lowest point in the watershed is at Forks of Salmon which lies at approximately 1,200' elevation.

This watershed will be analyzed based on pertinent issues, current and historic conditions, and will determine possible management opportunities. A portion of the watershed (Negro, Indian, and Black Bear drainages) was analyzed in an earlier process, the Bear Country Landscape Analysis, completed in 1993. Two focused watershed analyses were completed for individual projects within the watershed; one for the Discovery Day Mine and one for the Eddy Blow-Down Timber Sale. The completion of this watershed analysis will finish the first round of analyses for the Salmon River drainage, excluding Wooley Creek.

The climate in the Lower South Fork watershed can be characterized as montane mediterranean, with cold wet winters and hot dry summers. Average annual precipitation totals range from about 40' in the lower and eastern portions of the watershed to 60+" in the western mountains. The extreme western edge of the watershed is also influenced by coastal marine air, and sometimes experiences fog and high humidities that are not found in other parts of the Salmon River drainage. Winter precipitation is mostly rain at elevations below 4,000' while snow and deep snowpacks are typical above that elevation. However, this is highly variable and dependent on the direction, strength, and warmth of Pacific storms. Rain-on-snow events are relatively common, and, if severe enough, can cause flooding. Notable rain-on-snow floods have occurred in 1955, 1964 (the largest recorded flood), 1974, and in early 1997. Spring streamflows are typically not as large as mid-winter floods but high flows are sustained over several weeks in those tributaries with headwaters within the snowpack zone. Many smaller streams are completely dry by late summer.

Three large drainages, Knownothing, Methodist, and Plummer, flow into the South Fork from the west and south. Black Bear Creek is the largest tributary to the South Fork entering from the north. Smaller tributaries include McNeal, Negro, Indian, and Matthews Creeks, and Henry Bell, O'Farrill, Hotelling, and Jennings Gulches.

The landscape has a diverse range of land-forms, geology, and soil types. Glaciated terrain is relatively rare in the Lower South Fork, when



compared to the Upper South Fork and North Fork watersheds. Only two glacial lakes are present, located in the headwaters of West Fork Knownothing Creek. There is also a relatively low percentage of highly erosive granitic soils compared to the other Salmon River watersheds. However there is a greater concentration of dormant landslide terrane in this watershed. The landscape contains widespread areas of gentle to moderately steep terrain (0-65% slope gradient) intermixed with steep mountain slopes and inner gorges (>65% slope). Much of the gentler terrain is dominated by dormant landslide deposits or slump-earthflow terrain typically displaying bench-slope and hummocky topography.

Vegetation in the watershed can be generalized as Douglas-fir/evergreen hardwood below about 4,000' and mixed conifer to true fir at higher elevations. Inclusions of other types (e.g., Brewer spruce, gray pine) are also present. About 30,000 acres (about 45% of the watershed) have been significantly disturbed within the last twenty years, resulting in a large proportion of the watershed dominated by low seral stages of grass/forb, shrubs, and conifer seedling/saplings. This is primarily the result of two large stand replacing wildfire events; one in 1977 and another in 1987. The 1977 Hog Fire burned portions of the watershed including all of Negro Creek, stopping short of entering the Indian Creek drainage. The fire also burned most of the Poverty Gulch drainage, a tributary to Knownothing Creek. The 1987 fires were even more severe. The Glasgow Fire, which started just a mile east of Forks, rapidly advanced eastward through the Negro Creek drainage, then burned through all of Indian Creek and a large portion the Black Bear Creek drainage. On the north side of the river, only the Matthews Creek area was not burned. South of the river, the Hotelling and St. Clair fires started simultaneously from the same lightning storm. The Hotelling Fire burned most of the south half of the watershed except for the wilderness and the lower elevations between Knownothing and McNeal Creeks. The St. Clair Fire burned a small portion of the wilderness east of Plummer Creek.

Because of fires there are few areas left with undisturbed late/mature or old-growth conifer stands. The largest amount exists in the lightly burned portion of Knownothing Creek. Patches are also present in parts of Methodist, Black Bear, Matthews, and Plummer Creeks. These stands are comprised of mixed species of conifers, primarily Douglas-fir but including ponderosa and sugar pine, incense-cedar, and white fir. Stand understories include several hardwood species, such as live oak, black oak, madrone, chinkapin, and tanoak. The westerly portions of the watershed tend towards more pure Douglas-fir and tanoak stands; the easternmost stands of tanoak on the Klamath National Forest. Gray pine is common along the river corridor, and the northernmost extent of its range occurs in the watershed, near O'Farrill Gulch. In the higher elevations (5,000'+) conifer stand composition tends more towards white and red fir, with several other, more uncommon, species present. Among these are mountain hemlock, western white pine, and Brewer spruce. The largest known Brewer spruce is found in the Granite Gulch area. Other sensitive plants found in the watershed are Siskiyou fireweed, Marble Mountain catchfly, and Salmon Mountains wakerobin.

Pure stands of naturally occurring oaks; black, white, and live, are present, primarily at lower elevations and on south slopes. Matthews Creek has large patches with others in Black Bear, Indian, O'Farrill, and along the South Fork on south facing slopes. These areas provide important wintering habitat for blacktail deer, and occasionally Roosevelt elk which were reintroduced into the upper South Fork. Oak woodlands are important to numerous wildlife for their yearly fall acorn crops.

After the fires, much of the lands with merchantable timber were salvage logged, received some kind of fuels treatment, and then were planted with conifer seedlings. Many areas have received repeated silvicultural treatments, either to reduce grass and brush competition, or to replant failed plantations. Currently, much of the watershed, about 20%, is at various stages of reforestation, with some plantations having trees ten feet tall or more. Some plantations have been burned twice, and/or have had repeated failures and treatments; a tremendous cost in funds and manpower were expended to bring these lands back into conifer vegetation.

Fuels exist in varying amounts over the landscape, partially resultant of past logging or wildfires. The natural buildup of fuels within green stands presents a hazard, although underburning through some stands during the 1977/87 fires reduced fuel loadings temporarily. The effect of this underburning in various areas was to kill some of the understory, particularly hardwoods. These stems are now falling and increasing fuel loadings significantly; especially evident in Smith, Cody, and the lower portions of Knownothing Creeks.

American Indians have lived in the landscape for several thousands of years. The Konomihu Tribe once inhabited the area; the Karuk and New River Shasta still utilize the landscape today. Villages were located near important food source areas by the river and were utilized mainly during winter. A seasonal migration of people occurred during spring to higher elevations for the gathering and hunting of food.

Ninety-nine percent of the watershed is administered by the Forest Service, only one percent is held as private lands; including the Black Bear, Blue Ridge,

and Godfrey Ranches. All having permanent residents, with some being long time residents to the river. These lands and other private parcels along the South Fork were originally developed during the mining heydays of the 1880s. Active gold mining still occurs within the landscape, mostly placer along the South Fork and Knownothing Creeks and lode mining at the Discovery Day Mine.

Gold mining activities in the late 1880s created the need for timber harvesting; during this era timber harvesting was confined to the immediate needs of the local population. As National demand for wood products increased in the 1950s and '60s, extensive harvesting began within this landscape. Harvest methods used included clearcutting, overstory removal, and partial cutting.

A few small communities exist within the watershed. Forks of Salmon, which lies just north of the analysis area, provides a post office, elementary school, community hall, small store, Forest Service station, and an improvised golf course. This historic town, once a hub of gold mining activity, is now much smaller. The historic Forks store recently burned down. McNeal Creek, in the northwest corner of the watershed, is the domestic water supply for the town. Outside the watershed to the east lies Cecilville, having a similar history and a current condition as that of the Forks.

The majority of the watershed is roaded, including the maintained County Road (1CO2, also referred to as the Cecilville Road or Forest Highway 93) paralleling the South Fork. Outside wilderness, every drainage has some roaded access. Only a few sections of land lack a road, with some sections having several miles of road contained within them. Picayune Ridge, Hotelling Gulch, and Horse Mountain areas are the more roaded areas of the watershed. Some roads and road extensions were built to facilitate salvage logging after fires.

The landscape offers few employment opportunities to either local residents or outside employers. Some mining continues, most notably at the Discovery Day Mine in Knownothing Creek. This mine is a key employer for the area, offering jobs for 15-20 people. There is little potential for timber harvest in the near future in the watershed, as much of the land base is within the burn, wilderness, or LSRs. Continuing silvicultural treatments offer employment as tree planting and various brush reduction techniques are applied. A small amount of road and watershed improvement work may also be present. Commercial use of the South Fork is also present through rafting and kayaking.

The *Klamath National Forest Land and Resource Management Plan* (*Forest Plan*) has allocated all of lands within the watershed with appropriate Management Area designations, including Wilderness, a Special Interest Area (SIA) within Wilderness, Special Habitat for Late-Successional Reserves, Bald Eagle and Peregrine Falcon, Riparian Reserves, Designated and Recommended Scenic Rivers, Designated and Recommended Recreational Rivers, Partial Retention Visual Quality Objectives, and General Forest. The following Table 1-1 Management Area Acreage, gives the acreage and percentage of the watershed for each Management Area, based on the most recent (6/97) approximation of boundaries. These are displayed in Figure 1-2 *Forest Plan* Management Areas, contained in the Map Packet located at the end of this document.

Table 1-1 Management Area Acreage

MANAGEMENT AREA	ACRES	PERCENT
Wilderness (Includes SIA)	14,100	21
Special Habitat --LSR	16,900	25
Special Habitat --Eagle/Falcon	500	1
Riparian Reserves	9,800	15
Scenic/Recreational Rivers	1,100	2
Partial Retention VQO	15,000	22
General Forest	8,500	13
Total National Forest	65,900	99
Private Lands	800	1
TOTAL	**66,700**	**100**

Trinity Alps Wilderness is the only designated wilderness, occurring along the southern edge of the watershed. Most of this Wilderness contains higher elevation subalpine vegetation, but a significant difference lies in Plummer Creek. Here the wilderness boundary extends down to low elevations and to the center of the South Fork; a variety of vegetation types are found here, including grey pine. The grey pine in this area has been designated as an SIA. This portion of the wilderness is lightly used by humans. The subalpine areas receive use from deer hunters in the fall. A ridgetop trail extends through the area, but is located on the Trinity watershed side. Lightly used trails traverse Plummer Creek and areas to the Rock Lake/Mullen Camp area.

Two Late-Successional Reserves (LSRs) are present in the watershed. The Bowerman LSR (RC-346) occupies the lightly burned portions of the Knownothing drainage and Hotelling Ridge, totaling near 6,300 acres. The western portion of the larger Eddy LSR (RC-345) lies on the eastern edge of the watershed, about 52,000+ acres.

A Special Habitat area is designated around a falcon eyrie, and Riparian Reserves are designated around streams, wetlands, and unstable areas. Riparian Reserve boundaries are approximate based upon available stream and unstable land mapping. Actual Riparian Reserve boundaries will not be designated until project activities have gone through the NEPA process.

Portions of the South Fork Salmon River are designated as recreational or scenic segments of the National Wild and Scenic River system. The entire stretch is utilized by expert kayakers. The lower portion, from the confluence with Methodist Creek, is used by commercial and private use rafters. Swimming and tubing are also popular in the summer, especially at the more accessible holes; Matthews Creek Campground is a particularly popular spot. The remainder of the watershed is available for scheduled timber harvest with differing visual quality objectives.

The Bowerman LSR contains four active spotted owl territories and an additional territory just west of the LSR boundary. Seven spotted owl territories are in the Eddy LSR, either totally or partially within this watershed. Two additional owl territories are present in the watershed, both within the wilderness in Plummer Creek.

A Special Habitat area is designated around a peregrine falcon eyrie within Knownothing Creek drainage. It has been actively monitored for a number of years and has a history of reproductive success. Other wildlife species of note include at least six known goshawk territories within the landscape; two found in the last couple years. The Del Norte salamander has been found in the Methodist Creek drainage. There may be habitat for the Shasta salamander in the adjacent Upper South Fork watershed in the French Creek drainage, but no habitat exists in the Lower South Fork. Fisher are the most commonly seen large furbearer within the landscape, seen in different vegetative types, including portions of the burn. Marten have seldom been seen; high quality habitat is limited to the higher elevation true fir along the Salmon/Trinity divide.

The analysis area provides important habitat for indigenous and introduced fish species. Indigenous fish stocks include fall, winter, and summer-run steelhead, spring and fall-run chinook salmon, coho salmon, rainbow trout, Pacific lamprey, sturgeon, dace, Klamath small scale sucker, and sculpin. Introduced fish stocks include American shad, brown trout, and eastern brook trout. Freshwater mussels have been observed, however, no species information is available.

Four stocks of anadromous fish within the Lower South Fork are semelparous (i.e., die after spawning once). These include the spring chinook salmon, fall chinook salmon, coho salmon, and Pacific lamprey. After spawning, nutrients from decomposing bodies are released back into the system.

The South Fork of the Salmon River is an extremely important refugia for the last remaining wild-run spring chinook salmon in the Klamath River Basin. It is also an important holding and spawning area for summer steelhead.

Little is known about the distribution and abundance of coho salmon in the Salmon River and its tributaries. Evidence from direct observation surveys conducted in the summers of 1988-92 indicate coho may be utilizing Knownothing and Methodist Creeks. Due to safety, weather, and observation conditions, Forest Service biologists have not observed adult coho spawning in the analysis area.

Indian, Black Bear, and Negro Creeks have small steelhead runs of less than thirty pairs. Access to Black Bear Creek for steelhead is provided by a step pool ladder constructed in 1984. Knownothing and Methodist Creeks provide habitat for steelhead trout and chinook and coho salmon. Knownothing Creek also provides habitat for Pacific lamprey. Plummer Creek is also available to steelhead, but extensive anadromous spawning ground surveys have not been performed in this system. Anadromous fish access to Matthews Creek is most likely blocked by a bedrock falls near the main County Road FH-93. No extensive anadromous surveys have been conducted in this system.

Step 2 - Issues and Key Questions

The following nine issues have been identified by the Analysis Team and District Ranger: **Watershed Processes, Riparian Areas, Aquatic Dependent Species, Vegetative Biodiversity, Fire and Fuels Organization, Terrestrial Wildlife, Roads, Commercial Timber Outputs on Public Lands,** and **Human Uses**. A background statement for each issue was developed to provide the context of the issue and focus for the analysis. Key Questions follow and are presented for Steps 3, 4, and 5.

Other possible key questions concerning desired conditions and recommendations are implied rather than stated directly. The desired conditions will be discussed under each issue in Step 5 and recommendations are presented in Step 6.

ISSUES AND KEY QUESTIONS

WATERSHED PROCESSES- Watershed conditions in the Lower South Fork were highly impacted by fires in 1977 and '87 that burned a majority of the analysis area. Effects were variable depending on subwatershed, though were generally less than in adjacent watersheds burned by the same fires. These fire effects, combined with impacts from roading and timber harvesting, led to an Areas with Watershed Concerns (AWWCs) designation for much of the watershed, as specified in the *Forest Plan*. This analysis will discuss hydrologic and erosion processes, reevaluate cumulative watershed effects, and make future management recommendations for the watershed.

STEP 3 - CURRENT CONDITIONS

1-What are the dominant hydrologic and erosional characteristics and processes in the watershed?

2- What parts of the watershed are considered Areas with Watershed Concerns (AWWCs) in the *Forest Plan* and what additional areas will be evaluated in this process? What parameters are used to make this determination?

STEP 4 - REFERENCE CONDITIONS

1- What were historical (pre-Euro-American settlement) and reference erosion rates, and what disturbances affected them?

STEP 5 - INTERPRETATION

1- Are there changes between current and reference/historical erosion rates and what are their causes?

2- What are the hydrologic/erosional concerns in the watershed and what management strategies should be used for each subwatershed to minimize impacts from watershed processes?

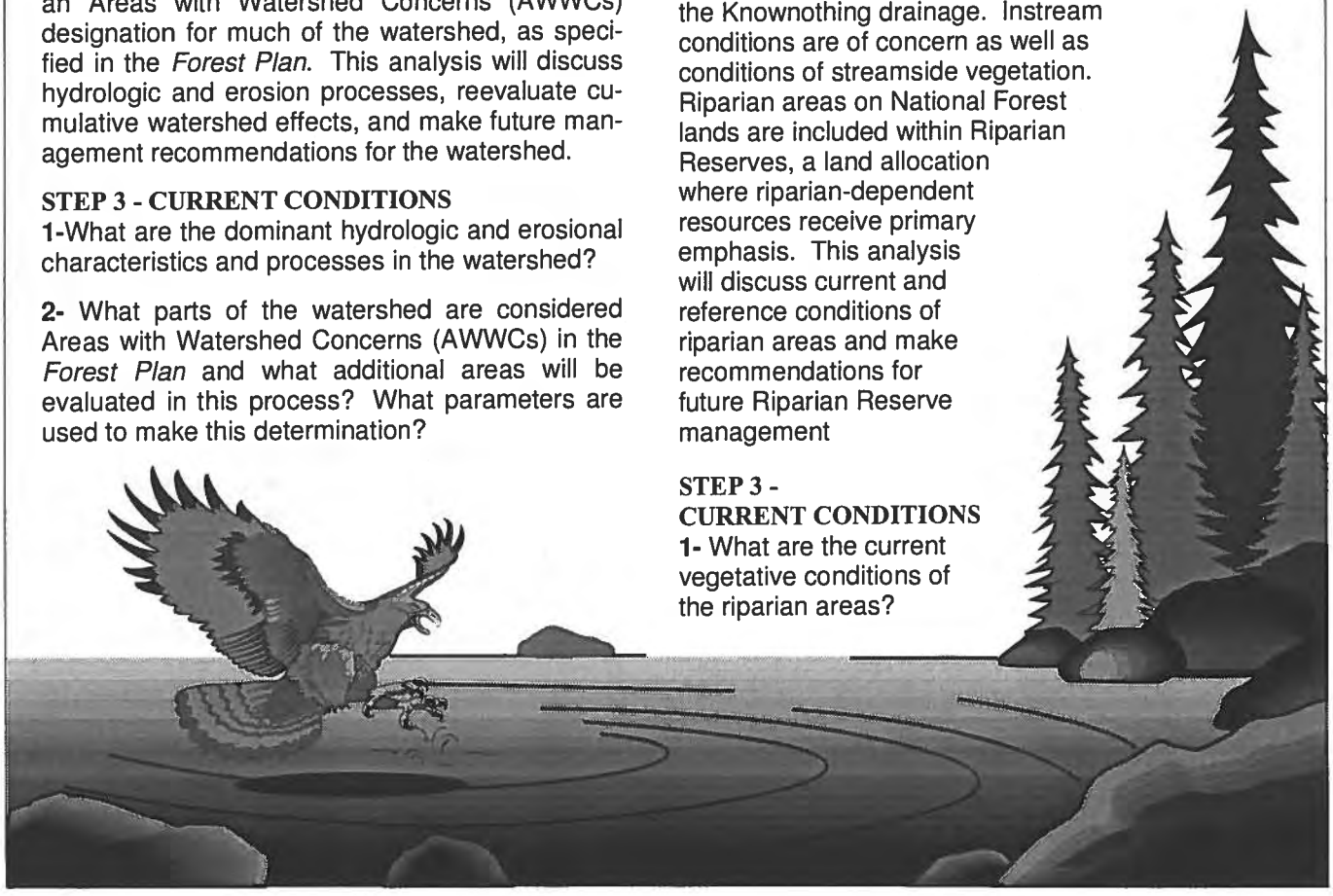
3- Which subwatersheds should be considered Areas with Watershed Concerns, when will they be considered recovered, and how can recovery be promoted?

4- What are the trends for watershed processes in this watershed?

RIPARIAN AREAS - The 1977 and '87 fires adversely impacted riparian areas in the watershed, particularly along streams north of the South Fork Salmon between Forks and Black Bear Creek. Additional riparian area damage from future fires is a concern, especially in the Knownothing drainage. Instream conditions are of concern as well as conditions of streamside vegetation. Riparian areas on National Forest lands are included within Riparian Reserves, a land allocation where riparian-dependent resources receive primary emphasis. This analysis will discuss current and reference conditions of riparian areas and make recommendations for future Riparian Reserve management

STEP 3 - CURRENT CONDITIONS

1- What are the current vegetative conditions of the riparian areas?



2- What are the current stream channel characteristics and aquatic species habitat conditions?

3- What are the water quality, quantity, and beneficial-use conditions of streams within the analysis area?

4- What is the extent of interim Riparian Reserves, how are they defined, and what is the vegetative condition within the Riparian Reserves?

STEP 4 - REFERENCE CONDITIONS
1- What are the historic and reference riparian conditions in the watershed?

STEP 5 - INTERPRETATION
1- What are the natural and human causes of change between historical/reference and current riparian area conditions?

2- How do the current riparian habitats compare to optimum habitats?

3- How should Riparian Reserves be delineated on-the-ground and how will final Riparian Reserves compare to the estimates used for this analysis?

4- What is the role of Riparian Reserves for terrestrial wildlife habitat and connectivity?

5- What activities are appropriate in the different types of Riparian Reserves?

6- What are the trends for riparian areas in the watershed?

AQUATIC DEPENDENT SPECIES - The South Fork Salmon River and its' tributaries are very important anadromous salmonid (salmon and steelhead) spawning and rearing areas. Several of these fish species are considered at-risk and may be placed on the Federal Endangered Species list. Also residing in the waters of the Lower South Fork are other, less studied fish species and some aquatic dependent amphibians and reptiles. This analysis will describe the current status of aquatic dependent species, as compared to historic populations, describe their trends, and describe maintenance, protection, and recovery needs of species at-risk.

STEP 3 - CURRENT CONDITIONS
1- What is the distribution and population size of anadromous and resident salmonids?

2- What aquatic/riparian dependent species are identified as at-risk?

STEP 4 - REFERENCE CONDITIONS
1- What were the population distributions and sizes of aquatic dependent species?

STEP 5 - INTERPRETATION
1- What are the natural and human causes of change between historical/reference and current species distribution and population sizes?

2- What areas are critical for maintenance, protection, and recovery for at-risk species?

3- What are the population trends for aquatic dependent species in the watershed?

VEGETATIVE BIODIVERSITY - Due to the occurrence of large fires in 1977 and 1987, a large proportion of the watershed is in early-seral vegetation. Both natural stands and plantations include large amounts of grass and brush. The hot dry summers, multiple fire starts during thunder storms, and steep topography put these large blocks of early-seral vegetation at risk to intense wildfire. A strategy needs to be developed to identify which areas can affordably and effectively be treated, which areas can be protected, and which areas would be best left alone. Without implementing such a strategy, fire disturbances are expected to increase early-seral patch sizes in the watershed.

Areas of this watershed have been allocated as Late-Successional Reserves (LSRs) to provide habitat for late-successional wildlife species, specifically the northern spotted owl. Currently the late-successional habitat is highly fragmented, leaving the Bowerman LSR isolated from the rest of late-successional habitat in the watershed. Existing pockets of late-successional habitat may be at risk of being lost to wildfire due to increased tree mortality and adjacency to volatile vegetation communities. These older stands are important in providing structural diversity in the watershed. This analysis will evaluate the current condition of late-successional habitat in the LSRs and across the watershed and make recommendations for providing and sustaining late-successional habitat. The analysis will also assess the existing condition of late-successional connectivity and recommend ways to provide connectivity of late-successional habitat across the watershed and to adjacent watersheds.

STEP 3 - CURRENT CONDITIONS
1- What are the current vegetation communities found in the watershed, what is their distribution, and what vegetation communities are capable of providing late-successional habitat?

2- What are the current seral stage distributions and stand densities found in the watershed?

3- How much of the watershed is currently late-successional habitat and how much is dispersal habitat for late-successional species?

4- What disturbance regimes are impacting the vegetation in the watershed?

5- What are the current wildfire risks (potential ignition sources) and fire behavior potentials found in the watershed?

STEP 4 - REFERENCE CONDITIONS
1- What was the historic distribution and pattern of vegetation in the watershed; including late-successional and dispersal habitats?

2- What were the historic disturbance regimes?

STEP 5 - INTERPRETATION
1- How have the vegetation communities changed over time and what have been the agents of change; including amounts and distribution of late-successional habitats?

2- Where are large areas at risk from catastrophic disturbance and what areas should provide the focus for treatment or protection?

3- What are the trends based on vegetation communities, site classes, and land allocations; including late-successional habitats and connectivity?

FIRE & FUELS ORGANIZATION - The Lower South Fork watershed has been highly impacted by fire. Developing vegetative conditions that are resilient to wildfire has been identified as being important for this watershed. Developing these conditions is labor intensive and will require a large and highly skilled organization. This analysis will compare current and past fire and fuels organizations with the fuels treatment and fire suppression needs of the watershed. The analysis will attempt to identify an organization capable of meeting both the demands for increased fuels treatment and for effective fire suppression and prevention. Some added considerations include areas with high concentrations of fuels need to be inventoried and evaluated for viability of treatment. Isolated residences and micro-communities are found in the watershed that are difficult to protect from fire and add a risk of human ignited fires. Recreational uses within the watershed are on the increase also adding more risk of human ignited fires.

STEP 3 - CURRENT CONDITIONS
1- What is the current organization for fire suppression and fuels treatment and their abilities?

2- What are the differences between fire suppression forces used in the LMP and the forces currently available?

3- What are current costs for fuels treatment (underburning) and for fire suppression in the watershed?

STEP 4 - REFERENCE CONDITIONS
1- What has been the history of fire suppression and fuels treatment in the watershed?

STEP 5 - INTERPRETATION
1- Can the current organization feasibly treat and/or protect all the areas within the watershed needing treatment and/or protection; if not, what would be the organizational needs?

TERRESTRIAL WILDLIFE - The Lower South Fork watershed is home to many wildlife species. These include Threatened and Endangered species; bald eagle, spotted owl, and peregrine falcon, Forest Service sensitive; goshawk, marten and fisher, species of special interest; deer and elk, and survey and manage species from the *Forest Plan*. The distribution and condition of the habitat for these species can have implications for management activities in the watershed. This analysis will evaluate the habitats for these species and recommend strategies to provide and maintain these habitats over time.

STEP 3 - CURRENT CONDITIONS
1- What wildlife species will be discussed in detail in this analysis?

2- For each of the Management Indicator Species, what are the habitat needs, and where and how much of this habitat is in the watershed?

STEP 4 - REFERENCE CONDITIONS
1- What was the historic distribution of habitats for the identified species?

STEP 5 - INTERPRETATION
1- For these habitats, what has changed from historic to present and what have been the agents of change?

2- What are the future trends for these habitats?

3- What are the desired conditions for these habitats?

ROADS - The original road system was developed to provide access to area gold mines, and later extended for timber sales. An extensive road system now provides access to many parts of the watershed. The road system is used for a variety of human uses such as timber and fire management, recreation, access to wilderness trailheads, hunting, woodcutting, sightseeing, etc., while causing some resource impacts to streams, riparian areas, and wildlife. A declining road management budget has decreased road maintenance. This analysis will identify current road system uses, impacts, and resource concerns, and provide the basis for a travel and access management plan.

STEP 3 - CURRENT CONDITIONS
1- What are the current conditions and uses of roads within the watershed?

STEP 4 - REFERENCE CONDITIONS
1- Why and how was the road system developed?

STEP 5 - INTERPRETATION
1- How have road uses changed from the past and why?

2- What resource and social concerns exist with the current road system?

3- What are future trends in road uses, needs, and management?

COMMERCIAL TIMBER OUTPUTS ON PUBLIC LANDS - Timber harvest has been an important practice on the public lands in the watershed. Significant logging began in this area during the early 1960s. Peaks of salvage logging occurred in the late '70s following the Hog Fire and in the late '80s following the Glasgow and Hotelling Fires. The *Forest Plan* prescribes sustainable timber harvest on available lands using an ecosystem management approach. This analysis will take into account our current understanding of ecosystem needs to predict future timber yields in this watershed. It will refine *Forest Plan* estimates of available lands, and make recommendations for timber outputs.

STEP 3 - CURRENT CONDITIONS
1- What are the capable, available, and suitable lands, potential timber harvest volumes, and growth rates?

STEP 4 - REFERENCE CONDITIONS
1- What, where, and how was timber historically harvested in the watershed?

STEP 5 - INTERPRETATION
1- How do *Forest Plan* estimates for capable, available, and suitable lands compare to those recommended in this analysis?

2- What future trends affect timber management in the watershed?

HUMAN USES - The watershed has a rich cultural heritage, both from American Indians and pioneering Euro-Americans. Currently the watershed has a diversity of land uses including residential, mining, firewood and mushroom collection, and recreational. Local residents have taken an interest in public land management activities. This analysis will discuss important heritage resources, other commodities, recreational activities, and community interest/involvement, and will recommend ways to enhance or protect these uses.

STEP 3 - CURRENT CONDITIONS
1- What heritage resources exist within the watershed?

2- What other commodities are utilized in the watershed?

3- What are the primary recreational uses in the watershed?

4- What is the community's interest/involvement in public lands management?

STEP 4 - REFERENCE CONDITIONS
1- What were prehistoric and historic land uses within the watershed?

STEP 5 - INTERPRETATION
1- What types of heritage resources and/or uses influence current forest management?

2- How have other commodity uses changed from the past and what are their trends?

3- How have recreation uses changed from the past and what are their trends?

4- How has community interest/involvement changed from the past and what is likely to change in the future?

Step 3 - Current Conditions

INTRODUCTION - This step describes the current range, distribution, and condition of ecosystem elements. It is organized by Issue as presented in Step 2 and answers Key Questions identified for each issue of this step.

WATERSHED PROCESSES

Key Question 1- What are the dominant hydrologic and erosional characteristics and processes in the watershed?

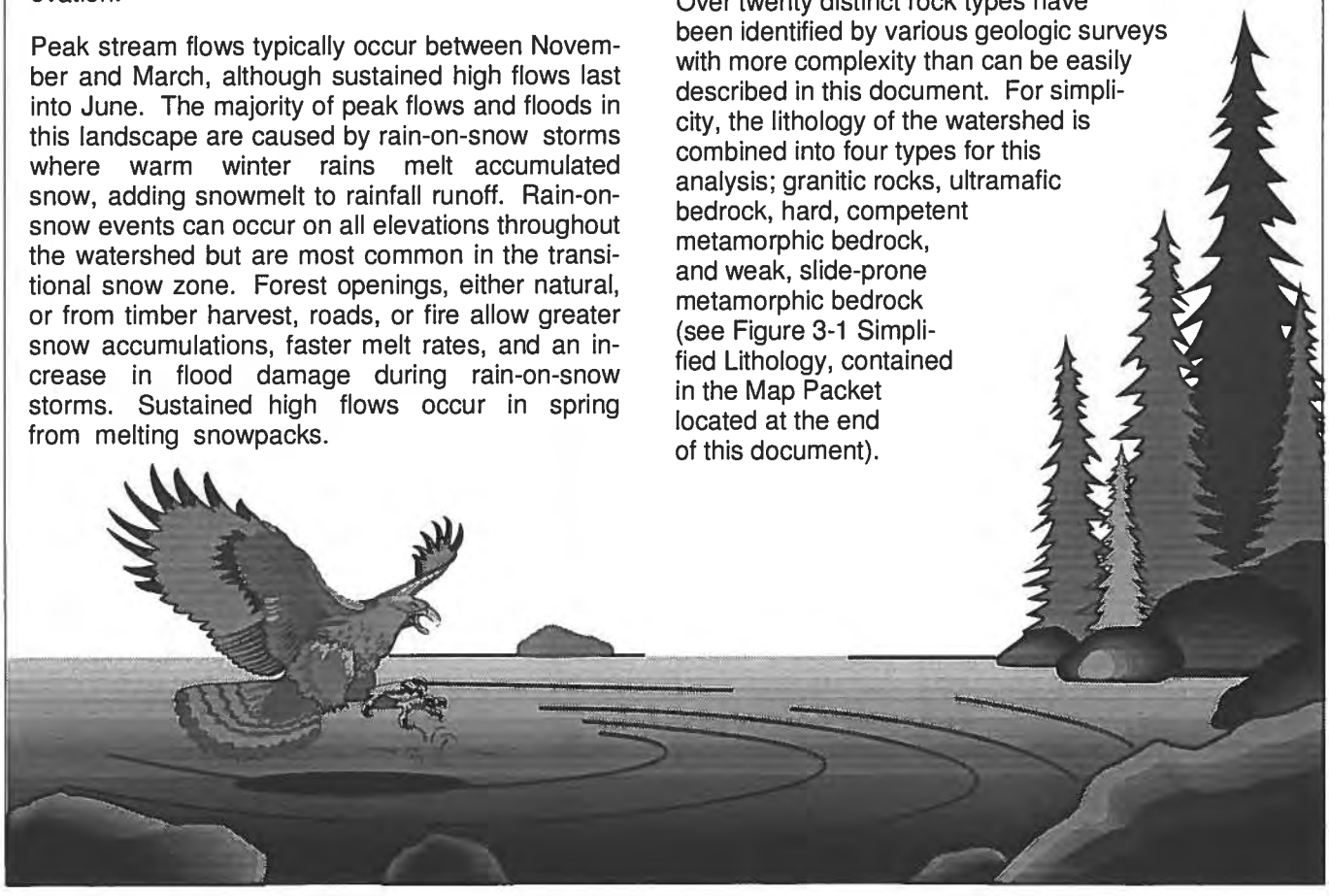
The hydrologic characteristics of the watershed are defined by climate and topography. Most precipitation falls between October and March; mostly as snow above about 5,500' elevation and as rain below 3,500'. Deep snowpacks accumulate in the high mountains of the southern and northeastern parts of the watershed, generally above 5,500'. Between 3,500' and 5,500' is a transitional snow zone where snow typically accumulates to some depth but can be partially or completely melted by mid-winter rains. The lower elevations along the South Fork Salmon River have less total precipitation than the high country, although precipitation is higher in the western low elevation areas than the eastern low elevations. Some snow accumulation may occur in winter as low as the Forks of Salmon but it generally melts within a few days at this elevation.

Peak stream flows typically occur between November and March, although sustained high flows last into June. The majority of peak flows and floods in this landscape are caused by rain-on-snow storms where warm winter rains melt accumulated snow, adding snowmelt to rainfall runoff. Rain-on-snow events can occur on all elevations throughout the watershed but are most common in the transitional snow zone. Forest openings, either natural, or from timber harvest, roads, or fire allow greater snow accumulations, faster melt rates, and an increase in flood damage during rain-on-snow storms. Sustained high flows occur in spring from melting snowpacks.

Because of the higher elevations in the Upper South Fork watershed, snowmelt stream flows remain high in the South Fork Salmon after the Lower South Fork tributaries have dropped to summertime flows. The South Fork Salmon and large tributaries have low flows by late summer, compared to winter and spring stream flow, but remain perennial and provide connected habitat for fish. Many headwater streams become intermittent or completely dry by late summer.

Summer thunderstorms are occasionally heavy enough to cause localized flooding. Thunderstorm induced flows are typically flashy, lasting from a few hours to a few days, and are often quite muddy. Summer showers contribute a very small proportion of annual stream flow but, due to heavy runoff induced erosion and channel scour, can contribute a significant amount of sediment to the stream system.

The erosional characteristics of the watershed are influenced by rock types and landforms. The geology and geomorphology of the watershed, like the rest of the Klamath Mountains, is a complex of intrusions, contact and shear zones, large dormant slides, moderate to steep mountain slopes, inner gorges, glacial deposits, and stream terraces. Over twenty distinct rock types have been identified by various geologic surveys with more complexity than can be easily described in this document. For simplicity, the lithology of the watershed is combined into four types for this analysis; granitic rocks, ultramafic bedrock, hard, competent metamorphic bedrock, and weak, slide-prone metamorphic bedrock (see Figure 3-1 Simplified Lithology, contained in the Map Packet located at the end of this document).



The following Table 3-1 Subwatershed Acreage and Percentage of Bedrock Types, displays acreage and percentage of bedrock type by subwatershed. Figure 3-2 Subwatersheds and *Forest Plan* Areas with Watershed Concerns, contained in the Map Packet located at the end of this document, shows the subwatersheds in the analysis area.

Table 3-1 Subwatershed Acreage and Percentage of Bedrock Types

Subwatershed	Total Ac	Percent Granitic Bedrock	Percent Ultramafic Bedrock	Percent Competent Metamorphic Bedrock	Percent Slide-prone Metamorphic Bedrock
Plummer	9,140	7	23	68	2
Jennings	7,710	1	16	79	4
Matthews	4,610	3	2	95	0
Black Bear	9,250	5	1	69	25
Indian	3,290	0	11	20	69
Methodist	8,070	3	16	50	31
Negro	6,550	1	31	1	67
Knownothing	14,540	21	0	1	78
McNeal	3,460	11	0	33	56
Total/Average	**66,620**	**7**	**11**	**44**	**38**

The granitic rock types in this watershed are composed of granodiorite and diorite. They comprise about 5,000 acres (seven percent of the watershed) in small bodies across the watershed. Diorite and granodiorite form sandy, easily eroded soil when deeply weathered, typically referred to as granitic soil. Deeply weathered granitic soil is susceptible to greatly accelerated surface erosion, channel erosion, and shallow debris sliding when vegetative and surface cover is disturbed or removed. Granitic bedrock also forms a few isolated hard rock outcrops in the Lower South Fork watershed in locations exposed by glacial scour.

The ultramafic rock types include serpentine and peridotite. In general, the ultramafic sites are poorly vegetated due to nutrient deficiencies inherent in the rock. The ultramafic type varies from exposed, soft serpentine bedrock with very little vegetation to rocky peridotite that supports open stands of Jeffery pine or mixed conifer. Ultramafic soils are often prone to deep-seated landsliding although landslides seem to be most common along contact zones between ultramafic and metamorphic rock types in the Lower South Fork watershed. In total, the ultramafic type comprises about 7,200 acres, 11% of the watershed, occurring in bands or as isolated blocks within predominately metamorphic terranes.

The competent metamorphic bedrock comprises about 29,100 acres, 44% of the watershed. These rock types can form deep soils, but shallow, rocky soils are most common. Deep-seated or shallow landslides can occur in this type but in general, all types of erosion are of less concern in this type than in the other bedrock types.

Slide-prone metamorphic rock types occupy about 25,400 acres, 38% of the landscape. These rock types often form deep soils subject to deep-seated landslides, debris slides, and channel erosion. The landforms in this type are dominated by large, deep-seated, dormant landslides on gentle but irregular slopes. Steep slopes and rock outcrops are also found but are not as common as in the competent metamorphic bedrock type.

The landforms across the watershed consist of shallow to deeply weathered soils on steep to gentle mountain sideslopes or dormant landslide terrane. Inner gorges dissect the slopes along nearly all the streams. Near the river, the terrain is mostly steep, rocky gorges carved by the South Fork Salmon River and its tributaries but there are some stream terrace and flood plain deposits. The high elevations in the watershed have undergone glacial scour and deposition during the last ice age although not nearly as extensive as in adjacent watersheds. There are some steep, rocky, glacier carved mountain slopes, two glacial lakes, and sloped valleys of glacial deposits.

The geology and geomorphology are combined into several distinct geomorphic terranes having similar characteristics. These are active slides, dormant, deep-seated landslides, granitic mountain slopes, non-granitic mountain slopes, inner gorges, debris basins, and glacial till, moraines, and alluvial terraces. Table 3-2 Percentage of Geomorphic Terranes by Subwatershed, displays the percentage of each geomorphic terrane that comprise the nine subwatersheds in the Lower South Fork watershed, except for active landslides which comprises one percent or less of each subwatershed. Figure 3-3 Geomorphic Terranes, contained in the Map Packet located at the end of this document, shows the locations of the geomorphic terranes.

Table 3-2 Percentage of Geomorphic Terranes by Subwatershed

Subwatershed	% Dormant Deep-Seated Landslides	% Granitic Mtn. Slopes	% Non-Granitic Mtn. Slopes	% Inner Gorge	% Debris Basin	% Glacial/ Terrace
Plummer	12	5	63	13	<1	6
Jennings	30	<1	50	18	0	1
Matthews	15	1	68	15	0	<1
Black Bear	16	4	65	14	<1	0
Indian	49	0	37	14	0	0
Methodist	20	2	57	17	2	2
Negro	36	1	46	17	0	0
Knownothing	20	14	45	18	<1	2
McNeal	40	7	34	18	0	0
Average	**23**	**5**	**53**	**16**	**<1**	**2**

Active landslides occur as small, scattered patches on slopes throughout the watershed. Active landslides can be one of two basic forms; shallow debris slides or deep-seated flows. Shallow landslides are characterized by bare ground on steep slopes resulting from recent slide activity. These are usually small in area

(less than a couple acres) but have usually had major downstream effects when they were activated. Deep-seated flows are more difficult to recognize, characterized by cracks in the ground and leaning trees rather than large areas of exposed soil. The deep-seated flows are often larger in area than shallow debris slides (up to several tens of acres) but the landslide material is not all contributed to streams at one time. Deep-seated flows are often combined with debris slides in complex masses. Active landslides are very prone to additional landsliding given some future rainstorm and several active slides were reactivated during the winter, 1997 flood.

The dormant, deep-seated landslide terrane comprises a large proportion of the Lower South Fork watershed. This terrane type is composed of large and small masses throughout the watershed although the Indian, McNeal, Negro, and Jennings subwatersheds contain the highest percentages of this type. Dormant landslide terrane is a complex of deep-seated slump and earthflow-type landslides that have been active over the last few thousand years. The landform is characterized by irregular but generally gentle slopes with indistinct small streamcourses. Large scale, deep-seated landslides can be activated during heavy rainfall years or a wet period of years. Toe zone areas often contain shallow debris slides and flows that deliver large quantities of sediment into adjacent streams. Sediment delivery to streams from dormant landslides can be high, even if fully vegetated and can be increased following wildfire, timber harvest, or road construction.

Granitic mountain slopes occur in small, localized areas throughout the watershed. The largest area of granitic slopes in this landscape occurs in the Bowerman Peak area between the East and West Fork of Knownothing Creek. Debris sliding and debris scour occur under pristine conditions but at a lower rate than in dormant landslide terrane. However, granitic mountain slopes are very sensitive to disturbances that remove soil cover, decrease rooting strength, and increase runoff. Debris sliding and erosion are greatly increased following disturbance such as fire, timber harvest, or road construction, especially on steep slopes.

Non-granitic mountain slopes are the most common geomorphic type in the watershed. They are much less sensitive to disturbance than granitic mountain slopes and less susceptible to landsliding than dormant landslide terrane.

Inner gorges are found along streams in all parts of the watershed. They have naturally high debris sliding rates, especially in unconsolidated soils within dormant landslides and glacial/terrace deposits. Inner gorges in granitic soils are sensitive to disturbance and have very high disturbance associated debris slide rates.

Debris basins occur in the steep mountain slopes near Youngs Peak and Horse Mountain. They occupy only a small percentage of the Lower South Fork watershed with the greatest concentration in the Methodist Creek drainage. Debris basins are more susceptible to landsliding than adjacent mountain slopes.

Glacial and terrace deposits are uncommon in this watershed although some glacial deposits occur in the Trinity Alps Wilderness and small terraces occur along the South Fork Salmon River. This terrane type is not particularly susceptible to landsliding and erosion with some exceptions. Inner gorges that cut through these deposits are very unstable with narrow, deep gorges and raw banks. Glacial deposits formed mostly from granitic parent material are susceptible to disturbance related erosion similar to granitic mountain slopes.

Debris sliding, surface erosion, and channel erosion all contribute sediment to streams and impact downstream beneficial uses. Debris slides and flows typically occur with exceptionally heavy, warm winter rains and rain-on-snow events. Storm flows with a recurrence interval of ten years or greater (storms not likely to occur but once every ten or more years) are generally needed to trigger debris slides. Summer thunderstorms are sometimes capable of causing floods in small streams, triggering debris slides and torrents. Flooding with debris torrents can have major impacts on channel morphology and riparian vegetation.

Surface erosion occurs much more frequently than landsliding, typically several times each year during storms not necessarily intense enough to trigger debris slides. Surface erosion rates are low when soils are covered by duff, litter, and vegetation but increases when the soil cover is removed by disturbances such as wildfire, road construction, logging, and fuel treatment. Granitic soils have the greatest increases in erosion following disturbance.

Channel erosion is mostly associated with high flows, especially winter floods. Channel downcutting and bank sloughing occur particularly in the steep gradient streams lacking bedrock banks and streambeds. The lower gradient streams can have downcutting, deposition, or lateral movement. Stream erosion often consists of redistributing alluvial bank material. Channel erosion is accelerated by peak flow increases and removal of protective riparian vegetation.

Wildfire is probably the largest single disturbance affecting watershed conditions in the Lower South Fork. The wildfires in 1987 burned over half of the watershed, in some locations with high intensity. Although surface erosion has probably returned to pre-1987

rates in burned areas, impacts on landsliding and channel erosion are still present.

Roads and timber harvest also contribute to accelerated erosion in the Lower South Fork. Roads contribute to increased debris sliding, especially in granitic soils. According to data collected over the entire Salmon River subbasin, road related landslide rates range from 60 to 800 times greater than undisturbed rates in granitic soils (de la Fuente and Haessig 1991). In other geomorphic terranes, increases in landslide rates range from 2.3 to 80 times greater with roads than in undisturbed areas. Refer to Appendix B-Cumulative Watershed Effects, located at the end of this document, for specific values by terrane type. The Salmon River study landslide rates are based on landsliding during the 1965-1975 time period and includes the effects of several large (greater than ten years) floods but excludes the very large 1964 flood.

Roads increase surface erosion by exposing soil on the road surface, cut and fill slopes, and by channeling water down road ditches or down the road surface. Road erosion is highly variable depending on road template, surfacing, wet weather use, the condition of the cut and fill slope, and the inherent erodibility of the soil. Some of these complex conditions are not well known in the Lower South Fork watershed. Appendix C-Road Issues and Concerns, and Resource Concerns, gives a summary of known concerns for each road.

Roads increase channel erosion by increasing stream flows during rainfall or snowmelt. Roads channel water in roadside ditches or down the road surface, increasing the amount of water and sediment reaching a channel. But the greatest channel erosion caused by roads can occur when a road-caused debris torrent scours a channel below the debris source, often when a culvert plugs and high water washes out the road fill over the culvert.

Timber harvest can also increase landsliding, surface erosion, and channel erosion. Landslide rates can increase with timber harvest, as much as nine to twenty times in harvest units over undisturbed areas in granitic soils according the *Salmon Sub-Basin Sediment Analysis*. Other geomorphic terranes range from 1.2 to seven times greater for harvest related rates compared to undisturbed (de la Fuente and Haessig 1991). The Salmon River study evaluated those areas of intensive timber harvest (clearcuts or other significant reduction of overstory) combined with areas impacted by stand replacing fire. Partial cuts or low intensity wildfire were assumed to have a small impact on landslide rates.

Timber harvest and associated fuel treatment increase surface erosion at a highly variable rates depending on residual soil cover, time since treatment, and soil type. Timber harvest that leaves soil cover mostly intact will have little increased soil erosion compared to highly ground disturbing harvest and fuel treatment. Since soil erosion increases resulting from timber harvest usually return to background levels within a few years after final site-prep treatment, the amount of increased erosion is very time-dependent. Granitic soils are the most sensitive to surface erosion increases.

Timber harvest can also increase channel erosion due to increased peak flows following canopy removal. Harvested areas allow greater snow accumulation snowmelt rates and than fully forested areas, causing increased runoff during rain-on-snow storms. Also, skid trails and fuel treatments can create conditions of decreased infiltration and increased runoff.

Key Question 2- What parts of the watershed are considered Areas with Watershed Concerns (AWWCs) in the *Forest Plan* and what additional areas will be evaluated in the process? What parameters are used to make this determination?

The Record of Decision for the Klamath Forest Plan identifies Areas with Watershed Concerns (AWWCs) across the Klamath National Forest. For this watershed, the AWWCs include all of the Indian Creek and McNeal Reach subwatersheds, and parts of the Knownothing Creek, Methodist Creek, Black Bear Creek, Negro Reach, and Jennings Reach subwatersheds (see Figure 3-2). Plummer Creek and Matthews Creek are the only subwatersheds that do not contain parts of the *Forest Plan* AWWCs. For this analysis, all subwatersheds in the Lower South Fork will be evaluated as potential AWWCs.

Forest Plan AWWCs boundaries do not correspond well with the subwatersheds used for this analysis. This is due to data limitations in the *Forest Plan* for analyzing areas; the *Forest Plan* analysis was limited to compartment boundaries. In addition, a higher resolution of data for analysis is currently available along with about ten years of updates. While some of the same techniques used in the *Forest Plan* are used for this analysis, results may be different.

The *Forest Plan* AWWCs determinations are based on cumulative watershed effects modeling results and the condition of stream system and fish habitat in areas all across the Forest. An AWWCs determination put restrictions on additional land disturbing activities, specifically timber harvest, on the National Forest lands until an analysis of the watershed had been completed.

The strategy for a watershed scale review of Areas with Watershed Concerns is to reevaluate the subwatersheds overlapping the Forest Plan AWWCs along with other subwatersheds needing evaluation. Each watershed analysis examines the watershed conditions, processes, and functions for all subwatersheds

that are possible AWWCs. The analysis determines which subwatersheds should presently be considered AWWCs and discusses recovery criteria. Determination through watershed analysis that an area has watershed concerns is not a planning decision. The determination advises managers that a subwatershed may not meet Aquatic Conservation Strategy objectives if additional land disturbance occurs. Future analyses will determine if an AWWCs has recovered.

Factors used to determine AWWCs are the magnitude of watershed disturbances (roading, timber harvest, and wildfire), watershed sensitivities (includes soil and geomorphic types), riparian conditions, and quality of aquatic habitat. Riparian conditions and aquatic habitat are discussed under the Riparian issue but the other factors are discussed in this section.

The road density and acres of timber harvest and wildfire for the analysis subwatersheds are displayed in Table 3-3 CWE Analysis Subwatershed Road Density and Timber Harvest Acreage. Watershed disturbances are also displayed in Figure 3-4 Watershed Disturbances, contained in the Map Packet located at the end of this document. All roads over all ownerships are included in road density calculations, excepting those not identified on air photos. The timber harvest acreage reported includes the intensive harvest (clearcuts or other significant reduction in overstory) in the Klamath NF timber database. Wildfire acreage is from the burn intensity mapping of the Hog Fire and 1987 fires. Moderate and high intensity acreage is reported for the 1987 fires but, because of a different style of burn intensity mapping, only high intensity is reported for the Hog fire. Younger disturbances mask older disturbances over the same area to avoid double counting acreage. Harvest is lumped into two categories, 0-20 year old and 20-40 year old activities. For this analysis, timber harvest (and wildfire) that has happened more than 40 years ago is considered recovered.

Table 3-3 CWE Analysis Subwatershed Road Density and Timber Harvest Acreage

Subwatershed	Road Density mi./sq.mi.	Intensive Harvest 1978-'97 Acres	1987 Wildfire Mod. or High Intensity Acres	Hog Fire High Intensity Acres	Intensive Harvest 1957-'77 Acres
Plummer	0.0	0	258	0	0
Jennings	2.1	202	1,610	0	71
Matthews	2.5	84	6	0	178
Black Bear	2.5	540	1,668	0	196
Indian	2.9	449	2,068	3	2
Methodist	2.3	684	1,347	0	185
Negro	3.6	1,074	2,963	234	0
Knownothing	2.0	1,255	2,226	77	436
McNeal	4.0	1,435	142	47	0
Total/Average	**2.2**	**5,720**	**12,289**	**361**	**1,069**

Watershed sensitivity indices are used in watershed modeling discussed in Step 5 and explained in Appendix B - Cumulative Watershed Effects. The indices include potential impacts to beneficial uses, channel sensitivity, soil erodibility, hydrologic response, and slope sensitivity (see Table 3-4 Subwatershed Sensitivities). The riparian conditions and aquatic habitat are discussed under the Riparian issue in this document and integrated into the AWWCs determination in Step 5.

Table 3-4 Subwatershed Sensitivities 1/

Subwatershed	Beneficial Uses	Channel Sensitivity	Soil Erodibility	Hydrologic Response	Slope Sensitivity
Plummer	H	L	M	H	VH
Jennings	M	H	M	L	VH
Matthews	H	L	M	M	VH
Black Bear	H	M	M	H	VH
Indian	H	H	M	H	VH
Methodist	VH	M	M	M	VH
Negro	H	H	M	L	VH
Knownothing	VH	M	M	H	VH
McNeal	VH	H	M	L	VH

1/ L=Low, M=Moderate, H=High, VH=Very High

The beneficial use index depends on the likelihood of adverse cumulative watershed effects impacting beneficial uses. Knownothing and Methodist Creeks each have important runs of anadromous fish including chinook and coho as well as domestic use and rate very high. McNeal Creek provides the municipal water source for Forks of Salmon and also rates very high. The remaining large streams also provide anadromous habitat but are generally limited to small runs of steelhead. These streams and subwatersheds rate a beneficial use index of high. The Jennings subwatershed contains only small South Fork Salmon tributaries that support very small fish populations. It is a minor contributor of water and sediment to the South Fork Salmon and rates as moderate for beneficial use.

The channel sensitivity ratings are from stream surveys and local knowledge. Several small streams in the Lower South Fork watershed (Hotelling Gulch, O'Farrill Gulch, and Graham Gulch) are considered very highly sensitive due to poor channel stability. Other stream reaches (McNeal Creek, Negro Creek, Indian Creek and Argus Gulch) are considered highly sensitive with fair channel stability. A few stream reaches (Plummer Creek, Matthews Creek, East Fork Knownothing Creek, and parts of Black Bear Creek) have low sensitivities with good to excellent channel stability. The remaining streams have moderate sensitivity. The ratings for the CWE analysis subwatersheds are an average of channel sensitivities within each subwatershed.

The soil erodibility index varies by geology, soil type, and slope. Granitic soils are the most easily eroded and steep slopes, especially in granitic soils, have higher erosion rates than gentle slopes. None of the subwatersheds have a high percentage of granitic soils; Knownothing Creek is highest with 21% granitic bedrock. All subwatersheds have a high percentage of steep slopes and rate a soil erodibility index of moderate.

The hydrologic response index depends on the amount of each subwatershed in the rain-on-snow zone, between 3500 and 5500 feet elevation. Over one half of the Plummer, Black Bear, Indian, and Knownothing subwatersheds are within this zone so these subwatersheds rate a hydrologic response index of high. Less than 25 percent of the Jennings, Negro, and McNeal subwatersheds are within the rain-on-snow zone and rate low. The Matthews and Methodist subwatersheds are intermediate and rate moderate.

Slope stability depends on the amount of active landslide, inner gorge, and toe zone of dormant slide in each subwatershed. All subwatersheds have high percentages of these unstable land types and rate very high.

RIPARIAN AREAS

Key Question 1- What are the current vegetative conditions of the riparian areas?

Vegetative conditions vary widely between stream reaches. The current conditions carry the imprint of natural and man-caused disturbances from the past several decades. Along the South Fork Salmon River, vegetative capability varies with channel type. The bedrock-dominated banks upstream from the mouth of Indian Creek naturally support very little vegetation. Large cobble bars downstream of Indian Creek, particularly near the mouth of Negro Creek, are similarly barren but could support more vegetation except for past placer mining and flooding. This stretch of the South Fork Salmon river corridor contains some sizeable placer mining operations and several homesite and pasture clearings. Flooding periodically scours the channel and redeposits sediment from upstream allowing only slow recovery of disturbed sites.

Several washouts occurred to Forest Highway 93 during the winter of 1996-97. Although one lane was lost to the river in places, the road was not closed for extended periods. Little riparian vegetation was lost to these road washouts. Some of the major streamside landslides along the lower South Fork were reactivated in the winter of 1996-97. A slide in the headwaters of the Upper South Fork removed riparian vegetation intermittently as far down river as the mouth of Indian Creek. Except for these disturbances, the riparian vegetation along the lower South Fork Salmon survived the 1997 flood intact.

There are five distinct reaches in terms of the quality of riparian stands along the Lower South Fork:

- **From Forks to the Methodist Creek confluence-** poor riparian cover overall; large river bars with some development on them.
- **From the confluence of Methodist to Graham Gulch-** good condition with the exception of just upstream from Henry Bell Gulch.
- **From Graham Gulch to Hotelling Campground-** good riparian conditions except for sparse stretches between the road and river.
- **From Hotelling Campground to the confluence of Indian Creek-** barren except for a thin strand of riparian vegetation.
- **From Indian Creek to the mouth of Plummer Creek-** good vegetation for the site conditions with the exception of area near the mouth of Matthews Creek and mined area just downstream of Matthews Creek where vegetation is sparse.

The greatest disturbance apparent along the tributary streams in this watershed is wildfire, specifically from the 1987 fires on the north side of the river. Riparian areas along Negro and Indian Creeks, and adjacent smaller streams, were set back to an early seral stage. The upper and lower portions of Black Bear Creek were unburned but all of Murphy Gulch and westside tributaries to Black Bear Creek burned hot. Matthews Creek remained unburned as did Jennings and Butcher Gulches.

The pattern on the south side was more variable. The Hog Fire of 1977 burned hot through the upper half of McNeal Creek, which underwent a total loss of riparian vegetation. After twenty years, the watershed is still recovering. A large streamside landslide reactivated in the headwaters in the 1997 storm, leading to the scouring of riparian vegetation in McNeal Creek for a couple of miles downstream from the slide. Large portions of the Knownothing Creek, Methodist Creek, and Hotelling Gulch watersheds underwent stand-replacing fire in 1987, with Hotelling Gulch losing the greatest proportion of riparian vegetation and Knownothing Creek losing relatively little.

Recovery rates from riparian loss seem to vary across the landscape and perhaps with weather conditions and other factors. For example, Indian Creek and Murphy Gulch have established robust stands of riparian vegetation in the past decade, while O'Farrill Gulch, Henry Bell Gulch, and Negro Creeks remain relatively unvegetated since the 1987, and in some cases, the '77 wildfires.

Key Question 2- What are the current stream channel characteristics and aquatic species habitat conditions?

Physical habitat inventories and biological surveys were conducted in analysis area streams during summer low flow conditions. These inventories provide quantitative information of key aquatic habitat parameters that can be used to assess the overall suitability of stream habitat from a fisheries perspective. Figure 3-5 Habitat Inventory Reaches, contained in the Map

Packet located at the end of this document, displays locations of the surveys. An analysis of Salmon River surveys is presented in *Salmon River Basin Fish Habitat and Channel Type Analysis*, by EA Engineering. The South Fork Salmon streams are presented in Table 3-5 Non-Reference Habitat Parameters. For this analysis streams were grouped into managed streams and reference streams. Reference stream information, taken from unmanaged and wilderness streams, is presented in Step 4. Managed streams are used here to describe current condition. Important parameters from inventories included in this analysis are in-channel coarse woody material (CWM), pool frequency, a habitat diversity index, shade, substrate composition, and surface fines.

Table 3-5 Non-Reference Habitat Parameters

Stream Reach	ROS Channel Type 1/	Avg L WM Coverage (%) 2/	Primary Pool Freq 3/ (pools/mi)	Shannon Diversity Index 4/	Avg % Shade	Avg % Embed-dedness	Avg % Surface Fines	% Run	% Riffle	% Pool
LOWER SOUTH FORK SALMON RIVER										
1	F3	0.00	11.37	1.2203	12.2	19.17	25.83	38.45	8.88	52.66
2	F1	0.00	9.30	1.2520	0.0	3.33	20.00	14.15	32.27	53.58
3	F3	0.00	6.57	0.1263	3.6	14.32	16.59	55.41	23.34	21.25
4	F2	0.08	5.17	1.0278	5.7	8.89	8.89	60.19	24.08	15.73
5	F1	0.00	11.55	1.0579	0.0	N/A *	14.00	65.40	8.72	25.88
6	F2	0.00	7.69	1.0894	5.4	24.13	16.96	55.50	20.98	23.52
7	C3	0.54	10.53	1.0734	3.3	65.00	15.00	51.85	11.06	37.09
8	F1	0.12	21.28	1.1031	4.5	25.00	10.00	51.05	16.84	32.11
9	F2	0.24	7.09	1.0744	8.9	23.33	10.59	53.83	28.04	18.13
10 5/	F1	0.08	14.03	0.9437	2.5	N/A	10.00	54.10	17.25	28.65
BLACK BEAR										
1	A2	0.25	5.61	0.9485	78.6	27.99	7.07	33.07	50.08	16.84
INDIAN										
1	A2	1.00	1.62	0.8943	77.5	25.90	15.47	36.22	52.93	10.85
METHODIST										
1	B2	0.21	0.00	0.8806	66.6	26.90	11.14	34.77	55.86	9.37
2	A2	1.90	11.72	0.9638	57.1	34.08	12.19	26.44	50.15	23.42
NEGRO										
1	B2	0.50	0.00	0.6560	55.0	54.00	17.00	36.91	55.20	7.88
2	A2	2.73	0.00	1.1585	66.3	58.13	22.81	21.80	29.10	49.09
KNOWNOTHING										
1	B2a	0.01	16.54	0.8721	74.3	32.33	12.95	31.81	45.46	22.73
2	A2	0.34	10.97	0.8702	78.0	23.29	13.57	29.44	52.90	17.66

1/ The Rosgen classification system uses a combination of channel slope, substrate size, stream width to depth ratio, channel entrenchment and confinement,and sinuousity to assign on of approximately forty different channel types to a specific stream reach (Rosgen 1996).
2/ The percent of total habitat area having large woody material as cover.
3/ Number of primary pools (greater than or equal to three feet in depth) per mile.
4/ (Shannon and Weaver 1949)
5/ Outside analysis area.
* N/A = Not Available

Large wood provides a source of cover and habitat diversity for fish through a range of flows and seasonal conditions. Wood also plays a role in maintaining healthy stream channels. Wood data is displayed as it relates to the percentage of cover it provides. Wood is sparse in most reaches, however, channel character influences the amount of woody debris and is discussed in Step 5.

Pools are an important habitat component, providing rearing and holding habitat. Pools were measured as primary pools which are greater than three feet in depth. Small streams may exhibit a low number of primary pools, especially in upper reaches, but have a high number of total pools. Channel characteristics also influence pool frequency especially in bedrock dominated channels. These factors may contribute to the low pool frequencies in Indian and Negro Creeks.

Habitat diversity, a measure of the variety of habitat types in each reach, was quantified using the Shannon index (Shannon and Weaver 1949). The diversity of habitats found in the analysis area is consistent with the channel types with the possible exception of Negro Creek.

Summer water temperatures are a concern especially in the mainstem of the Lower South Fork Salmon. Stream temperatures are influenced in part by the amount of solar radiation hitting the stream. Amounts of vegetative and topographic shade are important in regulating summer water temperatures. As streams increase in size, and width the amount of direct shade has less influence on stream temperature. Methodist and Negro Creeks both show low shade values. The Lower South Fork has extremely low shade values due to the size of the stream and the bedrock dominated terrain.

High amounts of fine sediment limits egg survival in spawning beds, reduces hiding cover for small fish, and limits food production. Fines were measured as a percentage of overall surface material. Embeddedness, a measure of the extent that large streambed particles are surrounded or buried by fine sediment, can also be an indicator of the level of stream bed health. This measurement directly ties to the quality of spawning gravels. Negro Creek had high values for both percentage of surface fines and embeddedness.

Key Question 3- What are the water quality, quantity, and beneficial-use conditions of streams within the analysis area?

WATER QUALITY

Suspended Sediment and Turbidity --Data for streams in the watershed is limited. Immediately following the 1987 fires, Knownothing Creek was intensively monitored for stream flow, turbidity, and suspended sediment. In Water Year '89 (Oct. 88-Sept. 89), Main Knownothing Creek had an average turbidity of 1.0 Nephalametric Turbidity Units (NTU) and a range of 0.1 to 35. The East Fork of Knownothing had an average of 0.74 NTU, ranging from 0.1 to 40, while the West Fork had 0.86 average and a range of 0.1 to 90 NTU. The average suspended sediment levels were Main Knownothing: 104.84 milligrams per liter (22.27 to 1,088 mg/l), East Fork: 17.84 mg/l (0.00-1316) and West Fork: 37.25 mg/l (0.00-4134). At all three stations, the maximum suspended sediment reading occurred during a 1.73" rainfall which fell over a two day period.

While hundreds of automatically pumped samples were taken at the Knownothing Creek stations, a total of 13 grab samples were taken at the mouth of Negro Creek from November 1988 through March 1989. These resulted in higher average turbidity (7.02 NTU) and comparable suspended sediment (25.51 mg/l). The maximums were smaller than for Knownothing Creek; 25.0 NTU and 89.91 mg/l, respectively. This probably represents sampling bias in that the turbidity peak events were missed.

The return interval for the November 1988 peak flow was only three years. By comparison, the New Year's Day 1997 storm was an estimated 25-50 year return interval peak flow (see Water Quantity section). While no turbidity or suspended sediment measurements were taken during the 1997 flood, frequent observations indicated that high turbidites were prolonged in McNeal Creek. Methodist Creek underwent less than a week of high turbidity as a result of a slide (or slides), as did Indian Creek. The main stem of the South Fork Salmon had high turbidites that lasted into the late spring, long after the Lower South Fork tributaries ran clear. The high turbidites in the South Fork Salmon were attributed to landsliding in the Wilderness headwaters of the Upper South Fork watershed.

Water Temperature --A better record exists for water temperatures on the South Fork and some of its tributaries. The greatest amount of data is for the months of May through October, however, data was collected on the river near its confluence with the North Fork Salmon for two complete water years (July 1990 through September 1992). The results of this monitoring, done partly to see if fire recovery changes could be detected, were previously published by Reichert and Olson in 1993; Reichert in 1994, and Dix in 1993. Water temperature data and interpretations are presented in Step 5, Riparian Areas.

WATER QUANTITY

There is a fairly lengthy period of record for the Main Salmon River at Somes (Sept. 1911-Sept. 1915 and Oct. 1927 to present). However, stream flow records for the South Fork at Forks only cover Water Years 1958 through 1965. The drainage area for the South

Fork is 34% of the gaged main stem, allowing one to roughly prorate flows. Fortunately, the record for both stations includes the highest peak of record for most of northwestern California; December 1964.

High Flows --The highest peak mean daily flow of record was 24,000 cfs for the South Fork, and 100,000 cfs for the main stem. The instantaneous peak for the main stem was 133,000 cfs. This value is unknown for the South Fork. The second highest known instantaneous peak for the main stem was 54,100 cfs in January 1974. This value may have been equalled or even exceeded in January 1997, however this figure is still unknown at this time.

Previous notable floods of history in the Klamath River Basin were published by the USGS in 1937. The earliest accounts following European settlement were 4 floods in 1852-3. These washed out the few bridges and caused damage to settlements that existed in Siskiyou County. Other floods were noted for 1861-2, 1881, 1890, 1904, 1915, 1927, 1928, 1936 and 1937. On Dec. 7 and 8, 1861 a flood washed out bridges, mills and mining equipment on the Salmon River. The 1927 flood level was double the maximum stage for any of the other years mentioned for the Klamath River.

Low Flows --The low flow of record for the Salmon River at Somes occurred in Water Year 1932. It was 70 cfs. The second lowest flow was in Water Year 1978; 80 cfs. While no records exist for these years on the South Fork, one could simply prorate based on basin size and come up with an estimated 23-27 cfs for those years. During the brief period of record (1957-1965) the South Fork had a low flow of 28-29 cfs for 5 of the 8 water years, with the remaining 3 years higher. This suggests that the South Fork has a base flow of 28 cfs.

Estimates by the USGS show that 1872-3 was the driest year for the Salmon River basin, with 1919-20 second driest. There was an apparent drought from 1871-74, which was third driest.

BENEFICIAL-USE CONDITIONS

Beneficial-uses of water within the Lower South Fork include domestic and mining uses as well as aquatic habitat discussed previously in Key Question 2.

Several springs are utilized for household purposes across the landscape. The streams which are known to serve, or have served within the past decade as domestic water supply are listed in Table 3-6 Water Supply Streams.

Table 3-6 Water Supply Streams

Stream	Type of Use
McNeal	Irrigation of school grounds, multiple households
Knownothing	Multiple households
Hotelling	Single Household
Methodist	Multiple households
Butcher Gulch	Single household
Black Bear Tributaries	Multiple households
Indian Creek	Single household
Negro	Multiple household
Henry Bell	Single household

Key Question 4- What is the extent of interim Riparian Reserves, how are they defined, and what is the vegetative condition within the Riparian Reserves?

Interim Riparian Reserves are a land allocation applicable to National Forest lands. They are defined in the *Forest Plan* and include: the extent of water bodies, wetlands, and unstable land or potentially unstable lands, 340 feet buffers (two site potential tree heights for this area) on each side of fish-bearing streams and around lakes and natural ponds, 170 feet (one site potential tree height) on each side of non fish-bearing perennial streams and around wetlands greater than one acre, and 170 feet (one site potential tree) on each side of intermittent streams. The lakes, ponds, and wetlands used for interim Riparian Reserve boundaries include those mapped on USGS 1:24,000 quadrangle maps. The streams include those on 1:24,000 maps with additional streams added based on computer modeling.

Unstable and potentially unstable lands are those on most current geomorphic mapping. The geomorphic types that are to be included in Riparian Reserves have been defined for the *Forest Plan*. They include; active landslides, inner gorges, toe zones of dormant slides, and highly dissected granitic mountain slopes. Active landslide, inner gorge, and toe zone of dormant slide features have all been mapped to the extent reasonable for this analysis. Highly directed granitic mountain slopes may occur in this watershed but none have been mapped at this time.

The extent of lands meeting the interim Riparian Reserve definition, including all land allocations and private lands, are displayed in Figure 3-6 Riparian Reserve Types, contained in the Map Packet located at the end of this document. In total, about 17,900 acres of land meet the criteria for interim Riparian Reserves in the Lower South Fork watershed. Excluding those riparian areas on private lands or within National Forest Wilderness, LSR, or Special Habitat land allocations, interim Riparian Reserves include about 9,800 acres. Riparian Reserve types are displayed in order of precedence with active slides masking inner gorges which mask toe zones. All unstable land types mask buffers on streams, lakes, or wetlands. Using this order of precedence, about 2% of the interim Riparian Reserve is active landslides, 60% is inner gorge, ten percent is toe zone, and 28% is buffers on water bodies.

Vegetation within the interim Riparian Reserve is characterized using the Ecological Unit Inventory (EUI) for the Lower South Fork. The EUI contains detailed information on vegetation seral stage, canopy closure, tree species present, soil types, Potential Natural Vegetation (PNV), and several other attributes over the mapped area, refer to Appendix D - EUI Defined. The existing vegetation for the Lower South Fork is constructed from the Potential Natural Vegetation (PNV), soil type, and seral stage (see Biodiversity issue for more details). Vegetation in the interim Riparian Reserves can be described using these same parameters.

The Lower South Fork area contains a large proportion of site not capable of growing dense stands of large trees. These existing vegetation types include grey pine, Jeffery pine, live oak, poor site mixed conifer, and subalpine scattered conifer. They are included, along with the small acreage of meadows and lakes in the watershed, as areas naturally lacking dense tree cover. The other types, Douglas-fir/tanoak, Douglas-fir/live oak, good site mixed conifer, and true fir, are all classified as potential late-successional habitat. The potential habitat group is split into early seral (shrub/forb, pole, and early mature) and late seral (mid/mature, late/mature, and old-growth). The potential habitat group is also split by those with tree cover less than 60% and those with tree cover greater than or equal to 60%. The results of this data sort are displayed in Table 3-7 Vegetation Classification in Mapped Riparian Reserves, and Figure 3-7 Riparian Reserve Vegetation, contained in the Map Packet located at the end of this document.

Table 3-7 Vegetation Classification in Mapped Riparian Reserves

Vegetation Classification	Acres	% of Good Site	% of Riparian Reserve
Good Site 1/			
Early-Seral, <60% tree	2,240	20	12
Early-Seral, >60% tree	1,480	13	8
Late-Seral, <60% tree	1,040	9	6
Late-Seral, >60% tree	6,580	58	37
Subtotal	**11,340**	**100**	**63**
Areas naturally lacking dense tree cover	6,570	---	37
TOTAL	**17,910**	**---**	**100**
1/ Good Site consists of Forest Survey Site Classes 2-4.			

AQUATIC DEPENDENT SPECIES

Key Question 1- What is the distribution and population size of anadromous and resident salmonids?

The watershed provides 30 miles of anadromous habitat for fall and spring-run chinook salmon, winter and summer run steelhead, winter coho salmon and Pacific lamprey. There are 32 additional miles of habitat provided for native rainbow trout. Speckled dace, Klamath small scaled sucker, marbled sculpin, and Pacific brook lamprey also occur in the watershed (refer to Figure 3-8 Fish Species Range Map, contained in the Map Packet located at the end of this document).

The analysis area provides critical spawning, rearing and holding habitat for both adult and juvenile fish. The presence and timing of the anadromous fish species in the watershed are listed in Table 3-8 Adult Fish Species Presence.

Table 3-8 Adult Fish Species Presence

Fish Species	Months Present
Adult spring chinook salmon	From July through October
Adult fall chinook salmon	From October through early December
Adult coho salmon	From December through January
Adult summer steelhead	From July through May
Adult winter steelhead	From November through May
Adult Pacific Lamprey	From April through June

Anadromous young are found within the landscape year-round. Steelhead juveniles remain in the system up to three years and lamprey young (*ammocoetes*) remain in the system up to seven years before outmigrating to the ocean. Most coho juveniles prefer to remain within freshwater for about one year before moving into the ocean; apparently a very low percentage of chinook juveniles will do likewise (Olson 1996). Most chinook juveniles appear to move out of the Salmon River the first summer after emerging as fry from gravels.

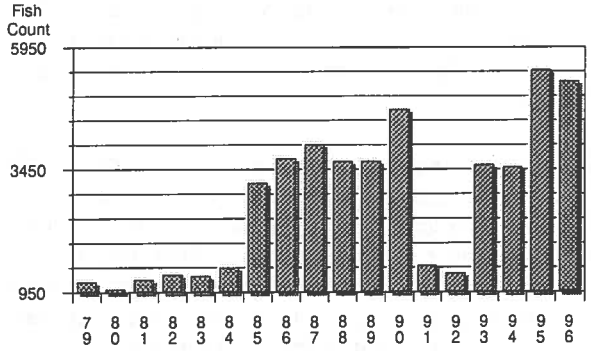
Historically it was estimated that 15,000 chinook salmon spawned in the Salmon River basin (CH2MHill 1985). Within the last five years, the spawning population of chinook salmon has ranged from 1,000 to 4,000 fish (CDF&G 1994). Overall, coho and steelhead populations are believed to be following the same declining trends (CH2MHill 1985). California Department of Fish and Game has estimated fall chinook salmon populations in the Salmon River from 1978 to 1996 using ongoing fall redd and carcass counts.

Prior to 1992, surveys were conducted by tagging a portion of the live fish in a run by capturing the fish in a wire located near the mouth of the Salmon River. Portions of the tagged fish were later recovered as carcasses after spawning in upstream areas. The frequency of recovery gave an estimate of the entire run size.

After 1991, the survey method switched to tagging carcasses and returning them to the river flow for redistribution. Recovery of a tagged carcass on a subsequent survey (along with consideration of other factors) also renders an estimate of the original run size. The survey method used after 1991, is more intensive and renders a statistically more accurate estimate of run size. The method also yields redd information, available on a reach basis. Chart 3-1 Salmon River Chinook Escapement, shows the population trend of chinook salmon in the Salmon River Basin; 1979-96 data. Table 3-9 Chinook Redds in Lower South Fork

Salmon, displays the numbers of redds found in this analysis area. Most redds are found in the lowest two reaches, Forks to 21 Bridge and 21 Bridge to Matthews Creek. Redd frequency decreases upstream above Matthews Creek.

Chart 3-1 Salmon River Chinook Escapement



Source: California Department of Fish & Game

Table 3-9 Chinook Redds in Lower South Fork Salmon

Year	Number Of Redds
89	264
90	212
91	259
92	419
93	680
94	629
95	1,114
96	1,003

Surveys to estimate the summer steelhead and spring chinook runs have been completed from 1980 through 1996. Table 3-10 Estimated Holding Adult Populations of Summer Steelhead and Spring Chinook shows these results. On average over half of the summer holding populations are in the South Fork of the Salmon River, about 25% are in the mainstem salmon and about 20% hold in the North Fork Salmon River.

Table 3-10 Estimated Holding Adult Populations of Summer Steelhead and Spring Chinook

Yr	Main Salmon		So Fork		No Fork		Total	
1/	SS	SC	SS	SC	SS	SC	SS	SC
'80	53	64	164	155	69	26	286	245
'81	30	57	59	159	71	3	16	219
'82	59	136	226	344	31	41	316	521
'85	22	91	53	252	44	6	119	349
'86	25	159	76	302	33	149	134	610
'87	24	124	82	260	22	92	128	476
'88	83	310	364	822	0	54	447	1,186
'89	15	31	65	59	0	30	80	120
'90	15	56	31	98	12	15	48	169
'91	24	22	26	139	17	19	67	180
'92	24	58	59	236	15	49	98	343
'93	44	349	47	571	16	363	107	1,283
'94	68	478	79	688	22	83	169	1,249
'95	66	322	58	901	49	177	173	1,400
'96	24	140	78	802	63	204	165	1,146
'97	56	287	44	596	41	345	141	1,228

1/ SS = summer steelhead, SC = spring chinook

In 1990 and 1991, steelhead spawning surveys have been conducted March through May on Black Bear, Indian, Knownothing, and Methodist Creeks. Because the relative success of completing these surveys is highly dependent on spring flow conditions, these data are very spotty. Knownothing and Methodist Creeks had the highest numbers of redds ranging from 19 to 120. Negro and Indian Creeks had the fewest numbers ranging from 0 to 3.

Key Question 2- What aquatic/riparian dependent species are identified as at-risk?

The Klamath Mountain Province Evolutionarily Significant Unit (ESU) of Steelhead, including both the summer and winter-run, have been proposed for Threatened status under the *Endangered Species Act* (ESA). Summer steelhead are Regional Forester-designated sensitive species. The Southern Oregon/Northern California Province ESU of coho salmon have been designated threatened under the ESA. The chinook salmon is currently in petitioned status under the ESA. Spring chinook are Regional Forester-designated sensitive species. Pacific lamprey and Western pond turtles are both State of California species of special concern. Western pond turtles are also Regional Forester-designated sensitive species.

VEGETATIVE BIODIVERSITY

Key Question 1- What are the current vegetation communities found in the watershed, what is their distribution, and what vegetation communities are capable of providing late-successional habitat?

An Ecological Unit Inventory (EUI) has been completed for the watershed. The EUI provides current information on seral stage, conifer size, hardwood size, tree cover, primary species, and secondary species. Information on soils and geomorphology is also incorporated into the EUI. The EUI information was combined into ten vegetation communities to represent the existing vegetation patterns in the watershed, see Figure 3-9 Existing Vegetation, contained in the Map Packet located at the end of this document. Table 3-11 Acreage and Percentage by Vegetation Community, identifies the acreages within each of these communities and the percent of the watershed occupied by each.

Table 3-11 Acreage and Percentage by Vegetation Community

Vegetation Community	Acreage	Percentage of Watershed
Canyon Live Oak with Scattered Conifers	13,935	21
Gray Pine	855	1
Jeffrey Pine	2,060	3
Douglas-Fir/Canyon Live Oak	23,200	35
Douglas-Fir/Tanoak	4,240	6
Mixed Conifer/Good Site	6,670	10
Mixed Conifer/Poor Site	4,770	7
True Fir	7,970	12
Subalpine Harsh Site with Scattered Conifers	2,640	4
Meadow/Lake	190	<1

The **Canyon Live Oak with Scattered Conifers Community** is found throughout the watershed. It typically occupies harsh sites and canyon live oak is found in both the overstory and the understory. Conifers (usually Douglas-fir) can be found scattered on better sites within the community. Due in part to harsh sites and also to frequent fire, large blocks of early/mid-seral canyon live oak can be found in Black Bear and Indian Creek drainages.

The **Gray Pine Community** is found on harsh usually serpentine sites. Gray pine is a conifer species adapted to harsh dry sites and fire. The community consists of gray pine as the overstory species and usually deer brush, live oak and grass understories. In stands that were burned in 1987, gray pine is overtopping shrubs and reestablishing on these sites. The northern most edge of the gray pine range is found within the watershed.

The **Jeffrey Pine Community** is also found on serpentine soils within the watershed. Jeffery pine usually makes up the overstory with a grass or grass/shrub understory.

The **Douglas Fir/Canyon Live Oak Community** makes up one-third of the watershed. Both species are found throughout the community, with Douglas fir dominating better sites and canyon live dominating harsher sites and exposed aspects. Other conifers including ponderosa pine and sugar pine and other hardwoods, including black oak and madrone are also found in this vegetation community.

The **Douglas Fir/Tanoak Community** is found on good sites within the watershed. Douglas-fir usually dominates the overstory with tanoak found in the understory and filling gaps in the fir dominated overstory. The eastern most edge of the tanoak's range in the Klamath Mountains is found in the watershed.

The **Mixed Conifer Community on Good Site** is scattered throughout the watershed. Douglas-fir is the most common conifer species with ponderosa pine, incense-cedar, and sugar pine also found in the community.

The **Mixed Conifer Community on Poor Site** consists of scattered conifers, mostly Douglas-fir and ponderosa pine, with an understory of grass/shrub, mostly deer brush.

The **True Fir Community** is found on good sites at high elevations in the watershed. White fir and red fir dominate and are maintained with high densities. Brewer spruce, mountain hemlock, and western white pine are also in this type, including the largest Brewer spruce ever measured.

The **Subalpine Harsh Site with Scattered Conifers Community** is found at the highest elevations of the watershed. The subalpine forest is characterized by glaciated slopes with thin soils and abundant moisture. Nearly barren slopes are common although a variety of high elevation species are found scattered in the community. The principal overstory species are red fir, mountain hemlock, Brewer spruce and white fir. The understory can consist of oceanspray, Drummond pasque flower, pinemat manzanita, and quill-leaved *lewisia*.

The **Meadow/Lake Community** is found on gentle slopes and depressions containing wet areas at high elevations. Typical herbaceous species include mountain heather, Labrador tea, California pitcher plant, swamp onion, meadow lotus, trillium, monks hood, lady slipper, bog rein orchid, and yampah. Sedges, rushes, and wet-loving grasses are also characteristic. Many of the meadows in this watershed, have a large component of shrubs, often alder, willow or bitter cherry.

The sorting of EUI data for existing vegetation is done in part to separate the sites capable of supporting late-successional habitat from those sites not capable. The existing vegetation types of Douglas-fir/Canyon Live Oak, Douglas-fir Tanoak, Mixed Conifer/good site, and True Fir are all capable of supporting late-successional habitat. Altogether, these four capable types add up to 42,080 acres.

Key Question 2- What are the current seral stage distributions and stand densities found in the watershed?

The current seral stage distributions and stand densities are listing below by vegetation community in Table 3-12 Acreage and Percentage Seral Stage and Stand Density by Vegetation Type.

Table 3-12 Acreage and Percentage Seral Stage and Stand Density by Vegetation Type

VEGETATION COMMUNITY --Seral Stage	Acres	Percent	Percent Avg. Density of Total Tree Cover
CANYON LIVE OAK WITH SCATTERED CONIFERS			
--Shrub	1,315	9	>60
--Pole	675	5	>60
--Early/Mature	2,020	14	>60
--Mid/Mature	8,255	59	>60
--Late/Mature - Old-Growth	1,670	12	>60
TOTAL	**13,935**		
GRAY PINE			
--Shrub	380	44	0-20
--Pole	25	3	41-60
--Early/Mature	145	17	0-20
--Mid/Mature	305	36	41-60
TOTAL	**855**		
JEFFREY PINE			
--Shrub	420	20	21-40
--Pole	30	1	21-40
--Early/Mature	150	7	21-40

VEGETATION COMMUNITY --Seral Stage	Acres	Percent	Percent Avg. Density of Total Tree Cover
--Mid/Mature	930	45	21-40
--Late/Mature - Old-Growth	530	26	41-60
TOTAL	**2,060**		
DOUGLAS-FIR/CANYON LIVE OAK			
--Shrub	5,720	25	21-40
--Pole	1,010	4	41-60
--Early/Mature	2,800	12	>60
--Mid/Mature	9,630	42	>60
--Late/Mature - Old-Growth	4,040	17	>60
TOTAL	**23200**		
DOUGLAS-FIR/TANOAK			
--Shrub	1,290	30	41-60
--Pole	225	5	>60
--Early/Mature	230	5	>60
--Mid/Mature	880	21	>60
--Late/Mature - Old-Growth	1,615	38	>60
TOTAL	**4,240**		
MIXED CONIFER/GOOD SITE			
--Shrub	1,410	21	21-40
--Pole	355	5	41-60
--Early/Mature	1,040	16	>60
--Mid/Mature	1,695	25	>60
--Late/Mature - Old-Growth	2,170	33	>60
TOTAL	**6,675**		
MIXED CONIFER/POOR SITE			
--Shrub	355	7	0-20
--Pole	35	1	41-60
--Early/Mature	820	17	41-60
--Mid/Mature	2,310	48	>60
--Late/Mature - Old-Growth	1,250	26	>60
TOTAL	**4,770**		
TRUE FIR			
--Shrub	1,535	19	21-40
--Pole	325	4	41-60
--Early/Mature	735	9	41-60
--Mid/Mature	2,435	31	>60
--Late/Mature - Old-Growth	2,940	37	>60
TOTAL	**7,970**		
SUBALPINE HARSH SITE WITH SCATTERED CONIFERS			
--Shrub	850	32	0-20
--Pole	10	<1	0-20
--Early/Mature	270	10	21-40
--Mid/Mature	895	34	21-40
--Late/Mature - Old-Growth	615	23	41-60
TOTAL	**2,640**		
MEADOW			
--Shrub	185	100	>60
TOTAL	**185**		

Seral stages are determined by the dominate overstory layer in a stand. The dominate tree layer must occupy at least ten percent of the stand area; it cannot consist of scattered predominate trees. Seral stage is primarily by size class, with some modification for site capability. For example, a stand that fits the size class for early/mature-seral stage, but has slow growing trees because of site limitations, may be classified as mid/mature. Table 3-13 Seral Stage Classification, shows size classes for each seral stage.

Table 3-13 Seral Stage Classification

Seral Stage	Description
Shrub	Trees (if present) <5" DBH or trees not present
Pole	Trees from 5-11" DBH
Early/Mature	Trees from 11-21" DBH
Mid/Mature	Trees from 21-36" DBH
Late/Mature and Old-Growth	Trees >36" DBH

Old-growth is distinguished from late/mature in the EUI database by characteristics of structural diversity; holes in the canopy, high number of down logs and snags, etc. But for most purposes, the late/mature and old-growth seral stages are collectively referred to as old-growth.

The late/mature old-growth type (LM/OG) is of particular importance for planning. The *Northwest Forest Plan ROD* standards and guidelines "specify retention of old-growth fragments in fifth field watersheds containing less than 15% of such stands." The Lower South Fork, a fifth field watershed, currently contains 14,825 acres of the LM/OG seral stages, or 22% of the 66,530 acre watershed. However, some LM/OG stands contain less than 40% tree cover, or are in the Canyon Live Oak with Scattered Conifer vegetation type, and do not provide late-successional habitat for many species. The distribution of LM/OG stands in the Lower South Fork is displayed in Figure 3-10 Late/Mature and Old-Growth Stands, contained in the Map Packet located at the end of this document, and management implications are discussed in Step 5.

Key Question 3- How much of the watershed is currently late-successional habitat and how much is dispersal habitat for late-successional species?

The Forest definition of suitable spotted owl nesting/roosting habitat is used to describe late-successional habitat (see spotted owl discussion in the wildlife section for a description of this habitat). Suitable spotted owl habitat, as sorted from the EUI data, includes only those vegetation types considered capable (see vegetation types discussion) with dominate trees larger than 20" (Mid/Mature and LM/OG seral stages), total tree cover greater than 60%, and at elevations less than 6,000 feet. The EUI sort of this criteria shows 20,060 acres of late-successional habitat in the watershed. The late-successional habitat is found mostly in the southwest portion of the watershed (Knownothing and Methodist creeks) and the northeast and east (upper Black Bear and Matthews creeks, see Figure 3-11 Suitable Northern Spotted Owl Habitat, contained in the Map Packet located at the end of this document).

Spotted owl dispersal habitat includes those areas not meeting nesting/roosting criteria but contain dominate trees larger than 11" and total tree cover >40%. Dispersal habitat can occur in vegetation types not capable of supporting nesting/roosting habitat. Based on an EUI data sort of vegetation that meets these criteria, there are 24,200 acres of dispersal habitat in the watershed. For the distribution of dispersal habitat, see Figure 3-11 Suitable Northern Spotted Owl Habitat.

Key Question 4- What disturbance regimes are impacting the vegetation in the watershed?

The fire regime for this watershed has by far the largest impact on the vegetation. Lightning fires are ignited in the watershed nearly every fire season. Most fires are contained within small areas (less than one acre) but on occasion, the number of starts overwhelms the suppression forces and large fires are the result. The most recent example of this occurred in 1987 when 36,310 acres (55%) of the watershed was burned by lightning ignited fires (see Figure 3-12 Fire History, contained in the Map Packet located at the end of this document).

Insects and disease also are an impact on vegetation in the watershed. Insect and disease outbreaks are usually found in areas where stand densities exceed site capability. Mortality flights that identify areas of mortality that exceed endemic levels have been done each year since 1993. These flights have identified 30 acres of high mortality (>10%), 2,110 acres of moderate mortality (5-9%), and 3,685 acres of low mortality (1-4%) in the watershed. The areas of high and moderate mortality are currently found in the Eddy Gulch LSR (see Figure 3-13 Mortality Flights 1993-1996, contained in the Map Packet located at the end of this document).

Wind throw is another disturbance that occurs infrequently mostly at higher elevations in the watershed. During the winter of 1995-96, a storm with high winds caused a large amount of wind throw mostly found within the Eddy Gulch LSR area.

Flooding and landslides occur in the watershed associated usually with winter storms. Rain on snow events are the most damaging, resulting in flooding, debris torrents, and landslide activation. Intense summer thunderstorms can also cause isolated flooding and debris torrents.

Key Question 5- What are the current wildfire risks (potential ignition sources) and fire behavior potentials found in the watershed?

Based on historic disturbances to the watershed, and current vegetative conditions, lightning ignited fires are the greatest threat to the watershed. Lightning fires have over the 72 year period (1922-1994) accounted for 77% of the fire starts. Lightning ignited fires have occurred within the watershed 60 of the 72 years (83% of the time).

Other potential ignition sources include recreation sites, residential areas and industrial sites. Dispersed recreation sites can be found throughout the watershed. Improved campsites are located at Mathews Creek and Hotelling Gulch. Residential areas include Forks of the Salmon and extended up both sides of the South Fork of the Salmon approximately two miles, the Godfrey ranch area, and the Black Bear mine area. Industrial sites include mining areas along Knownothing Creek and the Discovery Day Mine site. They also include timber harvest areas, currently the Eddy blowdown salvage area.

Fire behavior potential modeling is done in order to estimate the severity and resistance to control that can be expected, when a fire occurs during what is considered the worst case weather conditions. Late summer weather conditions are referred to as the 90th percentile weather data, which is a standard used when calculating fire behavior (90th percentile weather is defined as the severest ten percent of the historical fire weather, i.e., hot, dry, windy conditions occurring on mid afternoons during the fire season). The modeling incorporates fuel condition, slope class, and 90th percentile weather conditions in calculating projections on flame lengths and rates of spread. To identify fuel conditions, a crosswalk is developed from the existing vegetation layer to fuel models (see Figure 3-14 Fuel Models, contained in the Map Packet located at the end of this document). Three slope classes are utilized in the fire behavior potential modeling <35% slope, 35-65% slope and >65% slope. Aspect is also incorporated by varying one hour fuel moisture content by aspect. The 90th percentile weather data is based on twenty years of data collected at Sawyers Bar, which is the closest weather station to the watershed.

Fire behavior potential ratings of low, moderate and high are identified from the fire behavior modeling, see Figure 3-15 Fire Behavior Potential, contained in the Map Packet located at the end of this document. A low rating indicates that fires can be attacked and controlled directly by ground crews building fireline and will be limited to burning in understory vegetation. A moderate rating indicates that hand built firelines alone would not be sufficient in controlling fires and that heavy equipment and retardant drops would be more effective. Areas rated as high represent the most hazardous conditions in which serious control problems would occur i.e., torching, crowning, and spotting, control lines are established well in advance of flaming fronts with heavy equipment and backfiring may be necessary to widen control lines. For more information on fuel modeling and the development of fire behavior potential for this analysis, refer to Appendix E - Fire and Fuels.

Table 3-14 Fire Behavior Potential, identifies the areas of high, moderate and low fire behavior potential within each vegetation community.

Table 3-14 Fire Behavior Potential

Vegetation Type	High FBP Acres	Moderate FBP Acres	Low FBP Acres
Canyon Live Oak w/ Scattered Conifer	11,340	990	1,605
Gray Pine	750	105	0

Vegetation Type	High FBP Acres	Moderate FBP Acres	Low FBP Acres
Jeffrey Pine	1,365	250	440
Douglas-Fir/Canyon Live Oak	6,415	16,770	0
Douglas-Fir/Tanoak	1,620	2,620	0
Mixed Conifer/Good Site	2,350	2,225	2,090
Mixed Conifer/Poor Site	1,705	0	3,060
True Fir	2,060	2,695	3,195
Subalpine Harsh Site w/ Scattered Conifer	10	285	2,330
Meadow/Lake	0	0	185
TOTAL	**27,615**	**25,940**	**12,905**
Percent	**42%**	**39%**	**19%**

FIRE AND FUELS ORGANIZATION

Key Question 1- What is the current organization for fire suppression and fuels treatment and their abilities?

Table 3-15 Fire Suppression Organization, displays the current fire suppression organization for the Salmon River Ranger District.

Table 3-15 Fire Suppression Organization

No. of Positions and Position Title
1 District Fire Management Officer
2 Assistant Fire Management Officers
1 Fuels Officer
1 Fire Prevention Officer
2 Engine Captains
2 Fire Engine Operators
1 Handcrew Foreman
10 Firefighters
1 Lookout
21 Fire And Fuels Personnel Total

This list reflects the organization during fire season. During the portion of the year where the majority of the prescribed burning takes place (February-May) only those employees with permanent appointments are available. This leaves approximately ten people to accomplish prescribed burn objectives. Under the current organization, the amount of prescribed burn acres that can safely accomplished is approximately 1,000-1,500 acres per year.

During fire season the fire suppression organization is very capable, containing over 90% of fire starts to small areas (< 1 acre fire areas).

Final fire behavior potential determinations incorporate the ability of the fire suppression organization to contain fires where access is available.

Key Question 2- What are the differences between fire suppression forces used in the LMP and forces currently available?

The During the development of the *Forest Plan*, the Initial Attack Assessment Model of the National Fire Management Analysis System (NFMAS) was used to evaluate the cost of various fire organizations against the potential loss of resources. The optimum situation is where the expected cost of suppressing wildfires plus net benefit or resource value expected to be lost is minimized. The results indicate the most efficient initial attack fire organization and the budget needed to finance this organization. This organization, identified as the Preferred and "most efficient while considering land and resource values" is designed around the capability to successfully prevent at least 90% of fire starts from becoming escaped fires.

The preferred organization as displayed in Table 3-16 Preferred Fire Suppression Organization, was also identified as being instrumental in accomplishing natural and prescribed fire objectives of reintroducing fire as an ecological process. The wide margin between the current organization and the preferred indicates that suppression objectives and the implementation of natural and prescribed fire programs will not be met.

Table 3-16 Preferred Fire Suppression Organization

No. of Positions and Position Title
1 District Fire Management Officer
1 Assistant Fire Management Officers
1 Fuels Officer
1 Fuels Technician
1 Fire Prevention Officer
1 Fire Prevention Technician
3 Engine Captains
3 Fire Engine Operators
1 Handcrew Foreman
2 Watertender Operators
15 Firefighters
1 Lookout
29 Fire And Fuels Personnel Total

Key Question 3- What are current costs for fuels treatment (underburning) and for fire suppression in the watershed?

Current costs for underburning on the Salmon River District are approximately $100/acre. Some innovative helitorch burning within the Specimen Fire area has been accomplished at a cost of approximately $250/acre. The costs for broadcast burning on the district are approximately $400/acre.

The cost of suppressing the Specimen Fire, the most recent large fire on the Salmon River District, was $5,500,000. This fire occurred in 1994, with inflation, current cost of suppressing this 7,015 acre fire would be $6,190,000 or a cost of about $880 per acre.

TERRESTRIAL WILDLIFE

Key Question 1- What wildlife species will be discussed in detail in this analysis?

The analysis area contains potential habitat for a variety of vertebrate wildlife. Many of these habitats have been altered by management activities on public and private land. For this analysis, the wildlife focus will be on the bald eagle, peregrine falcon, northern spotted owl, northern goshawk, Pacific fisher, American marten, willow flycatcher, black-tailed deer, elk, and black bear. Amphibian and reptile species will also be discussed if information is available. These species

were selected for analysis because of their status as either protected by the Endangered Species Act, listed as Forest Service sensitive, or they have high social interest. These species are also included as part of the Forest Management Indicator Species (MIS) in the *Forest Plan*. Refer to Appendix F - *Endangered Species Act* and Other Species Considerations Questions and Answers.

Other MIS species or assemblages from the *Forest Plan* found in the analysis area include hardwood and snag assemblages. Information developed and tracked in the analysis, for vegetative biodiversity and other wildlife species should cover habitat concerns for the hardwood assemblages. Information on snags and snag densities is not available at the watershed scale, but expected snag densities for natural forest types found in the watershed will be presented.

Key Question 2- For each of the Management Indicator Species, what are the habitat needs, and where and how much of this habitat is in the watershed?

Bald Eagle: status-Federal Threatened

Bald eagles in inland Northern California are found in close association with lakes, reservoirs, and rivers that provide prey and suitable nesting and roosting habitat. Nests are usually located in multistoried forest stands with large trees and generally the largest ponderosa pine, sugar pine, or Douglas-fir are used for nests and roosts. Bald eagles feed primarily on fish during the spring and summer but often shift to waterfowl and carrion in the winter.

In this watershed, bald eagles are casual visitors during the fall and winter. Anadromous fish runs are the most likely attraction for the eagles. No nests have been detected in the watershed.

Peregrine Falcon: status-Federal Endangered

Peregrine falcons primarily nest on large cliff, usually near water. Peregrines begin nesting in February and the young fledge in early summer. Peregrines hunt for birds over large areas and many different habitat types. Perches, in prominent locations (high rocks, cliffs, and snags) are important to peregrines as observation posts in foraging, territorial defence, and reproductive behavior. There is one known peregrine eyrie within the watershed, in Knownothing Creek.

Northern Spotted Owl: status-Federal Threatened

On the Klamath National Forest, suitable nesting/roosting habitat for spotted owls is defined as multi-layered, multi-species conifer stands with greater than 60% total canopy cover. Large (>18" dbh) overstory trees, large amounts of down woody debris, and the presence of trees with defects or other signs of decadence in the stand are also important habitat components. The size of the stand and adjacency to other habitat types that owls can use are important factors in determining suitability.

Suitable habitat is found mostly in the southwest and northeast portions of the watershed (see Figure 3-11) with suitable habitat found in most drainages except those impacted by the fires in 77 and 87. There are ten spotted owl activity centers in the analysis area; four in the Eddy Gulch LSR, three in the Bowerman LSR, and three in the Salmon Mountain Wilderness.

There is currently 20,060 acres of suitable nesting/roosting habitat and 24,200 acres of dispersal habitat in the analysis area. Table 3-17 Suitable Spotted Owl Nesting/Roosting and Dispersal Habitat Acreage, gives a breakdown of spotted owl habitat by management area for lands within the watershed.

Table 3-17 Suitable Spotted Owl Nesting/Roosting and Dispersal Habitat Acreage

Land Designation	Nesting/Roosting Acres	Dispersal Acres
Wilderness	3,890	5,980
Special Habitat --LSR	9,010	4,915
Special Habitat --Eagle/Falcon	30	430
Riparian Reserves	2,320	4,095
Scenic/Recreational Rivers	180	760
Partial Retention VQO	2,350	4,610
General Forest	2,085	3,215
Private Lands	195	195
TOTAL	**20,060**	**24,200**

Northern Goshawk: status-Forest Sensitive

In northern California, goshawks use mature and old-growth conifer forest with dense canopy closures and little understory. Goshawks often nest on north and east aspects and low on the slope on moderate to flat terrain. Good goshawk habitat contains abundant large snags and large logs for prey habitat and plucking perches. Goshawk nest stands are composed of large dense trees and are often associated with forest openings such as meadows and riparian areas. Goshawks do most of their foraging in open mature forests, meadows, and other forest openings.

On the west side of the Klamath, suitable goshawk habitat is similar to spotted owl habitat and for this analysis it will be described as the same. For a display of suitable goshawk habitat, see Figure 3-11 Suitable Northern Spotted Owl Habitat, contained in the Map Packet located at the end of this document. Currently there are five managed goshawk nesting territories in the watershed; one each in Knownothing, Methodist, Smith, and two in Matthews Creek.

For the amount of suitable goshawk habitat in the watershed see the table of suitable spotted owl habitat (Table 3-17).

Pacific Fisher: status-Forest Service R-5 Sensitive

Fishers are medium sized forest carnivores weighing between 5 and 12 pounds, with males larger than females. Fishers are generalized predators of small to medium sized mammals, birds, and carrion; with snowshoe hares, squirrels, mice and porcupines important prey species. In the pacific northwest, fisher are categorized as closely associated with late-successional forests. For fisher, tree species is less important than forest structure that affects prey abundance and vulnerability, and provides denning and resting sites. Conifer stands that provide these features have a diversity of tree sizes and shapes, light gaps and associated understory vegetation, snags, fallen trees and limbs, and trees with limbs close to the ground.

For this analysis, suitable spotted owl habitat was used to display potential fisher habitat. For a display of fisher habitat see Figure 3-11, and refer to Table 3-17 located earlier in this section.

American Marten: status-Forest Service R-5 Sensitive

The American marten is a forest carnivore about the size of a small cat. Martens are found in climax conifer and mixed forests, at higher elevations usually above 5,000 ft. They need a moderately dense overstory and sufficient understory cover for hiding and denning. Moist sites that support dense succulent understory vegetation for prey species are considered prime marten habitat. Understory structure, including slash or rotten logs and stumps is necessary for denning, hiding, and foraging. Martens usually den in rotten logs, but have been known to use rock slides and slash piles.

Martens prey on small mammals, especially mice and voles. Other small mammals including ground squirrels, flying squirrels, chipmunks, and snowshoe hares are also important prey species. Seasonally, martens utilize insects, fruits, nuts, and small birds.

On the west side of the Klamath, marten habitat for denning is described as moderately dense >60% canopy closure above 5,000 ft. and often associated with true fir stands. Foraging habitat is generally >40% canopy closure above 5,000 ft. but also includes high elevation meadows. Using the EUI data, 2,070 acres of denning/hiding habitat is available in the watershed, with an additional 2,260 acres of foraging habitat. For a display of potential marten habitat see Figure 3-16 Suitable Habitat for Marten, contained in the Map Packet located at the end of this document.

Willow Flycatcher: status-Forest Service Sensitive, California Endangered

Willow flycatchers are small (sparrow sized) migratory songbirds that nest in riparian shrubs. Willow flycatcher breeding habitat in California, is characterized as moist meadows with perennial streams, lowland riparian woodlands dominated by willows and cottonwoods, or spring fed boggy areas with willow or alders.

Point count bird surveys have not documented willow flycatchers in the Lower South fork watershed, although suitable habitat does exist. Suitable flycatcher habitat is found in high elevation meadows and stream side riparian areas with a significant shrub component.

Black-tailed Deer: status-Species of Local Concern

Black-tailed deer habitat is a mix of openings and shrublands that provide forage and cover and forest cover for protection from weather and disturbance. Forage areas close to cover are utilized more than open areas because the deer can quickly escape predators. Deer habitat requirements change seasonally, with most deer migrating between energy rich summer ranges and nutritionally poor winter ranges. Diet also changes seasonally, with herbaceous vegetation utilized in the spring and early summer and then a move to browse in the fall and winter.

Cover is needed by deer to avoid predation or disturbance, and for protection from the weather. Thermal protection from heat in summer and cold in winter is needed by deer. A good representation of hiding cover is vegetation capable of obscuring 90% of a standing adult deer at 200 feet or less. Shrub fields and thickets of small trees provide important hiding cover. On the winter range, thermal cover is very important and is provided by evergreen trees and shrubs at least 5 feet tall with 70% crown closure. A mosaic of vegetation types that provide hiding cover, thermal cover and forage is needed for suitable deer habitat.

Fawning areas are another key component of deer habitat. Fawning areas typically have warm exposures, gentle slopes, low woody vegetation, dense ground cover and succulent forage and water within 600 feet. Fawning areas are most often found in the transition zone between summer and winter ranges.

Black-tailed deer are found throughout the watershed, with most of the animals using the higher elevations in the summer and moving down to low elevations for the winter. The early seral vegetation in Negro, Henry Bell, and Indian Creeks is important deer winter range.

Elk: status-Species of Local Concern

After having been extirpated from the watershed in the early 1900s, elk are again starting to repopulate the watershed. Most of these animals are believed to be coming from the Upper South Fork Salmon river as the herds transplanted there in the early 1990s expand their populations and range. They have been sighted in Matthews Creek, and Murphy Gulch.

Elk forage in wet meadows, springs and seeps, and young plantations. Older plantations and natural thickets are used for hiding cover. During winter, elk move to lower elevations using drainage bottoms for cover and forage.

Another factor in the repopulation of the watershed by elk, is providing adequate calving habitat. Good calving habitat is found on gentle slopes with dense cover, down woody material, close to forage and away from roads or other disturbance sources.

Studies have shown elk to be extremely sensitive to roads, and in areas where open road densities are greater than 2.5 miles per square mile habitat effectiveness drops to about half.

Black Bear: status-Species of Local Concern

Black bears are very adaptable and inhabit a wide variety of plant communities. They prefer forested and shrubby areas but use meadows, Riparian areas, ridge tops, burned areas, and avalanche shutes. Black bears prefer mesic over dry areas and forest over open areas. They use dense cover for escape, thermal protection, and bedding. Black bears are found throughout the Lower South Fork watershed; using low elevation southerly slopes in the spring and moving to higher elevation northerly and easterly slopes as summer progresses.

Black bears eat a wide variety of foods, relying most heavily on grasses, herbs, fruits and mast. They also feed on carrion and insects and sometimes will kill and eat rodents and fawns. Black bears also eat salmon and raid orchards, gardens, and trash bins of rural homes.

Maintaining well distributed populations of fruit-producing shrubs and mast-producing oaks is important in providing quality black bear habitat. High open road densities have been shown to reduce the quality of black bear habitat.

Amphibian and Reptile Species

The analysis area also provides habitat for several amphibian and reptile species. Aquatic and terrestrial amphibians and aquatic reptiles will be discussed.

Aquatic associated amphibians found in the analyses area include foothill yellow-legged frog, cascades frog, tailed frog, Pacific tree frog, western toad, Pacific giant salamander, rough-skinned newt, and long-toed salamander. All of these amphibians require aquatic habitats for a portion of their life cycle and several are closely tied to riparian areas for most of their habitat needs. Many of these amphibians are associated with low and mid elevation streams, ponds and springs. However, tailed frogs are often found at higher elevations in headwater streams with cool water temperatures and high stream gradients. No formal surveys have been conducted for aquatic amphibians in the analysis area.

Aquatic associated reptiles that occur in the watershed include Pacific Coast aquatic garter snake, western terrestrial garter snake, and western pond turtle. Both species of garter snake are closely tied to riparian habitats. Western pond turtles have been observed in the lower gradient portions of many watershed streams, including the South Fork of the Salmon River. During dispersal periods, western pond turtles may travel far from water and into higher elevation habitats.

There is habitat for several terrestrial amphibians in the watershed. These amphibians occur in upland areas and some may have a portion of their life cycle in aquatic habitats; however, most of these salamanders do not require open water at any stage of their life cycle. The most common of these salamanders is the ensatina. There is habitat for three other terrestrial salamander species in the watershed; they are Siskiyou mountain salamander, Del Norte salamander, and Shasta salamander. These three species have been designated in the Forest Plan as survey and manage and protection buffer species. Del Norte salamanders have been found in Sign and Methodist creeks during surveys for the Bower/Methodist timber sale. The closest recorded sighting of Shasta salamanders is over 50 miles to the southeast and the closest recorded sightings of Siskiyou Mountain salamanders is over 30 miles to the north.

ROADS

Key Question 1- What are the current conditions and uses of roads within the watershed?

The analysis area contains approximately 238 miles of road. There are 16 miles under Siskiyou County jurisdiction, 206 miles under Forest Service jurisdiction (including temporary roads), and six miles under private jurisdiction (see Figure 3-17 Current Transportation System, contained in the Map Packet located at the end of this document).

Forest Highway 93 (also known as Siskiyou County Road 1CO2) provides primary access to the watershed and was constructed along the South Fork

Salmon River. This portion of FH-93 starts at the community of Forks of Salmon and traverses the South Fork Salmon River for 14 miles to the end of the analysis area. This portion of the road is single lane paved with moderate and adverse grades (-10% to 10%). The road has little to no shoulder area, culverts, bridges, inside ditch line and a minimum amount of turnouts. There are private roads that exit the FH-93 that provide access to residences and mining claims and are maintained by those individuals. The private roads are constructed as low standard, native surface roads.

The county road 1E001 provides access to the watershed from the north (Black Bear Summit) and is located along Black Bear Creek for four miles. This portion of the road is single lane, native surface with moderate grades (-4% to -10%). The road has culverts, inside ditch line and a minimum of turnouts. There are private roads that exit the county road that provide access to residences and mining claims and are maintained by those individuals. These roads are constructed as low standard, native surface roads.

Forest Service road system within the watershed has a total of 206 miles, 68 miles of single lane, pit run aggregate surface and 138 miles of single lane, native surface roads. Forest Service provides the following level of maintenance: 17 miles of Level 1, 160 miles of Level 2, and 30 miles of Level 3. Users of the Forest Service road system are recreational, administrative, and timber hauling traffic. Forest Service roads access side drainages off of FH-93. Roads were constructed starting in 1930s until 1992. The following template and features exist on most roads, inslope or outslope, inside ditch line, culverts or rolling dips, and bridges. Roads have a moderate (4% to 10%) to steep (8% to 14%) grades. All roads use existing contours and switch backs to traverse from stream beds to ridge tops. Average road width is 15 to 24 feet plus turnouts. Roads access trailheads, private land and mining claims. Most of the road system is used for hauling merchantable material, fire prevention, recreation and administrative traffic.

Non-system roads exit the main Forest road system. Total length of non-system road is 18 miles within this watershed. These roads are used to access landings within a unit. Average grades are moderate (4% to 10%) to steep (8% to 20%). Average width of the non-system roads are 15 feet with limited amount of turnouts, rolling dips and cross drains.

The county road (FH-93) provides primary access to the watershed, and was constructed near main stream courses. The road is maintained throughout the year for user comfort and safety. Road construction standard for most of the miles was single lane, ditched, native surface and fair alignment, resulting in larger cut and fill slopes.

Private roads provide access to residences and mining claims and are maintained by those individuals. These roads were generally constructed as low standard, native surface roads.

Forest Service system roads within the watershed were constructed for the administration of National Forest Lands. Public use has been allowed by the Secretary of Agriculture on most roads. Travel access management strategies are used within the watershed to minimize resource use conflicts. These conflicts may include special wildlife considerations, erosion related water quality concerns, or public safety. Historically, most of the roads are managed to provide year-round access.

The following Table 3-18 Travel Access Management Mileage-National Forest Roads Only, displays miles of road by management activity.

Table 3-18 Travel Access Management Mileage-National Forest Roads Only

Travel Access Management Strategy	Miles
Year-Round Closure	18
Seasonal Closure	100
Open	88
TOTAL	206

Temporary roads are those roads on National Forest land which were constructed to provide access for a single use, such as to a residence, mining claim, water source, disposal site, harvest unit, etc.

The majority of the Forest system roads were constructed under timber sale contracts with the use of purchaser credits. Roads also provide for other Forest use and management activities, such as recreation, mining, law enforcement, and fire prevention and suppression.

These roads often traversed steep side slopes (<50% grade). Side casting (i.e., excavate and side cast without compaction) was the normal technique used during construction. The earlier dated roads were generally constructed 14-16 feet wide, inslope or crowned, unsurfaced, with turnouts, ditched, and with drainage structures. With years of use the road template has change to outslope. The later dated roads were generally constructed to 14 feet wide, out sloped, unsurfaced, and with minimum drainage structures.

The following Table 3-19 Road Miles by Road Template and Surface Type - All Roads, displays mileage for roads within the analysis area.

Table 3-19 Road Mileage by Road Template and Surface Type - All Roads

Road Template	Surface Type	Miles
Outslope	Chip Seal	16
Outslope	Crushed	6
Outslope	Native	131

Road Template	Surface Type	Miles
Crown	Native	11
Crown	Pit Run	64
TOTAL		228

In order to reach the desired road location that met management objectives, grades often ranged between 4 to 14% with occasional short pitches exceeding 14%.

Forest system roads are categorized into three functional classifications, they include; arterial, collector, and local. The main County road which travels through the watershed is considered an arterial. Forest system roads within the watershed are either classified as collector or local roads.

The following Table 3-20 Functional Classification- All Roads, displays miles of road by function classification.

Table 3-20 Functional Classification - All Roads

Functional Classification	Miles	Jurisdiction
Arterial	16	County
Collector	6	Private
Collector	72	Forest Service
Local	134	Forest Service
TOTAL	228	

Forest Service road maintenance is grouped into five maintenance levels (refer to Table 3-21 Road Maintenance Level Mileage- All Roads, and see Figure 3-17 Current Transportation System, contained in the Map Packet located at the end of this document. Most roads within the watershed are maintained to Level 2 or Level 3 standard. Level 1 roads are those roads closed to vehicle travel on a permanent basis. Level 2 roads are those roads maintained for high clearance vehicle use, while Level 3 roads are maintained for passenger car traffic. Maintenance levels higher than Level 3 are assigned to roads that have paved or aggregate surface, fair alignment, and with high volume of traffic.

Road maintenance is accomplished through timber sale contract requirements, Forest Service road crews, and service contract. The amount of maintenance accomplished each year within the watershed is declining because of reduced maintenance budgets, inflation, and reduced timber sale activity.

The following Table 3-21 Road Maintenance Level Mileage- All Roads, displays miles of road by maintenance level.

Table 3-21 Road Maintenance Level Mileage- All Roads

Level	Miles
1 - Closed	17
2a - High Clearance/Close Seasonal	101
2b - High Clearance/No Seasonal Closure	61
3 - Passenger Car	30
4 - All Weather Surface	5
5 - Paved, Double Lane	14
TOTAL	228

Many of the roads within the watershed have stabilized over the years, both cut slopes, and fill slopes may be vegetated. Erosion is limited to the road surface and is generally considered minor. Often erosion is triggered by intense seasonal thunderstorms, however severe erosion problems associated with roads maybe chronic, and generally can be traced to one or several causes (e.g., geometric design of the road, road grades, surface type, soil type, road location, steepness of terrain, inadequate drainage structures, road location, lack of maintenance, or vehicle use during wet weather conditions). For detail listing of existing road status, refer to Appendix G - Numerical Listing of Roads and Their Status.

COMMERCIAL TIMBER OUTPUTS ON PUBLIC LAND

Key Question 1- What are the capable, available, and suitable lands, potential timber harvest volumes, and growth rates?

On National Forest lands, the Lower South Fork watershed has a wide range of highly productive to low productivity conifer stands. Currently, there is approximately 290MMBF of timber on Matrix lands (available for harvest) in the watershed. These same lands are also currently growing approximately 110 MMBF of timber per decade.

There are four land allocations in the watershed from the *Forest Plan* which provide a sustained yield of timber: Partial Retention, General Forest, Recreational River, and Scenic River. Partial Retention, General Forest, and Recreational River areas comprise Regulation Class 2 and Scenic River is Regulation Class 3.

Table 3-22 Summary of Timber Acres, Volumes, and Growth Potential For Matrix Lands

Matrix Lands	Reg Class 2	Reg Class 3	Total
Total Acres 1/	24,260	110	24,370
Acres Available for Harvest 2/	20,620	90	20,710
Current volume on acres available for Harvest (MBF) 3/	291,800	1,300	293,100
Potential Growth on Acres Available for Harvest (MBF/decade) 4/	110,700	500	111,200

1/ Taken from the original LMP acreage estimates. Does not include mapped Riparian Reserves and Harsh Sites, but does include unmapped Riparian Reserves.

2/ Fifteen percent for green tree retention was subtracted from the total.

3/ Volumes were estimated from EUI data and compartment timber inventory data.

4/ Estimated by assigning growth rates based on site class to the site class breakdown from the EUI data.

Site class 1-4 was estimated to grow 120 cu ft/acre/year or with a six board foot/cu ft conversion, 720 board feet/acre/year or 7,200 board feet/acre/decade.

Site class 5 was assigned 50 cu ft/acre/year. Using a 6 board feet per cu ft conversion, 300 board feet/acre/year or 3,000 board beet/acre/decade.

Site class 6 was assigned 20 cu ft/acre/year. Using a 6 board feet per cu ft conversion, 120 board feet/acre/year, or 1,200 board feet/acre/decade

HUMAN USES

Key Question 1- What heritage resources exist within the watershed?

The Lower North Fork to Shasta and Karuk people is traditionally significant. In pre-European-contact times, area settlements were part of the largest population cluster in the Karuk domain.

Most activity centered around riverine settings. Travel was either cross-country, or by a network of trails in the river corridors or along ridges. In additional to village life near rivers, they secured important seasonal resources at locales in higher elevations. Trade was important, but goods and services were generally obtained locally.

The discovery of gold lead to the immigration of many diverse ethnic cultures into the landscape. American Indian village sites were located along the river or mouth of rivers and creeks. Much of the placer gold deposits were located under the village sites. Most village sites were piped off the hillside to get to the gold laden gravels.

Pre Historic sites have been dated to within the last 1500 years. A large proportions of sites are attributed to be used as an early or late summer camp for one or two families, most likely processing sites for animal and vegetable foods.

Within the landscape there are 12 recorded pre historic sites, 105 historic sites and four multi-component sites.

The largest mine in the landscape was the Black Bear mine which started in 1860. Numerous mines of various sizes started in and around the same time period. By the turn of the century most of the mines in the landscape had played out and were abandoned. Mining within the landscape has undergone several cycles of production, these cycles have been created by past increases in gold prices, depressions and wars.

Past mining operations have created a legacy of abandoned mines, mine dumps structures and a multitude of artifacts attributed to mining and home sites associated to the mines.

The majority of the historical sites recorded in the landscape are a direct result of these mining operations.

Key Question 2- What other commodities are utilized in the watershed?

Miscellaneous Forest Products -Firewood has been the most popular miscellaneous forest product utilized from the area. Many people from the communities of Cecilville and Forks rely on wood as their sole source of heat. People from the Scott Valley also use this watershed to obtain their firewood.

Boughs, post and poles, and mushrooms are also collected from the watershed in unknown quantities.

Mining -Mining activity has been and continues to play a significant role of the development in the watershed. Existing operating gold mines are prevalent within the Knownothing drainage. The working mines consist of hard rock/mill site operations upslope in the drainage while placer operations are occurring near the stream channel in the bottom 1/3 of the drainage. These mines are a readily source of income for many families living within the Salmon River drainage. Approximately eight families live at the mouth of Knownothing and work at the Discovery Day Mine. Several smaller placer gold mines are found along stream courses, with one or two miners working each site. Recreational suction dredging also occurs, with the amount of use variable depending on the gold market conditions.

Grazing -There are no grazing allotments in the watershed, however there is a feral herd of horses with approximately 10 animals. These horses typically feed in the O'Farrill Gulch and Matthews Creek area.

Water Uses -National Forest lands within the watershed provide domestic water sources for several families. Water is diverted from Argus Gulch for use at Black Bear and from a tributary to Negro Creek for use at Godfrey Ranch, and for the residents living along Knownothing Creek.

Key Question 3- What are the primary recreational uses in the watershed?

Although this area provides many traditional recreation uses such as camping, hiking, hunting, fishing, sightseeing, biking, kayaking, etc. (see Figure 3-18 Recreation Features), overall it probably receives less visitor use than many other watersheds of the Forest.

Otter Bar Lodge attracts regional visitors for both mountain biking and a kayaking school. The biking occurs primarily on Blue Ridge and the kayaking occurs on the South Fork Salmon River.

There are seven outfitters using the watershed, four packer/guides for Wilderness trips and three for river rafting or kayaking. Depending on water levels, river put-ins are at Methodist Creek and Windy Bridge, with trips floating through and taking out at Forks or Crapo Creek.

Hiking in Wilderness is a popular activity, with three trailheads to provide access to the Trinity-Alps Wilderness. The trailheads (in descending amount of use) are: Hotelling Ridge, Knownothing Creek, and Plummer Creek. Each trailhead is a secondary type (versus

primary) which does not have any improvements such as bulletin boards, or toilets. There are 2 and 12 miles of primary and secondary trails in the watershed. Primary trails serve as main transportation routes, traditionally receive at least a moderate amount of use, and are maintained annually. Secondary trails don't necessarily serve main attractions and one-third are maintained each year. There are another 29 miles of inactive reserve trails, which are not currently maintained.

Hunting uses include deer, bear, and upland birds. Fishing for steelhead is open in the tributaries and the Main Salmon River. The Main Salmon is closed to salmon fishing.

There are two developed recreation sites in the watershed; Matthews Creek and Hotelling Campgrounds, with 12 and 5 campsites respectively. Both received a low amount of use, and do not meet current design standards for accessibility. Matthews Campground provides day-use and swimming access, while Hotelling provides camping for a variety of users ranging from loggers to service contract workers.

Sightseeing occurs along County roads, by residents of the Forks of Salmon or campground visitors. The undeveloped, natural appearing scenery is valued as an attraction by local residents and users alike. The area was inventoried for existing visual condition levels in 1988, and the data is displayed in Table 3-23 Acreage and Percentage by Existing Visual Condition Levels, for the watershed.

Table 3-23 Acreage and Percentage by Existing Visual Condition Levels

Visual Condition Level 1/	Acres *	% of Watershed
Untouched	18,300	27
Unnoticed	16,200	23
Minor Disturbance	1,400	2
Disturbance	13,800	21
Major Disturbance	3,800	6
Drastic Disturbance	13,000	21
TOTAL	**66,500**	**100**

1/ Refer to Appendix H - Visual Condition Levels, for descriptions.

Key Question 4- What is the community's interest/involvement in public lands management?

The community has a diverse spectrum of interest and involvement both past and present. Some of the first public concerns of management on federal lands were brought to the attention of the Forest Service in early 1970s and then to eventual litigation from within this landscape. The involvement has grown to active participation of landscape enhancement projects ranging from fuel reductions to riparian planting.

The Salmon River Restoration Council is a grass roots operation that is actively committed to the restoration of landscapes and there contribution to fisheries, residents, and the public in general. The Council recently moved into the old Sawyers Bar Ranger Station.

The publics within the Salmon River watersheds are a well informed; keenly interested in forestry practices both locally and globally.

Many people within the landscape have asked to be placed on mailing lists of proposed actions so that they can contribute their concerns and knowledge early on in the planning process.

The *Main Salmon Ecosystem Analysis* (5/31/95) discussed in detail key elements of Community and Private Land Values/Uses for communities within the Salmon River drainages. This discussion is pertinent and relevant to this analysis and is incorporated by reference.

Step 4 - Reference Conditions

INTRODUCTION - This step describes how ecological conditions have changed over time, resulting in current conditions as described in Step 3. A reference will be developed based on historic conditions for comparison with current conditions. This is an attempt using historical data to determine how the ecosystem adapted/developed. The time period will vary by ecosystem features and data availability. Where actual data is lacking, descriptions of historical conditions will be constructed from a multitude of sources, inferences, and professional judgement.

This step begins with an historic overview that sets the framework for the step. Following the overview are answers to key questions by issue as presented in Step 2.

HISTORIC OVERVIEW

The Lower South Fork watershed falls within the ethnographic boundary of the Scott Valley Shasta Tribe, Karuk, and the Konumihu people. Most activity centered around riverine setting at the confluence of major tributaries or streams. A few villages were located on higher hills among the oaks, and situated near large springs.

Dwelling houses were semi-subterranean with dirt sidewalls and split-board end walls. These houses were only occupied during the winter. In the spring, they were abandoned for brush shelters. Temporary camps, associated with seasonal hunting and gathering, were single family bark houses. Later in the fall, during hunting expeditions, they camped in the open.

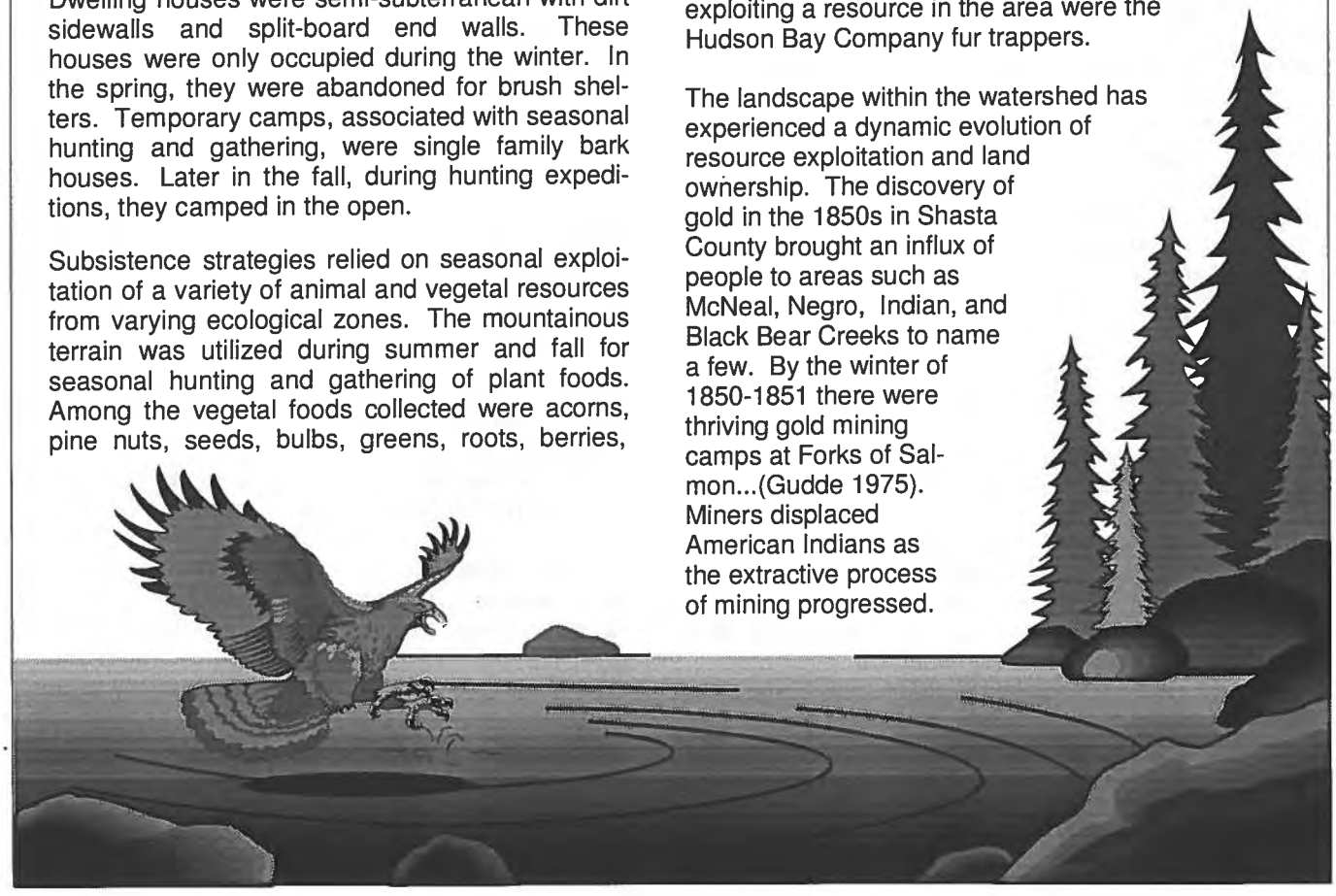
Subsistence strategies relied on seasonal exploitation of a variety of animal and vegetal resources from varying ecological zones. The mountainous terrain was utilized during summer and fall for seasonal hunting and gathering of plant foods. Among the vegetal foods collected were acorns, pine nuts, seeds, bulbs, greens, roots, berries, and other fruits. Non-vegetal foods included deer meat, bear, small mammals, salmon, trout, suckers, eels (Pacific lamprey), crawfish, turtles, mussels, fowl, insects, and grubs. Mountain lion and wildcat were also hunted. Manzanita berries were used as a cider drink and milkweed was a source for chewing gum.

Shasta Indian land management practices included burning for wild seed and tobacco crops. Fire was also used during deer hunting in late fall when the Shasta would encircle the deer with fire. Fires were also set on the hills in the fall when the oak leaves began to fall. Subsequently, areas which had new growth of hazel and beargrass were visited by basket weavers. These areas were visited two to three years after the area had been burned.

Existing literature does not address the use of high mountain spiritual or ceremonial areas. Holt (1977, page 335), however, does mention that "during a certain moon each year...boys and young men went alone on dark, stormy nights to a certain rocky point and piled stones. This was to make them brave..."

In the 1820s and '30s, the first Euro-Americans exploiting a resource in the area were the Hudson Bay Company fur trappers.

The landscape within the watershed has experienced a dynamic evolution of resource exploitation and land ownership. The discovery of gold in the 1850s in Shasta County brought an influx of people to areas such as McNeal, Negro, Indian, and Black Bear Creeks to name a few. By the winter of 1850-1851 there were thriving gold mining camps at Forks of Salmon...(Gudde 1975). Miners displaced American Indians as the extractive process of mining progressed.



Initially, placer gold was taken from old bench gravels and river tributaries which yielded substantial amounts of the metal. Placer mining could be performed by one individual or several men and did not require a large expenditure of capital especially when compared to later mining technologies. The Chinese followed the miners and successfully recovered gold by re-working old claims.

Hydraulic mining began in the area sometime after 1850 and operations were oftentimes concurrent with that of hard rock and dredge mining. This form of mining may have existed into the 1930s along with dredge and small-scale, depression-era placer mining.

During the 1860s and early 1870s, Elisha Mancell (Deacon) Lee became well-known for delivering heavy mining equipment to Black Bear Mine, on Black Bear Creek. The trail originated at Wildcat Creek and partially followed an old Indian trail to the mine. (The Black Bear Mine became one of the most productive gold quartz mines in the area). The Deacon Lee Trail also was part of a trail system that linked Callahan to the Salmon River mining region.

A post office was established at the Black Bear Mine during the summer of 1869, and stayed open until August 1941. Yocumville which is located at the mouth of Methodist Creek also maintained a post office from June 1889, to March 1891.

The Gilta Mine within the Knownothing Creek drainage, see Figure 4-1 Historic Features, contained in the Map Packet located at the end of this document, was established in 1892 and was instrumental in the establishment of the first private phone company in the Siskiyou County.

King Soloman Mine was established in the early 1890s along Matthews Creek. Like many mines of that era, they were as self sufficient as possible and maintained a sawmill, cook house, essay office and stamp mill.

Fresh fruits and vegetables were hard to come by in the mining camps and many available flats that were not needed for the mine operations or had potential for a find, were put into production for fresh vegetables.

Mules, horses and oxen were also used extensively for mining and hauling heavy freight. Fields were cleared for growing hay adjacent to the Forks of Salmon area and upslope from the river in the Blue Ridge Ranch vicinity.

The Civilian Conservation Corps changed the transportation system dramatically in the early 1930s. Many trails were constructed for fire suppression access but more importantly the Bacon Rind Road (connecting Cecilville with Sawyers Bar) was built to high standards for vehicle traffic. Construction of the Bacon Rind road and the road along the South Fork of Salmon made the communities readily available for cost effective transportation of goods and services.

The Forest Reserve (later the Forest Service) established the Klamath National Forest in 1905 through provisions of the *Organic Act of 1897.* Early management emphasized fire suppression, trail work, and road improvement to rural communities. Starting in the 1960s, timber harvest became an increasingly important activity within the watershed.

Prior to the 1960s timber harvest was done on a small scale in conjunction with mining operations. In the 1960s timber was harvested on a larger scale. However, most timber harvest was done following the large fires that occurred in the area; the Hog Fire in - 1977 and the Glassgow Fire of 1987.

WATERSHED PROCESSES

Key Question 1- What were historical (pre-Euro-American settlement) and reference erosion rates, and what disturbances affected them?

Erosion rates previous to Euro-American settlement were influenced by natural erodibility and instability, the occurrence of flood events, and natural wildfire or American Indian burning. The geomorphology of the area was basically the same as today with similar processes as described in Step 3. Active landslides, inner gorges, toe zones of large earthflows, and other unstable features provided the majority of sediment to streams during periodic flood events. The timing and frequency of floods was primarily dependent on heavy rainfall or rain-on-snow climatic events.

While flooding provided the mechanism to trigger large inputs of sediment to streams, fire was the primary upslope disturbance. Fires, either lightning or human started, frequently burned through the area and impacted watershed conditions. Fires were generally of low intensity with some patches of high intensity in upslope areas. Fires were less common and of lower intensity in riparian areas due to the low slope position and moist conditions, refer to the Vegetative Biodiversity section later in this step. Fires increased erosion and landsliding, especially when high intensity fire occurred on granitic soils.

Fire recurrence intervals in pre-settlement times have been studied in the Klamath Mountains area but the watershed impacts of these fires are not well known. Most burned acreage was likely burned at low intensity but patches of high intensity fire certainly occurred at various times and places. Therefore, while pre-settlement fire is acknowledged to have caused watershed disturbance historically, quantifying historic effects of wildfire is difficult. For modeling purposes, reference watershed conditions are considered pristine; no effects of fire or other disturbance.

RIPARIAN AREAS

Key Question 1- What are the historic and reference riparian conditions in the watershed?

Limited information exists pertaining to riparian conditions prior to Euro-American settlement based on historical accounts. The high gradient streams in the Lower South Fork were probably dominated by upland tree species, except for narrow riparian vegetation strips along larger streams with small floodplains or areas recently disturbed by flooding and debris scour. Intermittent streams had vegetation little different than adjacent uplands. The harsh site conditions discussed under the Vegetative Biodiversity section in Step 3 would have influenced stand structure along the streams.

A review of 1944 air photos shows that, in general, many upland areas have few large trees or relatively open tree canopies, likely because of site limitations and the affect of frequent fires that burned through the watershed. Riparian areas appear to provide a greater proportion of dense, large tree stands than adjacent uplands with the exception of south facing streams such as Negro Creek. Apparently, the frequent fires that periodically reduced tree densities in the mid to upper slope areas and on south slope riparian areas had relatively minor effects in riparian areas on northerly aspects. Many riparian areas probably had older conifers at densities near site potential, although wildfire and infrequent severe flooding with debris torrents would decimate vegetation in certain locations. Overall, about 40 to 60% of riparian areas supported dense stands of large conifers.

The 1944 photos also reveal extensive floodplain mining impacts along the South Fork and several tributaries. Riparian vegetation was severely impacted in places by hydraulic mining and also by mining camps and other settlements.

Little, if anything, is known about fish habitat conditions prior to mining operations. It is assumed the habitat was in good condition to support the salmon and steelhead populations that were said to exist by miners and R. D. Hume in Snyder's (1931) report. The extent of damage that mining had on the physical characteristics of the streams, including pools, fine sediments, riparian vegetation, and stream channels is unknown, however can probably be considered extensive.

The maximum water temperature recorded in the Salmon River during the summer of 1934 was 77.5º F. During this time period, the streams were lower than they had been during the previous decade and hydraulic mining was still occurring on the Salmon River. Water quality conditions were considered fair and had "improved over 1933 when the Salmon River was at times very badly polluted (Taft and Shapovalov 1935), and Moffett and Smith (1950) state that the Klamath River and many of its tributaries "ran silty".

Factors affecting riparian habitat quality may vary from stream to stream, however, the physical and biological components that create and maintain aquatic habitat are similar. These components are important within the aquatic, semi-aquatic, and surrounding riparian and upslope area and are able to sustain the character of a stream corridor. They are also continually changing as ecological processes within the watershed modify and reshape the habitat. Together, these components maintain and restore productivity and resilience in a fully functioning aquatic ecosystem. The following describes how these components contribute to a fully functioning aquatic ecosystem.

Upslope processes are critical in providing and maintaining suitable amounts and intensities of water flow, and natural delivery mechanisms of sediment without accelerated rates of erosion and sediment yield. Headwater areas are important for exchange of water, sediment, and nutrients. The timing, magnitude, and duration of peak and low flows is critical to sustaining aquatic habitat and patterns of sediment, nutrient, and wood routing.

Riparian areas are essential in maintaining stream temperatures, dissolved oxygen levels, and other elements of water quality. They also ensure large wood recruitment, stabilize the channel, provide for filtration of sediment, and increase habitat diversity.

Forested riparian ecosystems should have a diversity of plant communities. Late-seral stages in a community should predominate and consist of endemic conifer and hardwood species, with intermingled areas of early-seral stages such as grasses and forbs. Ideally, this should be a multi-layered canopy including signs of decadence such as standing and fallen dead trees. An overstory of conifers should provide future recruitment of large wood, and shade and thermal cover of the streams and lakes. An intermediate layer of mixed deciduous and coniferous vegetation should provide thermal buffering, nutrient cycling, bank stability, and recruitment of terrestrial insects as an aquatic food source. The vegetative canopy should provide stream surface shading during the summer and should be at site potential.

Wet meadow areas should have stable overhanging banks with herbaceous vegetation and/or woody vegetation providing canopy cover, bank stability, and sediment filtration. The water table should be near the meadow surface, with the stream meandering through. Few signs of gullying or compaction should be apparent.

Diverse and complex instream habitats are essential for all life stages of aquatic species and should include

large, deep pools for holding and rearing. Large woody material is critical for maintenance of these diverse habitats as it maintains stream channels and provides a source of cover through a range of flows and seasonal conditions. A diverse substrate is necessary with small percentages of fines and embeddedness for successful egg and alevin development. Sub-surface interstitial areas are also critical for invertebrates and juvenile fishes. An abundance of cool, well-oxygenated water, free of excessive suspended sediment is important for aquatic species production and survival.

Reference conditions for instream habitat components within the watershed have been identified in wilderness streams within the Wooley Creek watershed and in unmanaged streams within the Dillon Creek watershed. A detailed analysis of reference habitat conditions is found in *Salmon River Basin Fish Habitat and Channel Type Analysis*, by EA Engineering. The following information was taken from this report. Table 4-1 Reference Habitat Parameters, displays values for reference streams with Rosgen channel classifications similar to those of the streams within the analysis area.

TABLE 4-1 REFERENCE HABITAT PARAMETERS

Stream	Stream Reach	ROS Channel Type 1/	Avg L WM Coverage (%) 2/	Primary Pool Freq 3/ (pools/mi)	Shannon Diversity Index 4/	Avg % Shade	Avg % Embeddedness	Avg % Surface Fines	% Run	% Riffle	% Pool
Wooley	1	F2	0.25	16.93	1.0132	10.7	31.33	13.67	12.80	35.80	51.40
Dillon	2	F2	0.02	14.00	1.0739	9.5	21.25	19.77	33.06	27.12	39.82
Dillon	1	C3	0.00	7.22	0.9369	1.5	27.40	26.40	51.22	39.30	9.48
Hancock	1	A2	3.75	12.15	1.1587	74.38	21.14	7.96	39.42	7.70	52.87
Steinacher	2	A2	2.27	23.07	1.1793	76.40	24.09	12.12	29.72	34.58	35.70
BSkull	1	A2	2.38	0.00	1.0627	94.9	N/A	10.80	58.80	19.95	21.25
Bridge	1	A2	1.02	23.79	1.1329	61.58	9.50	5.17	34.27	28.58	37.15
Deer Lick	1	A2	0.86	3.33	1.1528	99.80	20.00	12.58	54.38	18.26	27.36
Bridge	2	B2	1.48	1.84	0.9285	54.50	15.00	17.78	51.25	30.5	18.18
Rock	1	B2	4.63	0.00	1.1577	77.94	30.00	12.75	39.28	32.65	28.07
Copper	2	B2	0.00	9.25	1.0297	15.00	18.33	5.00	74.28	18.24	7.47
NFDillon	10	B2	1.08	14.17	0.9810	41.30	16.88	3.75	83.88	10.21	5.91
Steinacher	1	B2a	2.13	28.18	1.1179	N/A *	N/A	N/A	23.61	38.26	38.13

1/ The Rosgen classification system uses a combination of channel slope, substrate size, stream width to depth ratio, channel entrenchment and confinement ,and sinuosity to assign on of approximately forty different channel types to a specific stream reach (Rosgen 1996).
2/ The percent of total habitat area having large woody material as cover.
3/ Number of primary pools (greater than or equal to three feet in depth) per mile.
4/ (Shannon and Weaver 1949)
* N/A = Not Available

AQUATIC DEPENDENT SPECIES

Key Question 1- What were the population distributions and sizes of aquatic dependent species?

It is difficult to determine the historical population size of salmon and steelhead in the Salmon River watershed, however fish numbers were sufficient to supply the primary subsistence food and be the basis for the economy of the indigenous people prior to the mid 1800s. After 1850 and the discovery of gold in the area, fish populations were subject to additional human impacts including mining, commercial timber harvest, water diversions and dams, artificial propagation, and other historical activities.

Stocks and species of salmonids that existed at the time of cannery development on the Klamath in 1912 included spring and fall run chinook salmon, coho salmon, and steelhead trout. Three fish canneries were operating at the mouth of the Klamath River which was heavily fished for salmon, with no limits. Steelhead trout were an incidental catch since migration times coincide with the salmon. Both Snyder and R. D. Hume in Snyder's (1931) report state that historically the spring run of chinook salmon was the "main run" of salmon and the population was very pronounced. "These spring salmon may be caught in the smaller streams fed by melting snow at the headwaters of Salmon River during the month of June" and have "now come to be limited" and "practically extinct" while the fall run was reduced to "very small proportions" (Snyder 1931). By the mid 1930s it was reported that anadromous fish populations within the Klamath Basin were already significantly jeopardized (Taft and Shapovalov 1935). They also reported "unfortunately no exact recorded facts exist concerning the size of the present and past runs of steelhead in the Klamath River. It would, nevertheless, be perfectly safe to say that the general consensus of opinion of fishermen and residents on the river is that these runs have decreased alarmingly, particularly during the past few years." Suggestions during the early 1930s to determine the decline of the spring run chinook included mining operations, overfishing both in the river and ocean, irrigation, and the building of Copco Dam.

Mining also had other impacts to the Klamath fishery. "During the period of placer mining, large numbers of salmon were speared or otherwise captured on or near their spawning beds, and if credence is given to the reports of old miners, there then appeared the first and perhaps major cause of early depletion" (Snyder 1931). Taft and Shapovalov (1935) studied occurrence of benthic invertebrates in Klamath River tributaries and found mined areas had consistently fewer organisms than non-mined areas.

Many dams were built in the Klamath system to divert water for mining, agriculture, and domestic use. These dams and diversions blocked salmon and steelhead from more than 200 miles of spawning and rearing habitat along Klamath River tributaries (CDWR, 1960 from CH2MHill). Unscreened or poorly screened water diversions and ditches resulted in a significant loss of juvenile fish which Taft and Shapovalov (1935) reported as the "most serious present loss of trout and salmon". During their review of Klamath River ditches most were found to contain juvenile fish. In a survey of diversions in the Klamath basin, the Salmon River basin had six diversions with a history of screens (working or not), 37 diversions needing screens, and 21 diversions reported as not needing screens.

Artificial propagation began within the Klamath River Basin in 1896 when eggs taken from a tributary to the Sacramento were raised to fry and introduced into the upper Klamath. Eggs from the Sacramento River were also taken in 1907, 1911, 1913, and 1917 for a total of 4,950,000; these were released in the Klamath River. A small hatchery was established at the mouth of the Klamath River in the 1890s that released fry originating from the Rogue River and after Copco Dam was established a hatchery was developed at Fall Creek (Snyder 1931). The affects these historic hatcheries and resulting fish had on the Salmon River watershed is unknown. A hatchery was also built to mitigate the affects Iron Gate Dam would have on the salmonid fishery. Since 1991, no fish plants have occurred in the Salmon River because of increasing concerns over genetic pollution of the wild fish and competition for food and space between hatchery and wild stocks.

VEGETATIVE BIODIVERSITY

Key Question 1- What was the historic distribution and pattern of vegetation in the watershed; including late-successional and dispersal habitats?

The result of the natural disturbance regimes was a mosaic of dry meadows, shrubfields and open stands of hardwoods and conifers. The best available information on the historic vegetative conditions are the 1944 aerial photos. Analysis of the 1944 photos shows for the most part, open stands of hardwoods and conifers with dense stands limited to the lower half of north slopes and drainage bottoms. Openings in the forest were prevalent. Open grass and shrub slopes, shrubfields, and patches of small trees are found throughout the watershed. The picture from the 1944 photos is that of a structurally diverse landscape.

In the low elevation grass and shrubfields, frequent high intensity fires were the most common natural disturbance. Frequent high intensity fires eliminated any competing conifers and helped perpetuate shrubfields in the landscape. This community grows into dense patches and is ready to burn within a few years after burning. Plants in this community have adapted to

this frequent fire regime by crown sprouting after a fire and/or by sprouting from seed banks in the soil.

In the oak woodland frequent low to moderate intensity fires maintained an open understory and a scattered large tree overstory. The frequent low intensity fires cleaned up the surface litter and removed concentrations of small trees. The mature trees were resistant to damage by low intensity fires. The frequent burning stimulated acorn production, which was important to American Indians and many wildlife species.

In the conifer communities, which in total cover the largest area of the watershed, frequent, low intensity fires were the primary ecological process shaping them. These fires varied in frequency and intensity depending on their position on the slope, the steepness of the slope, aspect, elevation, time of year, and size and density of the trees. With frequent influence by fire, the understory of these stands was maintained relatively open, with few sapling and pole-size trees or shrubs. Frequent fires cleaned the forest floor of litter and understory vegetation. Some sites experienced fire less frequent than others. These were found mostly on north and east aspects and riparian areas, where a thicker understory of shade-tolerant vegetation was often present. Even these areas were maintained with much less coarse woody material and fewer snags than found on these sites today.

Above the mixed conifer was found the true fir community that had a different fire regime. This higher elevation community was much cooler and moister than the mixed conifer which resulted in less widespread fire activity. Fires were mostly limited in size, with infrequent large fires. True fir are very sensitive to damage by fire and even low to moderate intensity fires can kill large trees. The small fires normally would kill trees in small patches and natural regeneration created patches of even-aged and even-sized trees across this community.

In the higher elevation areas of meadows, and shrubfields intermixed with small patches of trees, lightning fires were common, but moist conditions and lack of fuel continuity limited the spread and intensity of these fires.

Key Question 2- What were the historic disturbance regimes?

The natural disturbance regime for the watershed was dominated by fire. Natural fires were ignited by lightning. Fires were also ignited by American Indians to enhance acorn production and facilitate gathering in oak woodland communities, provide good quality stems for basket making material, improve seed production of grasses, improve travel, and to facilitate hunting. The vegetation in all plant communities developed and adapted to a disturbance regime dominated by fire.

A fire history study (Wills 1991) done in the watershed identifies a frequent pre-settlement (1742-1849) fire return interval, ranging from 5-41 years, with the mean range of plots being 10-17 years. The study area is located in the Hotelling Gulch area, in a Douglas-fir/live oak vegetation type, at elevations ranging from 2,950'-3,200'.

Endemic levels of insects and diseases have always been present in the landscape. However, the amounts of these infestations were probably less prior to active fire suppression activities (circa 1910) than today. Decreases in natural stand densities were largely due to mortality from lightning strikes, minor insect activity, and until recently, ground fires. This kept stocking at or below site capacity which tended to moderate the amount of mortality experienced during drought periods. Root disease pockets, blowdown, or areas which escaped American Indian underburning, would accumulate fuel. This would eventually promote a hot fire and develop a mosaic of size and age classes over the landscape. Also, because there were less incidence of high stocking levels, and resultant competition for moisture and nutrients, vegetation remained more vigorous overall and less susceptible to large scale mortality.

Broad scale mortality in natural stands in California ranges from 0.2 to 0.5% of the standing volume per acre per year. Natural mortality due to lighting strikes, insects, and disease is approximately 0.2%/ac/yr. (personal communication David Schultz PSW Entomologist).

FIRE AND FUELS ORGANIZATION

Key Question 1- What has been the history of fire suppression and fuels treatment in the watershed?

Fire suppression efforts on Forest lands began when the Klamath Forest Reserve was established in 1905. Early records (R. W. Bower 1978) indicate that around 1910 the Forest Service experienced problems with human-caused fires. This was attributed to cultural burning, forage improvement, carelessness, and people hoping to get employment in fire suppression. Effective fire suppression began in the watershed around 1920, after WWI, when more men became available to fight fire. The *New Deal* and Civilian Conservation Corps. of the 1930s gave fire suppression a dramatic boost of personnel, equipment, and facilities.

Fire control, suppression of all fires, was the goal until the early 1980s when some fires were allowed to burn within contained areas.

Fuels treatment has been used as a tool for site preparation after harvest to remove slash and create openings to plant trees. In recent years, some prescribed burning has been done to improve deer winter range habitat in O'Farrill Gulch.

TERRESTRIAL WILDLIFE

Key Question 1- What was the historic distribution of habitats for the identified species?

In this watershed, patterns of vegetation types are quite stable, while seral stage distribution is quite dynamic. Except for the areas that burned with high intensity in 1977 and '87, the distribution of habitats in the past would have been similar to the habitat distribution seen today. At most times in the past, the large blocks of early-seral would not have been found. However, based upon analysis of the 1944 air photos, early-seral habitat was distributed across the watershed, indicating that habitat for identified wildlife species was maintained.

A significant difference between historic and current habitats is the possibility of bald eagle use in the watershed. In the past, large anadromous fish runs would have provided a food source for them.

ROADS

Key Question 1- Why and how was the road system developed?

The road system has been developed over the years primarily in association with resource development and/or extraction. Road construction initially followed old trail alignments and centered around providing access for workers and equipment to mines. Peak construction periods occurred in the late 1890s and late 1920s during boom mining cycles. In the 1930s, roads were constructed for fire access by the Civilian Conservation Corps. A fourth surge of road construction occurred when the Forest Service began offering timber sales in the 1960s-1980s. These road systems were developed into new areas for log transport.
See Appendix G - Numerical Listing of Roads and Their Status, which identities the approximate date built of individual roads or road segments, see Figure 4-2 Road System Development by Decade, contained in the Map Packet located at the end of this document.

COMMERCIAL TIMBER OUTPUTS ON PUBLIC LANDS

Key Question 1- What, where, and how was timber historically harvested in the watershed?

Significant logging took place in the watershed during the periods of intensive gold mining activity in the late 1800s and early 1900s. Areas were logged or cleared for mining operations or for use as supports in mine adits.

The most recent period of logging activity began 35-40 years ago. Most of the recent logging has been regeneration cuts and fire salvage. These areas have been planted with conifers and are generally adequately stocked. The oldest plantations are abut 35 years old and some will be ready for a commercial harvest within five to ten years.

HUMAN USES

Key Question 1- What were prehistoric and historic land uses within the watershed?

See the *Historic Overview* write-up at the beginning of this step, also see Figure 4-1 Historic Features, which displays some features found in the watershed.

Step 5 - Interpretation

INTRODUCTION - This chapter begins with a brief outline of planning direction as it applies to the Lower South Fork watershed. Included with planning direction is a brief overview of management areas and a summary of desired conditions by management area. Following the management area overviews are answers to the Step 5 key questions by issue as outlined in Step 2. Issue-specific desired conditions based on *Forest Plan* guidance and landscape characteristics are also discussed.

PLANNING DIRECTION

The planning direction for determining desired conditions is derived from all appropriate laws and administrative direction, including the *Record of Decision of the Northwest Forest Plan* (*ROD*). The *ROD* provides standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. The *ROD* establishes a system of Late-Successional Reserves (LSRs) to provide habitat and connectivity for late-seral dependent wildlife species. The *ROD* also establishes the *Aquatic Conservation Strategy* (*ACS*) to restore and maintain the ecological health of watersheds and aquatic ecosystems. The *ACS* includes establishment and management of Riparian Reserves and Key Watersheds, completion of Watershed Analysis, and watershed restoration.

The *Forest Plan* incorporates the *ROD* and *Aquatic Conservation Strategy*. The *Forest Plan* identifies land allocations, desired conditions, and standards and guidelines for the National Forest lands. This analysis incorporates and relies on the *Forest Plan*. A brief summary of the *Forest Plan* land allocations and desired conditions follows to provide a basis for the desired conditions presented later in this chapter.

The Lower South Fork is part of the Salmon River Key Watershed. All direction specific to Key Watersheds applies to the Lower South Fork. Of specific concern is the stipulation that there will be no net increase in the amount of roads in Key Watersheds. If new roads are constructed in Lower South Fork, a corresponding amount of road must be decommissioned somewhere in the Salmon River sub-basin.

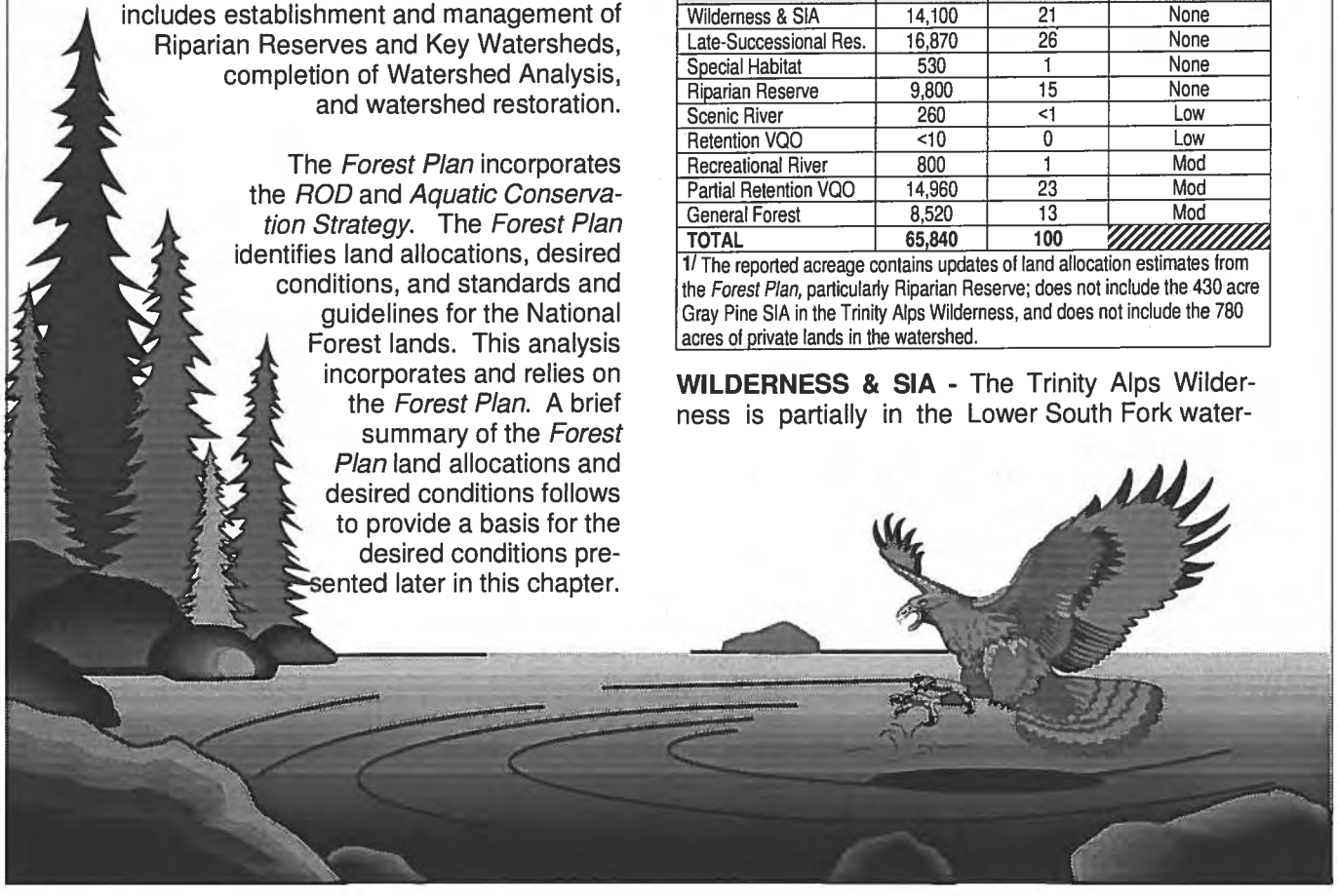
National Forest lands in the analysis area are divided into nine *Forest Plan* management areas; Wilderness, Late-Successional Reserve (LSR), Special Habitat, Riparian Reserve, Scenic River, Retention Visual Quality Objective (VQO), Recreational River, Partial Retention VQO, and General Forest. Inside the Trinity Alps Wilderness, at the mouth of Plummer Creek, is the Gray Pine Special Interest Area (SIA). Because this SIA is entirely within wilderness, it is not a land allocation, rather a subset of the Wilderness land allocation. Figure 1-2 *Forest Plan* Management Areas Updated During This Analysis, contained in the Map Packet located at the end of this document, shows the distribution and Table 5-1 Management Area Acreage, displays acreage of each area.

Table 5-1 Management Area Acreage

Management Area	Acreage 1/	% NF Lands	Scheduled Timber Harvest Level
Wilderness & SIA	14,100	21	None
Late-Successional Res.	16,870	26	None
Special Habitat	530	1	None
Riparian Reserve	9,800	15	None
Scenic River	260	<1	Low
Retention VQO	<10	0	Low
Recreational River	800	1	Mod
Partial Retention VQO	14,960	23	Mod
General Forest	8,520	13	Mod
TOTAL	**65,840**	**100**	

1/ The reported acreage contains updates of land allocation estimates from the *Forest Plan*, particularly Riparian Reserve; does not include the 430 acre Gray Pine SIA in the Trinity Alps Wilderness, and does not include the 780 acres of private lands in the watershed.

WILDERNESS & SIA - The Trinity Alps Wilderness is partially in the Lower South Fork water-



shed. Wilderness areas are to be managed for wilderness characteristics, natural conditions, and ecological processes. They are to provide primitive or semi-primitive, non-motorized recreational opportunities. Lightning caused fires are to be treated as prescribed natural fires provided they meet management objectives, otherwise they will be treated as wildfires and suppressed with minimum impact suppression techniques. Wilderness management objectives have not been completed for the Trinity Alps Wilderness and most lightning fires are suppressed. A fire plan is needed to define objectives and prescriptions for prescribed natural fire. Management ignited fires are permitted to allow fire to return to a more natural role, although planned ignitions in wilderness have not been attempted on the Klamath National Forest.

The Gray Pine SIA highlights a stand of gray pine near the northernmost extent of its range. This SIA is to provide recreational and educational experiences concerning gray pine consistent with wilderness objectives.

SPECIAL HABITAT - A portion of the Eddy Gulch LSR is within the analysis area, in Black Bear and Matthews Creek drainages, but the majority is to the north and east. The Bowerman LSR is entirely within this watershed and is located between the forks of Knownothing Creek, extending east to Methodist Creek. In addition, a Special Habitat area is designated along Knownothing Creek to provide habitat protection around a peregrine falcon eyrie. The goal of Special Habitat management areas is to provide habitat for late-seral dependent wildlife and other terrestrial T&E species over the long-term.

RIPARIAN RESERVES - Riparian Reserves are for the protection of aquatic dependent species and to provide late-seral connectivity between LSRs. Riparian Reserve acreage is approximated for this analysis as described in Step 3 - Riparian Reserves, although the value in Table 5-1 includes only National Forest lands outside Wilderness, LSR, or Special Habitat management areas. Riparian Reserve boundaries on-the-ground are to be determined by project and may vary from mapping done for this analysis. Riparian Reserve Standards and Guidelines apply on any National Forest land, within and outside Wilderness, LSR, and Special Habitat management areas, but does not apply on private lands.

WILD AND SCENIC RIVERS - The South Fork Salmon River is a designated National Wild and Scenic River. The portion of the South Fork Salmon downstream of Matthews Creek is classified Recreation River and the portion upstream of Matthews Creek is classified Scenic River. The boundaries of the Wild and Scenic River corridor were established in the *Forest Plan*. In the Recreational segment corridor, timber harvest is allowed (outside of the Riparian Reserves) but should meet Partial Retention VQO. In the Scenic segment, timber harvest and other activities should meet Retention VQO. Timber output expectations are the same as for Partial Retention and Retention VQO management areas respectively.

RETENTION, PARTIAL RETENTION, AND GENERAL FOREST - The Retention VQO, Partial Retention VQO, and General Forest management areas have timber harvest expectations and scheduled yields. The primary difference is the visual quality objectives. Retention VQO provide attractive scenery by maintaining natural or natural appearing conditions. The expectation for timber output is low, about five percent of standing volume per decade, because of the visual considerations. Partial Retention is intended to provided an attractive landscape where management activities remain visually subordinate to the natural character of the landscape. General Forest areas have less restrictive VQOs of either modification and maximum modification. Timber outputs are considered moderate for the Partial Retention and General Forest areas, approximately 16% of the standing timber volume harvested per decade.

WATERSHED PROCESSES

Key Question 1- Are there changes between current and reference/historical erosion rates and what are their causes?

There is a general increase in current erosion rates compared to reference/historical erosion rates. Much of the increase is directly attributed to the wildfires in 1977 and 1987. While wildfire has always played a role in the watershed, the intensity and extent of recent fires is probably greater than what generally occurred under reference conditions, especially in the Indian and Negro subwatersheds. Any surface erosion increases from recent wildfires has probably recovered to near reference condition, but increased landslide potential and channel erosion still exist.

Roads constitute a large percentage of increased erosion rates. Roads increase landslide, surface, and channel erosion over the long-term, until a road is decommissioned and has become revegetated or has been obliterated. Erosion impacts of individual roads are variable, from large erosion increases to erosion increases a little above background rates. Fixing known road erosion problem sites is the best way to decrease erosion rates from roads.

Timber harvest, including salvage, has also contributed to current increased erosion rates. While some harvest has minimal impact (salvaging only dead trees after a high intensity wildfire), regeneration harvest and fuel treatment of green trees has a larger impact. Differentiating between harvest impacts and fire impacts in the Lower South Fork watershed is difficult because of the extent of wildfire and salvage harvest.

Landslide sediment production modeling is one way to estimate increases in erosion rates. The landslide model used is the Salmon River sediment model, which is used across the Klamath National Forest. Modeled landslide volumes are estimates and should not be used as absolute values. However they do provide a basis for comparison. Two different landslide volumes are compared in this analysis. The first is current condition, modeled by overlaying the wildfire, roading, and intensive timber harvest acres (displayed in Step 3) with the geomorphic terranes and multiplying by landsliding rates. The second is a hypothetical reference condition, assuming the watershed is in pristine condition with no natural or management disturbances. Reference condition does not reflect actual historic condition with the influence of fire, as discussed in Step 4, but does provide a consistent basis for comparison. Results of the modeling for the nine analysis subwatersheds are displayed in Table 5-2 Subwatershed Landslide Volumes. The process used for modeling landslide rates is described in Appendix B - Cumulative Watershed Effects.

Table 5-2 Subwatershed Landslide Volumes 1/

Subwatershed	Current Condition	Reference Condition	% Over Reference	Over Threshold? 2/
Plummer	2.7	2.6	2	No
Jennings	6.1	3.5	76	No
Matthews	4.1	2.2	87	No
Black Bear	4.5	2.5	84	No
Indian	9.3	3.9	138	No
Methodist	4.7	2.9	62	No
Negro	10.0	3.9	158	No
Knownothing	6.3	3.1	103	No
McNeal	10.6	4.2	154	No

1/ All landslide volumes are expressed as cubic yards per acre; based on landslide producing event or events with similar impacts to the floods of 1970-1974.

2/ A percent over reference exceeding 200% is considered over threshold.

Other models also exist for the prediction of surface erosion and channel erosion. These models use many of the same parameters as the landslide model (e.g., the extent of watershed disturbance and soil types) but use different computations. Some channel erosion models closely parallel the landslide model and show similar results. Surface erosion models also parallel the landslide model although faster recovery rates for surface erosion, and a different way of handling soil types, can result in different answers in surface erosion models. Also, for surface erosion models to reasonably approximate actual conditions, site-specific data are needed. For example, road conditions such as surface type, wet weather use, template, and condition of cut and fill slopes impact surface erosion rates. This information was not available for this analysis and the surface erosion model was not used.

Key Question 2- What are the hydrologic /erosional concerns in the watershed and what management strategies should be used for each subwatershed to minimize impacts from watershed processes?

The landslide model gives some indication of erosional concerns for each subwatershed. The Forest Plan uses 200% over reference in the landslide model as an indicator that a subwatershed is over threshold and may have some erosion concerns that would affect management. For the Lower South Fork, none of the subwatersheds are above this level in the landslide model.

Another modeling technique used in the *Forest Plan* is the Equivalent Roaded Area (ERA) methodology. The ERA model provides a simplified accounting system for tracking disturbances that affect watershed processes. This model, while not intended to be a process-based sediment model, does provide another indicator of watershed conditions. The methodology combines roaded acres with acres of other disturbance, using coefficients which equate other types of disturbance to an equivalent acre of road. The amount of roads and intensive timber harvest are presented in Step 3 for each subwatershed in the Lower South Fork. These are multiplied by coefficients presented in Appendix B. The sum of the disturbances (ERA) is divided by the area of each subwatershed to arrive at a relative disturbance rating, percent ERA.

The percent ERA is then compared to a Threshold of Concern (TOC). The TOC is derived considering the beneficial uses, channel sensitivity, erosion potential, hydrologic response, and slope sensitivity for each subwatershed, as discussed in Step 3. These factors are combined in an algorithm that determines the TOC (refer to Appendix B). In general, a lower TOC indicates a greater chance of having watershed impacts than in an area with a higher TOC given the same amount of watershed disturbance. The TOC is compared to the percent ERA for each subwatershed to determine a risk ratio; values are displayed in Table 5-3 Equivalent Roaded Area and Threshold of Concern.

Table 5-3 Equivalent Roaded Area and Threshold of Concern

Subwatershed	% ERA	Threshold of Concern	Risk Ratio	Over Threshold? 1/
Plummer	0.6	8.5	0.07	No
Jennings	6.4	7.5	0.85	No
Matthews	2.4	9.0	0.26	No
Black Bear	6.8	7.0	0.97	No
Indian	18.0	5.5	3.27	Yes
Methodist	6.9	6.5	1.07	Yes
Negro	15.6	6.5	2.40	Yes
Knownothing	6.7	6.0	1.11	Yes
McNeal	12.3	5.5	2.23	Yes

1/ Over threshold occurs when the risk ratio equals or exceeds 1.0.

A risk ratio of greater than 1.0 means that a watershed or subwatershed is over threshold. Over threshold has been interpreted as approaching an unacceptable level of cumulative watershed effects. Five of the Lower South Fork subwatersheds have a risk ratio of 1.0 or greater as determined by this analysis.

However, detailed watershed conditions of all subwatersheds will be discussed.

The Plummer Creek and Matthews Creek subwatersheds each have low risk ratios and relatively low percent over background values in the landslide sediment model. Plummer Creek is entirely in wilderness with no roads and little effect from past wildfires. Matthews Creek has a moderate road density, some past timber harvest, and almost no effects from past wildfire. Neither of these two subwatersheds currently have significant watershed concerns. Any activities consistent with the management area desired conditions in these subwatersheds are appropriate with the proper NEPA documentation and project cumulative watershed effects analysis.

The Jennings, Black Bear, Methodist, and Knownothing subwatersheds have percent ERAs near or exceeding the respective TOCs. The Jennings subwatershed has the lowest risk ratio of the four (0.85) and a relatively low percent over reference in the landslide model (76%). Adverse stream effects were not noticed in this subwatershed during the January, 1997 flood. Additional watershed disturbance activities may be appropriate in this subwatershed; subject to NEPA analysis.

The Black Bear subwatershed has a risk ratio just under threshold (0.97) but a fairly low percent over reference in the landslide model (84%). Parts of the Black Bear subwatershed were burned hot in the 1987 wildfires, specifically the Murphy Gulch area, but the majority was lightly burned or outside of the fire perimeter. Adverse stream effects were minimal in the January, 1997 flood. Additional watershed disturbance may be appropriate although project analysis should steer activities away from the highly disturbed locations like Murphy Gulch.

The Methodist subwatershed has a risk ratio of 1.07, just over threshold, but a landslide model percent over reference of 62%, well below threshold. The north end of this subwatershed suffered some high intensity wildfire in 1987 although most of the subwatershed was lightly burned or remained unburned. Settling ponds were constructed in a small tributary draining some high intensity burned areas near the mouth of Methodist Creek. These settling ponds did not fill with sediment until the January, 1997; a result of flooding although may have been related to fire effects. Filling of the settling ponds was the primary stream impact observed in the Methodist subwatershed from the 1997 flooding. Overall, additional watershed disturbance may be appropriate in this subwatershed although not in some of the high intensity burned areas.

The Knownothing subwatershed has an ERA risk ratio of 1.11, over threshold, but a landslide model percent over reference of 103%, below threshold. The 1987 wildfires burned through much of the watershed, especially affecting the West Fork of Knownothing Creek. However, flooding effects in Knownothing Creek and its tributaries were minor during the January, 1997 flood. Overall, Knownothing Creek appears to be functioning at equilibrium, with the possible exception of the West Fork tributaries; Blackberry Creek and Poverty Gulch. Additional watershed disturbance may be appropriate with a project level Cumulative Effects Analysis.

The Indian, Negro, and McNeal subwatersheds each have high risk ratios, well above threshold, although their percent over reference in the landslide model is below threshold. The McNeal subwatershed was highly impacted by the 1977 Hog fire, the Indian subwatershed burned in 1987, and the Negro subwatershed burned through during both wildfire events. Channel scour was evident in Indian Creek after the January, 1997 flood and was also apparent in Negro Creek and Hotelling Gulch (both in the Negro subwatershed). It is uncertain whether significant flood effects occurred in McNeal Creek.

The McNeal subwatershed was salvaged then planted after the Hog fire. Plantations at the head of McNeal Creek are approaching 20 years old and some are in need of precommercial thinning. Although the McNeal subwatershed cannot be considered recovered, stand tending activities are appropriate, as are activities to reduce the chance of future fires. The Indian and Negro subwatersheds are dominated by shrub and young trees. Activities appropriate in these two subwatersheds include those aimed at restoring watershed health (tree planting, some stand tending) and reducing the risk of future fire.

The Indian, Negro, and McNeal subwatersheds all have high undisturbed landslide production estimates; 3.9, 3.9, and 4.2 respectively, due to the large amounts of dormant landslide terrane in each subwatershed. They also have high existing landslide production estimates; 9.3, 10.0, and 10.6 cubic yards per acre respectively. But, because of the high undisturbed landslide production estimates, they do not exceed the *Forest Plan* threshold of 200% over undisturbed.

Key Question 3- Which subwatersheds should be considered Areas with Watershed Concerns, when will they be considered recovered, and how can recovery be promoted?

The Indian, Negro, and McNeal subwatersheds should be considered Areas with Watershed Concerns, see Figure 5-1 Updated Areas with Watershed Concerns, contained in the Map Packet located at the end of this document. They will be considered recovered when overall tree size and stand character approaches some level of site potential, as determined by future analyses. The McNeal subwatershed is closer to

recovery due to the longer time since large-scale disturbance. This subwatershed has older (nearly 20 years old) plantations and thinning may be a benefit. The Indian and Negro subwatersheds have a longer time before recovery because of recent impacts. Tree planting/stand tending would be appropriate, as would the repair of erosion sources (as identified in Watershed Improvement Needs Inventory) and road closures.

The Jennings, Black Bear, Methodist, and Knownothing subwatersheds have high disturbance levels but should not be considered AWWCs. Activities in them should be evaluated carefully so that these subwatersheds do not become AWWCs in the future.

Key Question 4- What are the trends for watershed processes in this watershed?

Effects of the 1977 and 1987 wildfires are continuing to recover as trees become established and grow. Effects of the 1997 flood are also recovering and should be fully recovered in a few years. Road impacts, although small compared to wildfire impacts, will decrease slowly without active treatments. Repair of known road-related erosion problems will help decrease road impacts. Watershed processes should continue toward reference conditions provided future wildfires do not once again severely impact large areas.

DESIRED CONDITIONS

- Have a complete accounting of flood damage with permanent fixes prioritized and funded.
- Roads are a minimal source of eroded sediment.
- Fuels conditions are such that the risk of catastrophic wildfire is small throughout the watershed, particularly in areas with sensitive granitic soils.
- All subwatersheds are managed to remain under cumulative watershed effect thresholds.

RIPARIAN AREAS

Key Question 1- What are the natural and human causes of change between historical/reference and current riparian area conditions?

Mining has been the largest single impact to riparian areas in the Lower South Fork watershed, particularly the large scale placer mining along the South Fork Salmon, both upstream and within the analysis area. Mined-over floodplains and terraces remain poorly vegetated many decades after large-scale mining ended.

A recent impact to riparian areas has been fire. The wildfires of 1977 and 1987 have reduced many riparian areas to early-seral stages, especially in the Indian, Negro, and McNeal subwatersheds.

Roading has also impacted riparian areas. Several roads, including the primary county road through the watershed, are within riparian areas paralleling streams. Only in a few locations do these roads impact the stream channels for long distances, but they do affect riparian conditions. The roads themselves are an impact due to loss of habitat on the road surface, but roads also allow access for additional impacts. Firewood cutting, logging, and off-road vehicle disturbance in riparian areas are made possible in places by roaded access.

Timber harvest has also occurred in riparian areas, mostly in association with fire salvage. Green tree timber harvest has been a minor riparian area impact in the Lower South Fork watershed.

Key Question 2- How do the current riparian habitats compare to optimum habitats?

Reference conditions indicate between about 40-60% of the riparian areas (as approximated using interim Riparian Reserve guidelines) should be in late-seral, dense cover vegetation. Table 3-7 Vegetation Classification in Mapped Riparian Reserves, shows that almost 40% of the riparian areas naturally lack dense tree cover due to site limitations (shallow soils). These areas are probably close to optimum (for site capability) habitat. Of the total riparian areas, 37% is in late-seral, dense cover vegetation. This is slightly less than the range indicated for reference condition. Twenty percent of the total riparian area is in early-seral stages. This percentage is higher than reference condition due mostly to the effects of recent wildfires.

Channel gradients are mainly low in the mainstem of Lower South Fork. The channel is generally a deep gorge, entrenched in boulder or bedrock terraces. Historic hydraulic mining activities contributed coarse cobble and boulders which seem to withstand high flows, keeping the channel confined with a high level of entrenchment. Because of the large substrate size, confinement, and entrenchment, fine sediments are readily flushed from this high transport system.

Good habitat diversity exists throughout the watershed. There are a fair number of pools. This number is strongly influenced by the bedrock dominated landscape. Shade is good in most tributary streams but lacking in the mainstem. There is an overall lack of large woody material, probably due to high transport, confined channels. Water temperatures are low in tributary streams which could pose a problem in the mainstem.

Overall Indian and Negro Creeks have the lowest quality fish habitat with a lack of habitat diversity, shade, and pools. These streams also have high embeddedness and a high percentage of fines.

Habitat reference conditions for instream habitat components have been identified in measurable elements in the *Forest Plan* and by National Marine Fisheries Service to make determinations if stream ecosystems are at a properly functioning condition. These conditions are displayed in Table 5-4 Reference Habitat Components, along with information collected from reference streams within the Wooley and Dillon watersheds. These reference streams are either wilderness streams or reaches that are unroaded and primarily unmanaged.

Table 5-4 Reference Habitat Components

Component	Klamath LRMP	NMFS Matrix	Wooley/Dillon Reference
Water Temperature	Below 70°F	50-57°F	59°F
Fine Sediment	<15% in Spawning Gravel	<12% in Spawning Gravel	12% Overall
Pool Frequency	One Pool Every Three to Seven Bankfull Widths	>30% Pool Habitat by Area	11% of Total Habitat is Pool Habitat
Canopy Cover	80% Surface Shading	Not Applicable	46% Surface Shading
Coarse Woody Material	20 Pieces Per 1,000 Lineal Feet (24" Diameter x 50' Length)	>80 Pieces/Mile (>24" Diameter x >50' Length)	4 Pieces/Mile (>24' Diameter X 50' Length)
Substrate	Not Applicable	Gravel, Cobble Dominant	Gravel, Cobble Dominate
Width/Depth Ratio	Not Applicable	<10	Not Applicable

The extreme temperatures for the various streams is given in Table 5-5 Water Temperature Data for Selected Streams (1990-1994).

Table 5-5 Water Temperature Data for Selected Streams (1990-1994)

Station	Minimum °C	Maximum °C	Date
Black Bear Near Mouth (1990 Only)	-	19.0	Last Half of July
Black Bear -Upper (1991 and '92)	-	16.9	Mid to Late July
Indian Near Mouth (1990 and '92)	-	19.0	Late July
Knownothing (1990 and '91)	-	17.7	Mid July to Mid August
Negro (1990 and '91)	-	18.1	Late July
South Fork (July '90-Sept. '92)	-0.7	24.2	End of Dec.; Mid August 1992

Conclusions drawn from the data are:

- There is a wide variation in stream temperatures between years. The summer of 1992 was exceptionally hot and dry but 1993 was cool and wet. The different climatic conditions had a large impact on stream temperatures. Drought conditions existed throughout the study period, and may have skewed the data from normal conditions.
- Water temperatures in excess of 25° Celsius were recorded seven times in the lower South Fork in 1992, but not at all in 1993. Temperatures in excess of 25° can be lethal to salmonids.
- Upper Black Bear station revealed slightly warmer temperatures in 1991 than in 1988.
- Lower Black Bear stream temperature was warmer in 1992 than in 1988.
- Indian Creek, however, was lower in 1992 than in 1988.
- Knownothing Creek was also lower in 1992 than in 1988.
- Negro Creek had very low summer flow, causing monitoring to be suspended after 1990. Water temperatures were slightly higher in the 1st three weeks of August 1990 than during the same three weeks in 1988. However, the following three weeks were less than in 1988.
- There is a good correlation between watershed size and summer stream temperatures, with the larger streams having warmer peaks.
- Stream temperature increases progressively downstream. While this conclusion is drawn from a larger data set than the South Fork, the limited Black Bear data seemed consistent with this pattern.
- The relationship to shade was not strong, although where shade was lacking, this seemed to cause greater diurnal variation.
- Water temperature is a function of stream flow and air temperature as well as solar radiation.
- The cooling effect of the tributaries is very important, providing thermal refugia for cold water fishes.

Key Question 3- How should Riparian Reserves be delineated on-the-ground and how will final Riparian Reserves compare to the estimates used for this analysis?

Riparian Reserves in the Lower South Fork will be delineated on-the-ground based upon interim Riparian Reserve guidelines stated in the *Forest Plan*.

Interim Riparian Reserve guidelines are used for acreage estimates in this analysis and will be used on-the-ground. However, the extent of riparian features to be found on-the-ground is not known for certain. One aspect of Riparian Reserve unstable lands, has been checked or updated for the Lower South Fork. Inner gorges as mapped have been checked and are a close approximate of actual conditions. Toe zones of dormant slides, another aspect of unstable lands, have been updated for this analysis.

Toe zones were roughly mapped across the Forest for the *Forest Plan* and many toe zones are not yet included in the Forest-wide coverage. Also, nearly all *Forest Plan* toe zones overlap with inner gorges so they add very little acreage to Riparian Reserves. Additional toe zones, and additional Riparian Reserves, have been mapped by an experienced geologist using computer and map tools, with some ground truthing. The time it would take to map the entire Forest is considerable so pieces are being done as opportunities

and needs are presented. This analysis has provided such a need and opportunity.

Additional toe zone mapping was done for this analysis using Digital Elevation Model (DEM) slope interpretations, 1:24,000 topographic maps, air photos, and some field mapping. This refined mapping increased the area of toe zone about 1,900 acres, from 1,700 to 3,600 acres. This increased the area of Riparian Reserve (toe zones not already mapped as active slides or inner gorges) by about 1,600 acres across the watershed. Overall, toe zones make up about twenty percent of dormant landslide terrane based on this updated mapping, compared to nine percent before updated mapping.

The approximate extent of streams in the Lower South Fork was estimated by adding Digital Elevation Model (DEM) streams to the existing 1:24,000 USGS stream coverage. The assumption used for DEM streams is that 15 acres of accumulation (15 acres of land draining to one point) approximates stream origins. This assumption was tested in the Lower South Fork by the Methodist Creek stream study; a study done in the Lower South Fork watershed in the fall of 1996 to provide detailed stream information for this analysis. Stream length information for the study area (about 4,650 acres) is presented in Table 5-6 Stream Mileage for Methodist Creek Stream Study Area.

Table 5-6 Stream Mileage for Methodist Creek Stream Study Area

Type	From USGS and DEM 1/	From Ground Survey
Perennial Streams	8.3	8.3
USGS Intermittent Streams	6.8	6.3 2/
Subtotal	**15.1**	**14.6**
Additional Streams	4.7	10.2
Total	**19.8**	**24.8**

1/ DEM = Digital Elevation Model

2/ The ground survey found USGS intermittent streams over mapped in some locations, hence the decreased mileage of USGS intermittent streams.

In general for this area, the USGS 1:24,000 quads have mapped long streams accurately, occasionally mapping intermittent streams to a further extent than a definable channel can be found on-the-ground. However, the USGS quads do not contain many short stream segments tributary to primary stream channels. The DEM model helps with mapping some of these segments but many more small stream segments can be found only on-the-ground. Even contour crenulation, a method used in many areas that depends on map interpretation, does not pick up small streams. However, other swales that can be identified on maps or located using DEMs are not actually streams with identifiable channels and annual scour or deposition. Overall, ground truth stream mapping will find more miles of streams than will typically be located using maps and computer models.

Increased stream density based on field identified streams has increased Riparian Reserve acreage by about 140 acres in the Methodist Creek study area, from 1,290 acres to 1,430 acres, see Figure 5-2 Methodist Creek Stream Study. This is an increase of about 11%. Considering that the contract area is about 4,650 acres, the proportion of Riparian Reserves increase from 28% to 31% with the additional, ground truthed streams. Overall, using DEM generated streams to supplement USGS streams provides a close approximation of the stream network. Considering that some streams cannot be mapped until found on-the-ground, an additional three percent should be added to Riparian Reserve acreage to compensate for unmapped streams.

Key Question 4- What is the role of Riparian Reserves for terrestrial wildlife habitat and connectivity?

The *Northwest Forest Plan* (*NFP*) and the *Forest Plan* specifically mention Riparian Reserves as contributing to wildlife habitat, especially late-successional habitat, as well as protecting aquatic systems. Terrestrial wildlife habitat and connectivity is a broad issue and is covered, including the role of Riparian Reserves, in the Vegetative Biodiversity section.

Key Question 5- What activities are appropriate in the different types of Riparian Reserves?

Only management actions that are consistent with *ACS* objectives should be implemented within Riparian Reserves. The determination of whether a management action is consistent with the *ACS* depends upon the nature of the action, its timing, intensity, duration, and effect on the riparian environment. There are three different types of management actions appropriate to Riparian Reserves as they relate to the *ACS*, as outlined in the *Riparian Reserve Evaluation Techniques and Synthesis* (1997).

1. **Actions with special standards and guidelines.** Specific standards and guidelines describe how the *ACS* objectives are to be attained for some management actions, such as road construction and mining. An example of specific standards would be the requirement that new culverts or other stream crossings be constructed to accommodate at the 100-year flood level. Guidelines could include recommendations to outslope roadways and locate structures and support facilities for mining outside of Riparian Reserves. See *NFP* Pages C-29 through C-38 and the *Forest Plan* Pages 4-136 to 144 for standards and guidelines relating to actions in Riparian Reserves. For these types of actions, adherence to the specific standards and guidelines ensures that the action is consistent with the *ACS*.

2. **Actions that must be neutral relative to the *ACS*.** Some management actions, such as construction of recreational facilities, grazing, or temporary crossings of Riparian Reserves to facilitate management

of adjacent lands, may be implemented if they do not prevent or retard attainment of *ACS* objectives. Therefore, analysis of the action must include a description of the existing condition, a description of the range of natural variability of the important physical and biological components of a given watershed, and an explanation of how the proposed project or management action at least maintains the existing condition or mitigates the effects of the action.

3. **Actions that must be positive relative to the *ACS*.** Management actions, such as road decommissioning, silvicultural practices, prescribed burning, instream restoration projects, and salvage after catastrophic events, should be implemented when needed to attain *ACS* objectives. That is, such actions must contribute to attainment of at least one *ACS* objective and must not prevent or retard attainment of any of the *ACS* objectives. Therefore, analysis of the action must include a description of the existing condition, a description of the range of natural variability of the important physical and biological components of a given watershed, and an explanation of how the proposed project or management action contributes to attaining the objectives of the *ACS*.

To implement many of the management opportunities in the watershed, activities will take place within Riparian Reserves. Instream habitat improvements, repair of road related erosion problems, reduction of high fuel loadings to reduce the risk of catastrophic fires, and treatment of timber stands for development of late-successional habitat all could take place in the analysis area. Any action proposed to be implemented within Riparian Reserves, whether it be covered under special standards and guidelines, neutral relative to the ACS, or positive relative to the ACS, must be analyzed for its purpose and need, its expected effects on riparian features, how it relates to the nine ACS objectives, and must be documented during the NEPA process.

Key Question 6- What are the trends for riparian areas in the watershed?

The proportion of dense, late-seral vegetation in riparian areas will increase as trees grow larger and older. Some dense, early-seral stands may stagnate as tree densities approach site capacity. Poor site quality areas that result from past mining will slowing improve as vegetation becomes established. Other poor site quality areas will probably change little over time. A future wildfire could impact riparian areas, increasing the amount of early-seral vegetation.

Effects of the 1977 and '87 wildfires are continuing to recover as trees become established and grow. Effects of the 1997 flood are also recovering and should be fully recovered in a few years. Road impacts, although small compared to wildfire impacts, will decrease slowly without active treatments. Repair of known road-related erosion problems will help decrease road impacts. Provided future wildfires do not once again severely impact large areas, watershed processes should continue toward reference conditions.

Overall aquatic habitat should slowly improve over time as the impacts of the fires and floods continue to diminish as the watershed recovers. The mainstem will continue to have a lack of shade and large woody material as it is a bedrock dominated, high transport channel. Indian and Negro Creeks should slowly improve in habitat diversity, as fine sediments are flushed out over time.

DESIRED CONDITIONS

- Mid to late-seral stands in Riparian Reserves are maintained over the long-term at a percentage consistent with reference conditions.
- High quality aquatic habitat exists in all streams with adequate amounts of CWM in streams as site capacity allows.
- Habitat is sufficient for sustainable populations of indigenous aquatic species. Fine sediment in streams is reduced to levels consistent with good quality aquatic habitat.
- Roads, dispersed recreation sites, and other human developments in riparian areas are maintained to achieve attainment of *Aquatic Conservation Strategy* objectives.
- Riparian features are well identified on maps and on-the-ground.

AQUATIC DEPENDENT SPECIES

Key Question 1- What are the natural and human causes of change between historical/reference and current species distribution and population sizes?

The natural and human causes of change that may have influenced current species distributions and population sizes are the same as those impacting riparian areas and aquatic habitat conditions, refer to Step 5 Riparian Areas, Key Question 1. Changes between historical and reference habitat conditions may in-turn, result in changes in aquatic community compositions or the area a specie utilizes at a given time.

Current fish species ranges in Lower South Fork are similar to historic occupation. However, current population sizes are believed to be well below historical levels. The extent that mining, fire, roading, and timber harvest, within the analysis area, have impacted anadromous fish population size is unknown. It is also unknown the extent impacts of natural events and human activities outside the analysis area, such as ocean conditions and commercial harvest, have had on fish population sizes within Lower South Fork.

Key Question 2- What areas are critical for maintenance, protection, and recovery for at-risk species?

The mainstem of the Lower South Fork of the Salmon River is critical habitat for spawning chinook salmon. It is also critical holding habitat for spring chinook and summer steelhead populations. Surveys completed within the entire Salmon River basin show on average that over half of the summer holding populations of both steelhead and chinook occur in the Lower South Fork. In addition Knownothing and Methodist Creeks are critical for spawning steelhead populations.

Because of the overall importance of Lower South Fork to anadromous fish in the Salmon River basin protection of upslope areas from large scale disturbances is critical. It is also critical to maintain cool water temperatures and deep pools in mainstem Lower South Fork throughout the summer months for these populations.

Key Question 3- What are the population trends for aquatic dependent species in the watershed?

Fall chinook populations within the Salmon River Basin have increased dramatically the last two years, primarily as a result of severe restrictions on ocean harvest of the species. The South Fork Salmon River is an important refugium for the last remaining wild-run spring chinook in the Klamath River Basin. Long-term solutions for the Lower South Fork Salmon analysis area will require continual improvement in habitat factors, including obtainment of a suitable temperature regime, especially in the mainstem Lower South Fork Salmon, and a suitable sediment regime especially in Negro and Indian Creeks. Steelhead and coho populations remain largely unassessed but general observations and local input from residents indicate that populations have declined over the last decade.

DESIRED CONDITIONS

- Adequate cool deep pools during summer months especially in the mainstem Lower South Fork to support summer holding populations.
- Current fish range and species composition continues to fit historic conditions and compositions.
- A better understanding of populations and habitat needs for lesser known aquatic species within the watershed such as resident trout, freshwater mussels, and stream dependent amphibians.

VEGETATIVE BIODIVERSITY

Key Question 1- How have the vegetation communities changed over time and what have been the agents of change; including amounts and distribution of late-successional habitats?

Based on information available for this analysis, the watershed contained stable vegetation communities in a wide variety of seral stages. Based on soil capability, aspect, elevation, and plant adaptations to the environment, plant communities were remarkably stable. For example, the areas occupied by Douglas-fir/live oak have not changed since pre-settlement times. In this watershed no evidence has been found of plant communities expanding or contracting.

The pre-settlement landscape was probably exceptionally patchy containing complex mosaics of different age and size classes in the conifer/hardwood communities. Large uniform patches created by infrequent catastrophic fire were broken up by more frequent medium scale disturbances (Wills and Stuart 1994). The post-settlement fire suppression era removed the more frequent medium scale fire disturbances, and helped to set the stage for the large catastrophic fire events of 1977 and 1987.

The biggest changes in the vegetative communities are the results of the large fires in 1977 and 1987, and the subsequent salvage logging and reforestation. These activities left large contiguous blocks of early-seral stages. This has fragmented some and isolated other blocks of late-successional habitat in the Methodist, Hotelling, and Bowerman areas.

The basic patterns of late-successional habitat and dispersal habitat are the same today as in the past. Natural barriers to dispersal were found on shrub dominated south slopes and low elevations in the watershed. Forested riparian areas provide a dispersal habitat across most of the watershed and to higher elevations which facilitated movement into adjacent watersheds. These forested riparian areas are very important for dispersal, especially through areas where upslope habitat is limited. Recent large fires and salvage logging activities have increased barriers to dispersal and reduced the total acreage of late-successional habitat compared to past averages. Areas for potential late-successional habitat are found in McNeal Creek, Poverty Gulch, Hotelling Gulch, Methodist Creek, Upper Indian Creek and Upper Negro Creek. These areas burned at high intensity either in 1977 and/or 1987 and now support dense stands of regenerated conifers, see Figure 5-3 Potential Late-Successional Habitat, contained in the Map Packet located at the end of this document.

Recent large fires have also reduced the acreage of old-growth in the watershed. The *NFP* provides for the retention of old-growth fragments in watersheds where little remains. The minimum from the *NFP* is 15% in old-growth. Table 5-7 Old-Growth Acreage by Vegetation Type, shows the remaining old-growth in the watershed. The acreage of old-growth was calculated using seral stage and density information from EUI. Stands qualified as old-growth by meeting the following criteria: seral stage of late/mature or old-growth and a total tree density of $\geq$ 40%. Canyon live oak with scattered conifers and gray pine vegetation

types were included in the table as they are both tree dominated plant communities, but neither were used to summarize total old-growth acres. Gray pine does not normally grow to a size that qualifies as old-growth and the canyon live oak with scattered conifers meets the EUI qualifications based on the size of the scattered conifers and the density of the hardwoods. The canyon live oak vegetation type does not provide the ecological characteristics normally found in old-growth stands, so was not used in the calculations of old-growth.

Table 5-7 Old-Growth Acreage by Vegetation Type

Land Designation	Private Lands	Wilderness	Special Habitat LSR	Special Habitat Eagle/ Falcon	Riparian Reserve	Scenic River	Rec. River	Partial Retention	General Forest	Total Old-Growth (%)	Old-Growth FS Land (%)
Canyon Live Oak	0	429	122	59	341	0	25	388	309	1,673 (12)	1,673 (12)
Gray Pine	0	0	0	0	0	0	0	0	0	0 (0)	0 (0)
Jeffrey Pine	0	339	87	0	15	0	0	5	13	459 (22)	459 (22)
Douglas-Fir Canyon Live Oak	38	798	2,045	42	504	2	12	224	347	4,012 (17)	3,974 (18)
Douglas-Fir Tan Oak	0	0	572	0	373	0	2	302	367	1,616 (38)	1,616 (38)
Mixed Conifer Good Site	3	440	1,290	0	127	0	0	150	80	2,090 (31)	2,087 (31)
Mixed Conifer Poor Site	0	905	15	0	62	0	0	85	2	1,069 (22)	1,069 (22)
True Fir	0	1,779	560	0	99	0	0	139	137	2,714 (34)	2,714 (34)
Sub-alpine Harsh Site Scattered Conifers	0	330	0	0	8	0	0	24	44	406 (150)	406 (15)
Total	**41**	**4,591**	**4,569**	**42**	**1,188**	**2**	**14**	**929**	**990**	**12,366 (19)**	**12,366 (19)**

Based on this analysis, old-growth accounts for 19% of the Federal lands in the watershed. With the current trends in large scale disturbance it is important to protect the remaining old-growth stands and promote the development of old-growth characteristics in other conifer stands.

In areas of the watershed that have not burned in the last 20 years, fire suppression activities have allowed increases in stand densities in the higher elevation mixed conifer and true fir stands. As a result of increased stand densities, some areas of mortality in conifer stands are now being observed. These conditions are adding to fuel loading and fire behavior potential, putting these stands at a higher risk of being lost to catastrophic fire.

Key Question 2- Where are large areas at risk from catastrophic disturbance and what areas should provide the focus for treatment or protection?

The natural disturbance regime for the watershed included frequent fires. Effective fire suppression is short lived in this watershed. Flashy vegetative conditions, steep topography, hot dry summers, and the occurrence of dry lightning storms set the stage for uncontrollable wildfire. The current fire suppression organization is successful most of the time, but can be quickly stretched to its limits during multiple start events. Dry lightning storms igniting multiple fires will overwhelm fire suppression forces.

Lower elevation south and west aspects have historically been areas more frequently burned. These hotter and drier slopes are maintained with flashy fuels (mostly grass and shrubs) and are likely to support fast moving high intensity fires.

Timbered stands are found more often on north and east aspects, and areas with good soils at higher elevations and lower one-third of slopes near perennial and large intermittent streams. These areas tend to be shaded and sheltered from the wind, reducing effects of severe weather conditions. Fires initiated within these areas are usually easy to suppress. However, the fuel loads in many stands have develop to levels far beyond what was historically maintained. These fuel conditions, combined with steep topography and adjacent hot flashy fuels, puts them at higher risk of being lost to wildfire.

Fire behavior modeling has identified over 70% of the watershed as having high to moderate fire behavior potential. See Figure 3-15 Fire Behavior Potential, contained in the Map Packet located at the end of this document; this helps to set the stage for large, high intensity fires. These fires have the potential of burning into and reducing the amounts of mid/late-seral, and old-growth stands.

A variety of vegetation communities in the watershed developed, adapted, and have been maintained by soil types, aspect, precipitation, microclimate, and disturbance. The removal of fire as a frequent disturbance has changed these vegetation communities. In attempting to protect them from fire, we have made some more vulnerable to being lost to fire (true fir, Douglas-fir/live oak, Douglas-fir/tanoak), some more extensive due to their ability to establish and persist in disturbed areas (shrub, hardwood/shrub), and some communities will be lost with continued protection from fire (gray pine). To maintain a wide variety of vegetative communities and seral stages that were common in the watershed, fire should be a frequent disturbance.

Timbered stands in the watershed (Fuel Models 8, 9, and 10) were historically maintained with frequent low to moderate intensity fires. To continue to maintain these stands, it is important that they be treated (underburned). The EUI vegetation layer was used to develop the Fuel Model Layer; see Figure 3-14 Fuel Models, contained in the Map Packet located at the end of this document, to identify these locations. Areas modeled as Fuel Model 10 tend to correspond with areas of late-successional habitat. Many areas of late-successional habitat have accumulated high fuel loadings and are modeled as having high fire behavior potential. These factors impact the health of stands and the ability of larger trees to survive large scale fire disturbance.

Plantations on good sites are big investments. Protecting these sites is important for wildlife values, visual quality enhancement and future harvest opportunities. These stands should be evaluated for treatment needs, see Figure 5-4 Fuels Treatment and Fire Management Considerations, contained in the Map Packet located at the end of this document.

As stated in the Aquatic Dependent Species Step 5 write-up, the South Fork of the Salmon River, Knownothing and Methodist Creeks provide important spawning and holding habitat for anadromous fish. These areas should be considered high priority for maintaining or improving habitats. These are also areas prone to wildfire occurrence. Treatment and protection along and above these streams should consider methods to minimize increases in sediment and also water temperature. These areas can have direct impacts on aquatic habitats. The complete removal of vegetation, as in a stand replacement fire, can increase sedimentation, change the flow regimes, and increase stream temperatures thus degrading aquatic species habitats. This makes it critical to protect these areas from catastrophic fire, which can be done by making the upslope areas more resilient to the effects of fire.

Private residences are features to protect in the watershed. High intensity wildfires occur and have destroyed private residences in the recent past (1987). Residences at higher risk of being lost to wildfire are those found above the river corridor on south aspects. Godfrey Ranch and Black Bear residents are at a higher risk due to their being situated in areas very prone to large wildfires. All residents in the watershed should be concerned and take precautions to protect themselves and their homes from wildfire. Wildfires will continue to occur throughout the watershed and falling embers can ignite homes outside of the fire area.

Wildfires respond to breaks in topography and vegetation. Some natural fuelbreaks exist in the watershed as well as some fuelbreaks from wildfire suppression and fuels treatment activities. In looking at aerial photos from 1995, some fuelbreaks have been identified and ridges that can be used to extend these fuelbreaks into a coordinated system. This system can then be used for more effective fire suppression and in fuels treatment activities that use prescribed fire, see Figure 5-4.

In this watershed areas at risk of catastrophic disturbance are also found in the wilderness, particularly in Plummer Creek. Other unique plant communities found in the wilderness, i.e., gray pine, depend on fire to be maintained. In order to maintain an appropriate fire regime that allows maintenance of fire dependent plant communities in the wilderness, a wilderness fire plan which includes pro-active use of fire needs to be developed.

Key Question 3- What are the trends based on vegetation communities, site classes, and land allocations; including late-successional habitats and connectivity?

As noted in previous discussions the vegetation communities in this watershed are very stable, with little change in species composition expected under most conditions. Due to the disturbance regime the seral stage distribution can be quite variable. The landscape has changed from a mosaic of seral stage patches maintained by moderate to small disturbances (mostly fires), to a landscape of large blocks of early-seral vegetation as a result of the recent large scale fires. These large blocks of early-seral habitats have fragmented and isolated blocks of mid/late-seral habitats. The current vegetative conditions put remaining areas of mid/late-seral habitats at risk to large scale high intensity fire. Unless this cycle can be broken, this watershed will continue to expand early-seral habitats and reduce mid/late-seral habitats.

DESIRED CONDITIONS

- A diversity of seral stages similar to pre-settlement conditions are maintained across the watershed. This mosaic of moderate and small patches will provide habitats for the variety of wildlife that use the watershed.
- The large blocks of early seral vegetation that are a result of the 1977 and 1987 fires are broken up into smaller patches. This will help move the landscape towards more spatial and structural diversity.
- On the better sites in the Douglas-fir/tanoak and Douglas-fir/live oak, maintain most of the hardwoods in a tree character. This will more closely match the pre-settlement conditions and provides more acorn production which is important for many wildlife species.
- Poor sites which are mostly hot and dry and for the long-term can only support shrubs, manage for wildlife values. These areas are important deer and elk winter and spring range and have high value for black bear and wild turkey.
- In LSRs and Riparian Reserves, where vegetation communities are mixed conifer and/or true fir, manage for the maintenance of 50-75% of these stands with large tree character (mid/mature, old-growth). This is in line with natural conditions of the vegetation types in the analysis area.
- Conifer plantations growing on good sites in this watershed are protected from catastrophic fires. These same plantations are managed to promote tree growth and make them more resilient to fire. This will provide future mid/late-seral habitat and also commercial timber.
- A viable system of fuel breaks (including ridge-top roads) is established and maintained throughout the watershed. This system can be utilized for both fire suppression and fuels treatment activities.

FIRE & FUELS ORGANIZATION

Key Question 1- Can the current organization feasibly treat and/or protect all the areas within the watershed needing treatment and/or protection; if not, what would be the organizational needs?

The *Forest Plan* states that fire is a fundamental process on the landscape and that fire must play a key role in ecosystem management. The *Forest Plan* assumes not all acres are suitable for prescribed burning. Administrative areas, progeny sites, recreation areas, and young plantations are not scheduled for burning.

This watershed is prone to wildfire. In recent years the Forest Service has been down-sizing in most disciplines, including fire and fuels. The direct effects are less fire suppression and fuels personnel. Indirect effects include the loss of militia personnel.

Fuels treatment is paramount in protection and maintenance of desired conditions for vegetative communities and land allocations. The large fires in 1977 and 1987 are the primary contributors to the existing conditions in the watershed. Reducing the effects of future fires is probably the most important factor in

achieving and maintaining the desired conditions for vegetative communities, wildlife habitats, and human values.

Current personnel ceilings and budgets will make it very difficult to achieve desired fuels reduction and/or protect important areas of the watershed from catastrophic fire.

The current fire suppression and fuels treatment organization is unable to treat the amount of acres called for in the *Forest Plan*. The organization is quickly over-extended when burning large numbers of acres. Burn units need to be in the same area so they can be monitored. The organization is unable to take full advantage of open-windows do to these limitations.

For this watershed, most spring burning should occur between February and May. Fire season on average occurs May through September. Fall burning can be done usually in October and November. To take full advantage of the open-windows (when the weather and fuels conditions are in prescription to meet objectives) an organization needs to be available in the spring and fall as well as during fire season. Current budget and personnel constraints do not allow for this flexibility. To meet the objectives of the *Forest Plan,* an organization of approximately twenty trained and experienced people that can be actively involved in prescribed burning during the spring, fall, and fire season, need to be in place on the Salmon River District. The trends are that there will not be enough qualified personnel available to accomplish the amount of prescribed burning necessary to create the vegetative desired condition.

DESIRED CONDITION

- Desired condition is to provide an effective fire suppression presence in the watershed during fire season, and to have a fuels organization that can take full advantage of open-windows to complete fuels treatment objectives.

TERRESTRIAL WILDLIFE

Key Question 1- For the analysis species, what has changed from historic to present, what have been the agents of change, and what are the trends?

Bald Eagle: Bald eagles depend on fish as their primary food source; with the reduction of anadromous fish stocks, there is not a viable food source for bald eagles. Unless fish stocks increase, the Lower South Fork will not have suitable habitat for resident bald eagles. Bald eagles will continue to be casual visitors to the watershed in the late fall and winter.

Peregrine Falcon: There is very little information on historic peregrine falcon activity in the watershed. Peregrine falcon use of this area is most likely limited by suitable cliffs for nest sites. The falcons in Knownothing creek nest fairly close to human activity, but seem to be doing okay. As long as disturbance to the nest site is minimized and adequate habitat for prey species exists, birds should occupy this area.

Northern Spotted Owl, Northern Goshawk, Pacific Fisher: These three species all depend on late-successional forest conditions. They have slightly different habitat requirements and dispersal needs, but in most cases habitat suitable for one, can be used by all. During pre-settlement times, late-successional habitats extended over more of the watershed, with moderate and small areas of mid and early-seral. This was a result of the disturbance regime of infrequent large scale stand replacing fires and more frequent moderate and small fires. This mosaic of habitat types provide nesting, denning, foraging, and dispersal across the watershed and into adjacent watersheds.

As a result of the large fires in 1977 and 1987, logging, and road building, there is less late-successional habitat and that habitat is fragmented and more isolated. These conditions expose animals to increased predation and make dispersal more difficult. The recent trend of frequent large fires will make it difficult to maintain late-successional habitat or grow early-seral stands to late-successional habitat.

American Marten: There is almost no information on marten activity in the watershed. Logging and road building in higher elevations (above 5,000 ft.) have reduced marten habitat and the current fire regime has the potential to further reduce habitat.

Willow Flycatcher: Riparian shrubs (willow flycatcher nesting habitat) were removed from the lower reaches of the streams in the watershed. Mining and clearing for settlement were major reasons for the removal. Remaining habitat is isolated in high elevation meadows and headwaters with a large shrub component. Under the current fire regime, the remaining habitat is vulnerable to loss from fire. Restoration of riparian habitats along the South Fork and major tributaries could increase habitat and potential use by flycatchers.

Black-tailed Deer: They depend on a mosaic of seral stages and vegetation age classes to provide a mix of forage, hiding cover, and thermal cover. The natural fire regime provided a good mix of habitat requirements for deer. Logging has provided the early-seral vegetation for the deer, but the associated roads exposed them to harassment and poaching. For the long-term, deer numbers should remain fairly constant with increases and decreases depending on habitat conditions (fires, droughts, harsh winters etc.).

Elk: The vegetation types and the natural fire regime provide elk habitat in the watershed. Elk were extirpated from the Salmon River by the early 1900s. Unregulated hunting and market hunting were primary factors. Elk have been reintroduced in the upper South Fork of the Salmon and the herd is expanding into the lower South Fork. Potential elk habitat exists across the lower South Fork and baring some unforeseen disaster, elk should eventually occupy the whole watershed.

Black Bear: Black bear are still found throughout the watershed and will most likely continue to use the watershed in good numbers. The bears seem to have adapted to habitat changes brought about by human use in this area and should continue into the future as long as the mix of forest seral stages that provide food and shelter are maintained.

Reptiles and Amphibians: With no historic surveys and only limited current surveys, it is not possible to draw conclusions about any changes from past to present. It is possible to say that mining has impacted riparian habitats and the populations of riparian dependent reptiles and amphibians. Mining has reduced habitats and possibly isolated populations. Most likely, road building and logging have done the same to terrestrial species. Without more information, the long-term trends for most reptiles and amphibians cannot be determined.

All of the wildlife species found in the lower south fork have adapted to the natural disturbance regime of infrequent large scale disturbance and more frequent moderate and small disturbances. A return to a disturbance regime that more closely follows the natural regime should benefit most wildlife species. To lessen the effects of management activities, projects should be planned and implemented in a way similar to the natural disturbance regime.

DESIRED CONDITIONS

- A mosaic of various seral stages and habitats distributed across the watershed.
- Large enough blocks of late-successional habitat are maintained to provide habitat requirements for species needing forest interiors; spotted owls and forest carnivores.
- Connectivity between the Bowerman LSR and the Eddy Gulch LSR is provided along with dispersal corridors into adjacent watersheds.
- Shrubfields are maintained in a condition to provide for early/seral wildlife species habitat needs; deer.
- A road system that does not significantly impact wildlife or contribute to habitat degradation.

ROADS

Key Question 1- How have road uses changed from the past and why?

The types of road uses have changed considerably from the past. Historically, road use centered around resource use and extraction such as timber and mining. Road construction probably followed the boom/bust cycles of the mines, with peak mining road use occurring in the 1930s. As the Forest Service began offering timber sales in the 1960s in the higher elevations, new road construction was required to provide access for equipment and log transport. Road construction increased in the five years after the Hog Fire of 1977 and the Glasgow Fire of 1987 to provide access for salvage logging operations. Logging continued until the early 1990s, at which time the road use related to the timber resource declined.

There has been a slow but steady increase in recreational use of the road system, with current recreational use probably exceeding all other uses. A variety of recreational uses occur in multiple settings and is dispersed throughout the watershed. Uses such as sightseeing, trailhead access, etc., have created public expectations for relatively easy access to sites. This is in direct conflict with our road maintenance budget which has declined rapidly the last few years as a result of reduced timber sales.

Several administrative road uses have probably stayed about the same, including fire suppression and law enforcement, while other uses such as silvicultural work have probably declined. Road closures has increased in the last ten years. On National Forest roads this is due to providing increased resource protection such as minimizing erosion in winter months, and reducing wildlife poaching and harassment.

Key Question 2- What resources and social concerns exist with the current road system?

Resource and social concerns include immediate needs and longer-term concerns. Recent January, 1997 flooding impacted the existing road system. Areas where flood affects were concentrated include Methodist Creek, Blue Ridge, McNeal Creek, and the King Solomon Mine areas. The most recent Forest survey identified 18 sites in the watershed which were damaged by the floods and would require repairs, see Figure 5-5 Road Damage - 1997 Flood, contained in the Map Packet located at the end of this document. Immediate resource concerns include repairing sites so they do not become chronic sediment sources. Immediate social concerns involve opening roads needed for fire suppression, and administrative or recreation access.

Long-term resource concerns (not flood related) generally involve stream sedimentation from small fill slope failures, cut bank raveling, and road surface erosion. Another resource concern involves road densities and their effect on wildlife habitat fragmentation. Outside of wilderness, the average road density for the watershed is 2.8 miles/square mile, with Hotelling

Gulch/Ridge, Picayune/Blue Ridge, and O'Neil Creek/ Poverty Gulch areas having the highest road densities, see Figure 5 - 6 Road Density, contained in the Map Packet located at the end of this document. Refer to the Watershed Processes and Terrestrial Wildlife sections for additional discussion on road related concerns.

Social concerns are vegetation encroachment on the roadway creating safety concerns and the potential conflict between increased recreation demand and declining road maintenance budgets. Private landowners (Godfrey Ranch) have entered into an agreement with the Forest Service to maintain the O'Farill Gulch road which accesses their property.

Other social concerns include providing long-term access for fire suppression, administrative use access, and maintaining a transportation system to support timber harvest activities. Refer to Appendix C - Road Issues and Concerns, and Resource Concerns, for general resource concerns of the watershed.

Key Question 3- What are future trends in road uses, needs, and management?

--The Salmon River is identified as a Key Watershed in the *Forest Plan*, therefore there will be no net increase in the amount of roads in the Salmon River Basin. The intent for Key Watersheds is to decrease the miles of roads, or at a minimum, decommission at least one mile of road for each mile of new road constructed.

--A variety of recreational activities (hiking, sightseeing, etc.) will slowly increase in use, thereby placing greater demands on the road system.

--Road maintenance budgets will probably continue to decline slightly and eventually stabilize.

--Timber harvest will continue on matrix lands in the watershed, placing limited demands on the existing road system.

--Cooperation will continue between road users, landowners, and advisory groups.

--There will probably be a limited amount of new road construction of National Forest system roads, primarily to support timber harvest.

DESIRED CONDITIONS

- Roads are designed, constructed, maintained, or improved to minimize resource affects and meet *ACS* objectives while meeting human needs.
- The miles of open roads are managed at a level that does not contribute to reduced wildlife habitat quality.
- Fire suppression access is maintained commensurate with risk and fire behavior potential.
- The roads providing access to private lands are in a condition that minimize road resource damage.
- The effects of roads in Riparian Reserves and LSRs are minimized, and road densities are reduced where appropriate.

COMMERCIAL TIMBER OUTPUTS ON PUBLIC LANDS

Key Question 1- How do *Forest Plan* estimates for capable, available, and suitable lands compare to those recommended in this analysis?

Through refinement of land allocation estimates made in this analysis, the land allocations available for scheduled timber harvest (Matrix lands) total 24,540 acres or 37% of the watershed. This is higher than the 21% matrix lands estimated for the entire Klamath National Forest. Matrix allocations are: Retention (<10 acres), Partial Retention (15,960 acres), General Forest (8,520 acres), Scenic River (260 acres), and Recreational River (800 acres). The Retention and Scenic River land allocations (260 acres) are expected to provide for low levels (approximately five percent of standing timber volume per decade) of timber harvest. Recreational River, Partial Retention, and General Forest (25,280 acres) are expected to provide moderate levels (approximately 16% of standing timber volume per decade) of timber harvest.

Other conditions in the watershed have the potential to affect the amount of land available for scheduled timber harvest. These are identified in the *Forest Plan* and further refined through this analysis. They are discussed below:

Harsh Sites - Sites were identified in the *Forest Plan* based on local experience and timber management practices. The harsh site determination was based more on professional judgement than soil or vegetation inventory. A site is considered capable if it can support 20 cubic feet of conifer growth per acre per year, which is equivalent to Forest Survey Site Class (FSSC) 6 or lower. FSSC 7 sites and higher are incapable of supporting this level of growth and are considered harsh sites. In addition, certain vegetation types (live oak with scattered conifers and gray pine) on FSSC 6 or better soils have few commercial conifers and are very difficult to regenerate so are also considered harsh sites. Based on EUI vegetation and soils data, there are 8,020 acres of the live oak/scattered conifer type, gray pine type, or FSSC 7 in the Matrix lands in the Lower South Fork. This is considerably more than the 3,590 acres of harsh site estimated in the *Forest Plan*.

Mapped Riparian Reserves - The mapped Riparian Reserves in the *Forest Plan* consisted of

mapped unstable lands, using the *Forest Plan* unstable lands definition (refer to Riparian Areas issue) and the data available at the time. Stream buffers were not used in the *Forest Plan*.

For the Lower South Fork analysis, mapped Riparian Reserves were updated with additional unstable lands mapping and applying interim Riparian Reserve buffer widths (from *Forest Plan*) on known and interpreted streams. This increased the mapped reserves significantly.

Unmapped Riparian Reserves - In the *Forest Plan*, 44% of the mapped capable, available, and suitable land was assumed to be unmapped Riparian Reserves (buffers on streams). The acres estimated as unmapped Riparian Reserves were not used in *Forest Plan* modeling to calculate the potential timber sale quantity.

For this analysis, the extent of unmapped Riparian Reserves was estimated by comparing the updated mapped Riparian Reserves with on-the-ground stream mapping done in the Methodist Creek area (refer to Riparian Areas issue). This comparison showed that after the updated Riparian Reserve mapping was completed, about three percent of capable, available, and suitable lands in the Lower South Fork are likely to be unmapped Riparian Reserve.

The acreage calculations for the *Forest Plan* and Updated lands available for timber harvest are displayed in Table 5-8 *Forest Plan* and Updated Lands Capable, Available, and Suitable for Scheduled Timber Harvest.

Table 5-8 *Forest Plan* and Updated Lands Capable, Available, and Suitable for Scheduled Timber Harvest

Land Allocation or Modification	*Forest Plan* Acreage	Updated Acreage
Initial Land Base Outside Wilderness, LSR, and Sensitive Species	34,070	34,340
Mapped Riparian Reserves	-6,110	-9,800
Lands Available for Timber Harvest 1/	27,960	24,540
Harsh Sites 2/	-3,590	-8,020
Subtotal	**24,370**	**16,520**
Unmapped Riparian Reserve 3/	-10,720	-500
TOTAL	**13,650**	**16,020**

1/ Lands available for timber harvest include Scenic River, Retention, Partial Retention, Recreational River, and General Forest land allocations, collectively referred to as Matrix lands.
2/ Forest soil survey Site Class 7 and the EUI vegetation types of gray pine and canyon live oak with scattered conifers were used in the analysis update.
3/ *Forest Plan* assumes 44% of mapped capable, available, and suitable lands are unmapped Riparian Reserves. This analysis updated estimates of unmapped RR using the methodology for the 1996 survey work from Methodist Creek and applied it across the watershed.

Table 5-8 shows an increase of about 2,400 acres of lands capable, available, and suitable for timber harvest, comparing *Forest Plan* estimates to updated estimates. However, because a watershed analysis is a mid-level analysis and not a decision document, these refinements in acres available lands are still estimates unless a *Forest Plan* amendment formally adopts them, see Figure 5-7 Lands Available for Scheduled Timber Harvest, contained in the Map Packet located at the end of this document. The acreage increase is due to the large estimate of unmapped Riparian Reserves acreage used in the *Forest Plan*. The Methodist Creek stream study (see Figure 5-2) shows that the unmapped Riparian Reserve estimate used in the *Forest Plan* is quite conservative. The Methodist Creek stream study also shows that updating unstable land and stream mapping (using office techniques rather than intensive field mapping) allows nearly all the Riparian Reserves to be mapped, with a small percentage of a given area being unmapped Riparian Reserve.

The acres of Harsh Site increased with the updated estimate, somewhat compensating for the decrease in unmapped Riparian Reserve. This information provides feedback to the *Forest Plan*, and could be useful in modeling assumptions for future timber yield calculations at the Forest scale. Table 5-9 Acres of Harsh Site by Matrix Land Allocation, shows the distribution by land allocation.

Table 5-9 Acres of Harsh Site by Matrix Land Allocation

Land Allocation	Total Acreage	Harsh Site Acreage	% of Total	Capable Acreage	% of Total
Scenic River	260	140	54	110	46
Recreational River	800	390	49	410	51
Partial Retention	14,960	4,520	30	10,440	70
General Forest	8,520	2,960	35	5,560	65
TOTAL	**24,540**	**8,020**	**33**	**16,520**	**67**

Other factors must also be considered when programing timber harvest over the short-term. Three subwatersheds are identified in this analysis as AWWCs (refer to Watershed Processes issue). Extra care must be taken in these subwatersheds to not aggravate existing watershed conditions or increase watershed concerns over the long-term. Programed timber harvest may be differed or restricted until these subwatersheds have recovered.

Another factor to consider for programing timber harvest is seral stage distribution. The Lower South Fork watershed is identified as having a low percentage of late/mature and old-growth seral stages, and a high percentage of shrub/forb seral stage, primarily due to recent wildfire effects. This watershed should be managed toward the desired mix of seral stages. Table 5-10 Existing and Desired Seral Stage Distribution, lists the existing and desired mix of seral stages for the Partial Retention and General Forest land allocations. Desired conditions are from the *Main Salmon Watershed Analysis (1995)*, assuming an even flow of timber yield, and are appropriate for the Lower South Fork. Desired conditions have not been developed for the Scenic and Recreational Rivers land

allocations as these allocations occupy only a small portion of the capable, available, and suitable lands. They are not included in Table 5-10.

Table 5-10 Existing and Desired Seral Stage Distribution

Size Class	% Partial Retention 1/ (Existing)	% Partial Retention (Desired)	% General Forest 1/ (Existing)	% General Forest (Desired)
Shrub/Forb	43	5-10	31	5-20
Pole/Early/Mature	21	30-40	13	40-55
Mid/Mature	27	30-45	39	15-30
Late/Mature, Old-Growth	9	15-25	17	15-20

1/ Source - EUI Data Sort; based on the Vegetation/Biological Diversity section earlier in this step (vegetation communities and seral stage distribution).

Table 5-10 identifies shrub/forb and mid/mature as the dominate seral stages in both Partial Retention and General Forest land allocations. Most of the shrub/forb seral stage is in those areas burned in the fires of 1987 and 1977.

The *Forest Plan* estimates an 11MMBF/decade timber yield from the watershed. An analysis method using the updated EUI inventory estimate 22MMBF/de-cade yield. Using regeneration harvesting to meet *Forest Plan* assumptions and desired conditions, approximately 620 acres/decade of regeneration harvest would need to occur. Refer to Appendix I - Timber Yield Calculations, for detailed calculations used in determining the potential timber yields for the watershed.

Key Question 2- What future trends affect timber management in the watershed?

--The probable threat from a large fire burning in the watershed is great. Out year investments (plantations) must be protected when and wherever possible.

--Overall timber outputs will probably be driven more by forest health issues, rather than just outputs.

--Wildlife considerations, including Survey & Manage species will continue to strongly influence timber project scheduling, location, and design.

--The recent T&E designation for coho salmon will strongly affect the timber program.

--The potential presence of Del Norte salamanders on Matrix lands will affect the amount of planning time and cost for timber sales in the area.

--Existing plantations are 35-40 years old, excluding fire, a large timber volume will be available for the market in approximately ten years.

--To maintain Forest health on all National Forest lands, it is likely there will be some timber outputs from non-matrix lands.

DESIRED CONDITIONS

- The watershed contributes to a Forest-wide ecologically sustainable timber program that provides an even flow of wood products.
- Lands available for scheduled timber harvest in Forest Planning reflect as near as possible the actual watershed conditions for capable, available and suitable lands.
- Timber output opportunities are consistent with land allocation goals.
- Timber mortality in the watershed is reduced to near endemic levels.

HUMAN USES

Key Question 1- What types of heritage resources and/or uses influence current Forest management?

--The large number of historic mine sites has had a slight influence on Forest activities resulting in minor relocation of roads and timber harvest unit locations.

--All known cultural sites must be avoided by land disturbing activities until a significance determination is completed for the site.

--Some limited local collection of mushrooms is believed to occur. It is anticipated that these activities will increase.

Key Question 2- How have other commodity uses changed from the past and what are their trends?

Traditional non-commodity uses such as mining and firewood collection have declined from historic levels; future use will probably stay about the same. Other non-traditional uses such as post and poles, Christmas tree and bough collection, and mushroom collection will probably increase slightly from past levels.

Overall firewood collection has declined in the last several years as the availability of easy firewood has declined in association with timber sales. Also, some people are converting their heating source from wood to heating oil - a more reliable and cleaner burning fuel. However there will always be folks who will use wood for heat, thereby maintaining a steady need for firewood.

Mineral extraction was a much greater land use in the past, but will probably remain at about current levels. However, mining activities fluctuate with the gold market and could increase.

The overall use of boughs, Christmas trees, posts, and poles will probably remain about the same or increase slightly as the area population increases.

Key Question 3- How have recreation uses changed from the past and what are their trends?

--Use patterns have changed somewhat from an exclusively locally-dominated use to now include a Regional and National market. This is based on life styles oriented to the outdoors, ability to travel further, and National Wilderness and Wild & Scenic River designations; drawing visitors from out of the area.

--There has been a slight increase in backcountry use, with use expected to continue to increase.

--Driving for pleasure, river rafting/kayaking, camping, and fishing have increased from past levels as a result of corresponding population increases. They will continue to be popular activities.

--Both bear and deer hunting will continue to be popular activities in the watershed.

Key Question 4- How has community interest/involvement changed from the past and what is likely to change in the future?

Community interest in Forest management activities has been high since the early to mid-1970s. This level of interest will persist indefinitely unless the composition of the community changes.

With the formation of the Salmon River Restoration Council in 1996, and cooperative maintenance on the O'Farill Gulch Road, opportunities to work together with the community have occurred more recently. This may facilitate additional cooperative opportunities in the future.

DESIRED CONDITIONS

- Archaeology sites are protected as needed. Forest Service managers have a good understanding of American Indian traditional and contemporary values.
- Non-timber commodity needs are met.
- Recreational access and opportunities are provided commensurate with public needs.
- Activities on private and public lands are complimentary toward mutually agreed upon objectives.

Step 6 - Recommendations

This step synthesizes results of the ecosystem processes discussed in previous steps and generates management recommendations responsive to issues and key questions. The goal of the recommendations is to identify changes in ecosystem conditions and function that require management action to achieve desired ecologic, economic, and social objectives.

Management recommendations are broken into nine issue areas; **Watershed Processes, Riparian Areas, Aquatic Dependent Species, Vegetative Biodiversity, Fire and Fuels Organization, Terrestrial Wildlife, Roads, Commercial Timber Output on Public Lands**, and **Human Uses**. Recommendations are developed based on analyses and conclusions reached in previous steps. Recommendations are displayed in narrative format in Tables 6-1 through 6-9.

Recommendations focus on Management Opportunities which are also displayed in Figures 6-1 through 6-4, contained in the Map Packet located at the end of this document. Narratives are to be used in conjunction with these maps to arrive at opportunity locations.

Tables in this step provide general descriptions of the Existing Situation, Desired Conditions, Management Opportunity, Benefitting Resources, Considerations, and Emphasis Rating. **Red Flag** opportunities, which should be given the highest priority, are identified in the Management Opportunity column.

TABLE COLUMN DEFINITIONS

Existing Situation & Desired Condition - These narratives are qualitative and quantitative determinations identified through the analysis process. Existing Situation summary statements are generated directly from integrating information on management practices and/or ecological processes from Steps 3, 4, and 5; most are situations not meeting Desired Conditions.

Desired Conditions are developed from Step 5 - Interpretation and represent a refinement of direction from the *Forest Plan*.

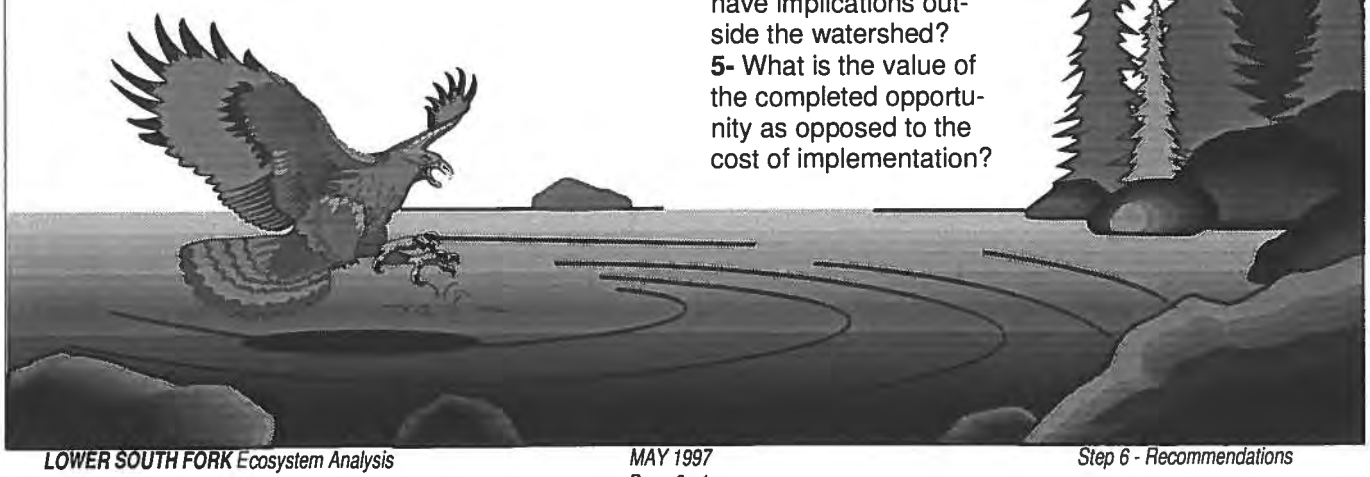
Management Opportunity - This is the identification of management actions, projects, and other activities that promote Desired Conditions. During the analysis process, comparisons were made between Existing Situation And Desired Conditions to determine how close a particular resource or ecological function was to achieving the Desired Condition. Opportunities were developed that either maintained the Desired Condition, or improved ecosystem trends to move towards Desired Condition.

Benefitting Resources - This identifies a priority list of multiple resources that most benefit from the completion of the listed opportunity.

Considerations - Factors identified in this column should be taken into account when implementing Management Opportunities. They may include risks or benefits to other resources, or options and alternatives to consider when accomplishing the Management Opportunity. Comments found under Considerations should be reviewed during development and implementation of site-specific projects.

Emphasis Rating - To assist with establishing work priorities for project development, an Emphasis Rating system is used. The following questions are considered for rating individual opportunities:

1- Are there resources at-risk if the opportunity does not occur?
2- Is the opportunity an immediate need?
3- Are there amenity or commodity benefits from doing the opportunity?
4- Does the opportunity have implications outside the watershed?
5- What is the value of the completed opportunity as opposed to the cost of implementation?



Each opportunity is given a rating by the Analysis Team, based on their professional judgement, assigning a High, Medium, or Low value to the five questions listed above. These five values are averaged to establish the overall Emphasis Rating.

When an across the board rating of High is given, it is referred to as a **Red Flag** opportunity. It implies a sense of urgency for implementation to bring an ecosystem function or system back in balance or respond to human needs or values.

It is important to note that all identified opportunities are general in nature. Specific "how tos" will be determined later, during project development and implementation at the District level, through a project environmental analysis.

Table 6-1 ISSUE - Watershed Processes

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
1- The January, 1997 flood impacted watershed conditions. Preliminary reports are complete and some road damage has been repaired. An overall road strategy is needed to determine roads to repair or decommission.	1- Have a complete accounting of flood damage with permanent fixes prioritized and funded. Lessons learned are documented and incorporated for future management .	1 - a. Continue damage assessment and repair strategy, incorporating new or changing information. Use air photos and field techniques to investigate damage, particularly landslide rates and resulting downstream damage. b. Use results to update landslide modeling and make structural repairs more resistent to future flooding as appropriate, see Figure 6-1.	1- Aquatic Species, Transportation and Access	1- Repairs made need to meet ACS objectives and be consistent with transportation plans.	1. H 2. H 3. H 4. M 5. M Avg H-
2- Roads in general cause increased erosion and other watershed impacts. Some roads are more impacted than others and are in greater need of restoration.	2- Roads are a minimal source of eroded sediment.	2-. Identify and treat site specific road-related erosion problems as appropriate in Transportation plans, see Figure 6-1.	2- Aquatic Species, Transportation and Access	2- Coordinate with local landowners, particularly the Salmon River Restoration Council. Meet ACS objectives.	1. H 2. M 3. M 4. M 5. M Avg M
3- Catastrophic wildfires caused widespread watershed damage in the recent past, negatively impacting downstream resources with the potential for future damage.	3- Fuel conditions are such that risk of catastrophic wildfire is limited to small areas throughout watershed.	3- a. **RED FLAG** -Develop a fire strategy utilizing strategic fuel breaks to minimize watershed damage in future fires. b. Identify and treat fuels to the reduce risk of catastrophic fire, see Figure 6-2.	3- Aquatic Species, Wildlife, Timber Outputs, Recreation	3- Treat fuels while meeting soil cover standards, and CWM needs for wildlife and soil productivity.	1. H 2. H 3. H 4. H 5. H Avg H
4- The watershed analysis determined that Indian, Negro, and McNeal subwatersheds have very high disturbance levels, are not functioning at equilibrium, and should be considered Areas with Watershed Concerns. The Jennings, Black Bear, Methodist, and Knownothing subwatersheds also have high watershed disturbance but are not considered AWWCs.	4- Subwatershed conditions are maintained or improved so that all subwatersheds are functioning at equilibrium.	4- a. **RED FLAG** -Design projects to improve watershed conditions or, at a minimum, do not contribute to watershed degradation, see Figure 6-1. b. Monitor implementation of projects and watershed conditions, and provide feedback to Land Management Planning.	4- Aquatic Species	4- Work with private landowners on watershed improvement projects for mutual benefit.	1. H 2. H 3. H 4. H 5. H Avg H

Table 6-2 ISSUE - Riparian Areas

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
5- Dense (>60% tree cover) mid to late-seral stands currently occupy about 37% of Riparian Reserves. The remainder is early-seral or open stands resulting from wildfire or timber harvest, or is harsh site not capable of supporting dense mid to late-seral stands.	5- Mid to late-seral stands in Riparian Reserves are maintained over the long-term at a percentage consistent with reference conditions, between about 40 and 60% of Riparian Reserve area.	5- Protect the remaining mid to late-seral stands in Riparian Reserves, increase the percentage of mid to late-seral stands through silvicultural practices (e.g., thinning, tree planting) where appropriate, see Figure 6-3.	5- Riparian Dependent Species	5- Utilize prescribed fire where appropriate.	1. M 2. M 3. M 4. M 5. M Avg M
6- Low levels of instream CWM and recruitment exist in some streams.	6- High quality aquatic habitat in all streams with adequate amounts of CWM in streams where site capability allows.	6- Improve site conditions which promote growth of large trees in capable Riparian Reserves and increase instream wood.	6- Aquatic Species	6- Work with cooperating agencies	1. M 2. M 3. M 4. M 5. M Avg M

Table 6-2 ISSUE - Riparian Areas

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
7- High amounts of instream fine sediments are reducing habitat quality for many aquatic species.	7- Habitat is sufficient for sustainable populations of indigenous aquatic species. Fine sediments in streams are reduced to levels consistent with good quality aquatic habitat, less 15% fines on average.	7- a. Update Watershed Improvement Needs Inventory (WINI). b. Repair WINI sites to decrease amounts of fine sediments entering stream systems from management activities and restore natural stream processes, see Figure 6-1.	7- Aquatic Species	7- Work with cooperating agencies, Salmon River Restoration Council, and other private landowners.	1. H 2. M 3. M 4. H 5. M Avg M+

Table 6-3 ISSUE - Aquatic Dependent Species

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
8- Steelhead and coho populations are not fully assessed (adult and juveniles) within analysis area and critical habitat areas are unknown.	8- Knowledge of adult and juvenile steelhead and coho and juvenile chinook populations is sufficient to determine management needs.	8- Gather population information of juvenile and adult anadromous species. Continue with fall chinook spawning surveys.	8 - Aquatic Species	8 -Work with CDF&G and other interested groups and individuals.	1. M 2. M 3. M 4. H 5. M Avg M
9- Fisheries habitat is underutilized. Temperature barriers exist in the South Fork Salmon and downstream of the analysis area.	9- Habitat is fully utilized. Stream temperatures are consistent with high quality habitat to the extent possible.	9- a. Identify areas for possible riparian vegetation plantings, see Figure 6-3. b. Monitor the effectiveness of past plantings.	9- Aquatic Species	9- Influences on anadromous fish populations are not completely understood or assessed.	1. M 2. M 3. M 4. M 5. M Avg M
10- Little is known about several aquatic populations within the watershed, including native mussels, warm water species, exotic species, and amphibian species.	10- Knowledge of life histories and habitat requirements of lesser known aquatic species within the analysis area is sufficient to determine possible management effects.	10- Survey and research life histories and habitat requirements of aquatic species.	10 - Aquatic Species	10 - Utilize anglers and high school students to assist in data collection.	1. L 2. M 3. M 4. H 5. M Avg M

Table 6-4 ISSUE - Vegetative Biodiversity

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
11- Areas with low to moderate conifer mortality have been identified in the watershed. This condition increases fuel loadings and fire behavior potential.	11- Conifer mortality is maintained to near endemic levels (<5% of any given stand).	11- Continue to monitor mortality through use of mortality flights; use salvage sales, thinning from below, underburning, etc. where appropriate to reduce inner tree competition and fire hazards, see Figure 3-13 Timber Mortality.	11- Biodiversity, Timber Output, Wildlife	11- Maintain adequate snag densities for wildlife and CWM recruitment. Be proactive in LSRs; complete LSR plans.	1. M 2. M 3. M 4. M 5. H Avg M+
12- The Bowerman LSR has been highly impacted by wildfires. There is less late-seral habitat than optimal and the existing habitat is fragmented with roads and plantations.	12- LSR is fully functioning with adequate late-seral habitat. Existing plantations are multi-species and at densities to grow large trees as quickly as possible.	12-a. **RED FLAG -**Develop an LSR Management Plan, see Figure 6-4. b. Thin and release plantations selecting for species diversity. c. Treat natural and activity fuels, develop shaded fuel breaks. d. Determine need for seasonal or permanent closures, or decommissioning of roads to reduce habitat fragmentation.	12- Wildlife, Biodiversity	12- Tie road work to Road Management Plan.	1. H 2. H 3. H 4. H 5. H Avg H

Table 6-4 ISSUE - Vegetative Biodiversity

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
13- The Eddy Gulch LSR is adjacent to areas with volatile vegetation and high fire behavior potential. This situation places the LSR at risk to loss from high intensity fire.	13- The Eddy Gulch LSR is resilient to fire effects, and late-successional habitat is perpetuated over time.	13-a. **RED FLAG** -Thin from below and underburn in LSR and adjacent areas. b. Develop and maintain a system of shaded fuelbreaks to protect LSRs, see Figure 6-4.	13- Wildlife	13- Maintain snags and CWM. Work with local residents.	1. H 2. H 3. H 4. H 5. H Avg H
14- Connectivity of late-seral habitat between LSRs and across the watershed has been fragmented from past fires and salvage logging. Although late-seral habitat is distributed across the watershed, few large blocks of habitat remain.	14- Connectivity of habitat for late-seral wildlife species is maintained across the watershed.	14-a. Promote and maintain connectivity using Riparian Reserves and management activities throughout matrix lands. b. Develop and maintain important blocks of habitat between LSRs, see Figure 6-3.	14- Late-Seral Dependent Wildlife	14- None identified at this level of analysis.	1. M 2. M 3. L 4. M 5. M Avg M-
15- Many areas of late-successional habitat have high fuel loadings and high fire behavior potential. These factors impact health and ability of larger trees to survive large scale disturbance.	15- Late-successional habitat is resistant to large scale disturbance and is perpetuated over time.	15- Utilize thinning from below, underburning, and/or any other silvicultural techniques to enhance late-seral habitat and provide wood products as a by-product, see Figure 6-4.	15- Late-Seral Dependent Wildlife, Biodiversity	15- Use of fuelbreaks to reduce large areas of continuous fuels.	1. H 2. M 3. M 4. M 5. H Avg M+
16- Periodic insect infestations, blowdown, or wildfires cause tree mortality in LSRs and Riparian Reserves which are not available for scheduled timber harvest. Although not a current concern, excessive mortality can contribute to potential for catastrophic fire.	16- LSRs and Riparian Reserves provide periodic timber yields as a by-product of management activities through salvage consistent with land allocation objectives.	16- Assess forest health in Reserves, utilize salvage and/or thinning timber for commodity outputs where Reserve objectives are met; monitor outcome.	16- Wildlife, Biodiversity, Commodities	16- Activities are consistent with LSR Assessments and ACS objectives.	1. M 2. M 3. M 4. H 5. M Avg M+
17- Approximately 18% of the watershed is late/mature old-growth, approaching the 15% minimum in the *Northwest Forest Plan.*	17- The amount of late/mature old-growth is increased over current levels and distributed on capable sites throughout the watershed.	17- Maintain existing late/mature and old-growth stands and enhance the growth of mid/mature stands to develop old-growth characteristics.	17- Biodiversity, Late Seral Dependent Wildlife	17- Remove dead and dying trees where appropriate to increase resiliency from fire, insects, and disease.	1. H 2. H 3. M 4. M 5. M Avg M+
18- Fire behavior potential modeling has identified 41% of the watershed as having high fire behavior potential and 31% as having moderate.	18- Majority of watershed in condition where fires exhibit low fire behavior, high fire behavior potential is minimized, and breaks in fuel continuity exist.	18- a. **RED FLAG** -Utilize fuels management activities to reduce fuel loadings and develop shaded fuelbreaks. b. Develop strategy to treat and/or protect high priority areas, e.g., Forks of Salmon water supply, LSRs, private residences, AWWCs, etc., see Figure 6-2.	18- Fire, Biodiversity	18- Work with private landowners in fuels management.	1. H 2. H 3. H 4. H 5. H Avg H
19- The mixed conifer, hardwood/shrub, gray pine, and Jeffery pine communities developed and were maintained with frequent fire influence. With fire suppression practices, fire is precluded from fulfilling its ecological role in maintaining these communities.	19- Conifer communities and hardwood/shrub communities are perpetuated over time through use of frequent low to moderate intensity fire.	19- Develop fuels program that includes an appropriate schedule of burning in these communities.	19- Biodiversity, Wildlife, Biological Diversity	19- Work with private landowners, Salmon River Restoration Council, CDF, CDF&G, and American Indian groups.	1. M 2. M 3. M 4. H 5. M Avg M+

Table 6-4 ISSUE - Vegetative Biodiversity

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
20- High intensity wildfires are common in the watershed. Past fires have destroyed some private residences and future fires threaten to do so again. Wildfires respond to natural boundary changes (breaks in topography and vegetation), not landownership.	20- Wildfires are contained to small (sub-watershed size or smaller) areas. Private residences are not at risk to loss from wildfire.	20- Develop good working relationships with private landowners and residents, develop co-op agreements to incorporate fuels treatment across landownership boundaries.	20- Fire, Biodiversity, Wildlife, Upslope Hydrologic Processes	20- Fire and fuels programs developed to utilize changes in topography and vegetation. Work with Salmon River Restoration Council and other interested groups or individuals.	1. H 2. H 3. H 4. M 5. M Avg H-

Table 6-5 ISSUE - Fire & Fuels Organization

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
21- The Lower South Fork Watershed has a history of large fire occurrences. Fire suppression and fuels treatment is needed to develop many of the desired conditions identified in the *Forest Plan* and this analysis. The existing fire and fuels organization may not be sufficient for current and future demands.	21- A fire and fuels organization capable of 1) maintaining a prevention presence, reducing occurrence of human caused fires, 2) providing fuels treatment to significant amount of acres to reduce fuel loadings, improving wildlife habitat, protecting commodities, and allowing fire to act as a natural ecological process, 3) monitoring prescribed natural fires, and 4) detecting and suppressing fires when necessary.	21- Identify and budget for an organization that can meet desired conditions.	21- Fire, Biodiversity, Wildlife, Timber Output, Aquatic Species, Recreation, Private Landowners	21- Forest budget priorities.	1. M 2. M 3. M 4. L 5. M Avg M-

Table 6-6 ISSUE - Terrestrial Wildlife

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
22- Extensive areas of early-seral (shrub/forb) habitat exists in the watershed as a result of wildfire and timber harvest. These areas are currently in good condition for deer habitat and forage but are aging and will loose their value to wildlife, and will also become a higher fire hazard as shrubs become decadent.	22- High quality wildlife habitat exists and is maintained in a mosaic of patch sizes, shapes, and age classes.	22- Monitor the condition of early-seral stands, actively manage as appropriate to provide high quality wildlife values, and protect from large catastrophic wildfire.	22- Wildlife, Recreation	22- Work in cooperation with private landowners.	1. L 2. M 3. M 4. M 5. M Avg M-
23- Little is known about several wildlife populations in the watershed, including Del Norte salamanders, elk, wild turkeys, and many bat species.	23- Knowledge of life histories, habitat requirements, and use of the watershed for these species is acquired.	23- Survey for presence, habitat use, and research life histories of these species.	23- Wildlife	23- Use local volunteers to assist in data collection.	1. L 2. M 3. L 4. M 5. M Avg M-

Table 6-6 ISSUE - Terrestrial Wildlife

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
24- Habitat requirements for furbearers (marten and fisher) include large amounts of structure on the forest floor; logs, stumps, and slash piles. This can present a conflict with fuels reduction plans.	24- Adequate structure is maintained while hazardous concentrations of fuel are reduced.	24- Wildlife and fire personnel work in concert to provide for forest carnivores in fuels reduction work. Promote better understanding of habitat needs of forest carnivores.	24- Late-Seral Dependent Wildlife, Biodiversity	24- None identified at this level of analysis.	1. M 2. M 3. L 4. M 5. M Avg M-
25- There are five goshawk management areas in the watershed. The current condition of the habitat or occupancy by goshawk is unknown.	25- Suitable goshawk habitat is maintained in the management areas and goshawk use is monitored.	25- a. Survey for goshawks in and around management areas. b. Use silvicultural techniques to maintain suitable goshawk habitat.	25- Wildlife	25- None identified at this level of analysis.	1. M 2. M 3. M 4. M 5. M Avg M
26- Suitable habitat for forest carnivores (American marten and Pacific fisher) exists in the watershed, but information on use is lacking.	26- a. Knowledge of habitat requirements and use by forest carnivores in the watershed is sufficient. b. Suitable habitat is maintained in the watershed.	26- a. Use accepted survey techniques (camera and track plate) to detect presence in the watershed. b. Provide and maintain blocks of suitable habitat in the watershed by using silviculture and prescribed fire methods.	26- Wildlife	26- Take into account habitat requirements (snags and CWM) when implementing projects.	1. L 2. L 3. L 4. M 5. L Avg L+

Table 6-7 ISSUE - Roads

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
27- Road maintenance budgets have declined over the last few years. Adequate money to maintain the entire system is lacking.	27- A road system is maintained which supports administrative use, timber harvest, vegetation management activities, and fire suppression.	27- Develop a Transportation Plan which addresses resource needs, protection, and a declining road maintenance budget.	27- All	27- Public desires are considered as well as administrative needs.	1. M 2. H 3. M 4. H 5. H Avg H-
28- High open road density in some areas of the watershed contribute to habitat fragmentation, disturbance to wildlife, increased sedimentation, and changes in runoff patterns.	28- The miles of open road are managed at a level that reduces habitat fragmentation and disturbance to wildlife.	28- **RED FLAG** -Reduce open road density in critical wildlife areas (LSRs, Riparian Reserves, calving and fawning areas) to levels that minimize effects on wildlife and watersheds. Close roads seasonally or permanently as determined by Transportation Plans, see Figure 6-1.	28- Terrestrial and Riparian Dependent Species	28- Transportation planning includes needs of recreation, fire access, and National Forest administration.	1. H 2. H 3. H 4. H 5. H Avg H
29- Site specific road problems exist; small fill slope failures, cut bank raveling, proximity to streams, etc.	29- A stable road system that meets access needs, minimizes sediment delivery to stream channel, and reduces recurring maintenance costs.	29- Ensure Transportation Plan adequately addresses long-term maintenance and sediment reduction, see Figure 6-1.	29- Aquatic Species	29- Repair needed roads, consider closure or other options for unneeded roads.	1. H 2. M 3. H 4. M 5. M Avg M+

Table 6-8 ISSUE - Commercial Timber Output on Public Lands

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
30- Thirty-seven percent of National Forest lands fall within land allocations that have a timber yield expectation.	30- To have a sustainable long-term flow of timber commodities, commensurate with site capabilities and administrative constraints. *Forest Plan* estimates a timber output expectation of about 11 million board feet per decade.	30- Develop an environmentally sustainable timber program based on site potential and management constraints, see Figure 5-7.	30- Timber Output	30- Analysis based on recent inventories.	1. M 2. H 3. H 4. H 5. H Avg H-
31- Over 40% of the General Forest and Partial Retention is in early-seral stage conifer stands. These early-seral stands are vulnerable to loss from high intensity fire.	31- Early-seral stands are resilient to fire effects and protected from high fire behavior areas.	31- a. Use adaptive management silvicultural treatments to develop stands that are resilient to fire. b. Develop a system of fuelbreaks to protect these areas, see Figure 6-2.	31- All	31- Possible strategies include thinning stands to wider spacing and using whole tree yarding to remove fuels. Focus on plantations growing on FSSC 2 - 5.	1. M 2. H 3. H 4. M 5. H Avg H-

Table 6-9 ISSUE - Human Uses

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
32- Local residents are interested and involved in management activities on National Forest lands. They provide valuable input and a source of labor and equipment to implement Forest management.	32- Good lines of communication between local residents and public land managers exist.	32- Participate in joint venture groups dealing with local concerns.	32- All	32- Work with the Salmon River Restoration Council and other residents and community groups	1. L 2. M 3. H 4. M 5. M Avg M
33- Some previous activities have created visual impacts not consistent with Visual Quality Objectives (VQOs).	33- Previously disturbed areas meet desired VQOs.	33- Develop and implement management strategies for areas of concentrated use to rehabilitate landscapes not meeting desired VQOs. Prioritize rehabilitation efforts based on criteria in *Forest Plan*, see Figure 6-3.	33- Scenery	33- Small timber sales are an effective management tool.	1. M 2. L 3. M 4. M 5. L Avg M-
34- The Gray Pine Special Interest Area (SIA) lies mostly within the Trinity Alps Wilderness, it does not have a management strategy. Gray pine is a fire dependent species, requiring periodic fire to perpetuate the stands.	34- The Gray Pine SIA is a successful educational and interpretive tool. Gray pine stands are perpetuated with the use of prescribed natural and/or management ignited fires.	34- Develop a management strategy that may include such things as improved access, interpretive signing, botanical brochure, fire plan, and research opportunities, see Figure 6-3.	34- Recreation	34- Management strategy must be consistent with wilderness objectives.	1. L 2. L 3. M 4. M 5. L Avg L+
35- Twenty-one percent of the watershed is within the Trinity Alps Wilderness. A wilderness plan including a fire plan has not been adopted for this wilderness. Fire suppression practices have allowed for the development of conditions that put wilderness values at risk to loss from either high intensity fire or lack of fire.	35- Fire is allowed to function a natural ecological process in the wilderness.	35- Develop a strategy for using prescribed natural and management ignited fires in allowing fire to function as a natural ecologic process in the wilderness.	35- Recreation, Wildlife, Fire	35- Natural fuel breaks exist at higher elevations. Employ fuels treatment along wilderness boundary at lower elevations.	1. M 2. M 3. M 4. H 5. M Avg M

Table 6-9 ISSUE - Human Uses

Existing Situation	Desired Condition	Management Opportunity	Benefitting Resources	Considerations	Emphasis Rating
36- Mining is an important human activity in the Lower South Fork providing employment for dozens of people. However, mining can be a negative impact on other resources, primarily in riparian areas.	36- Mining continues to employ people in the watershed but impacts to other resources are minimized.	36- Continue to administer mining plans of operation to minimize impacts on riparian areas and other resources.	36- Human Employment, Riparian Areas.	36- Mining operations must comply with applicable laws and meet ACS objectives.	1. M 2. H 3. H 4. M 5. H Avg H-
37- There is a demand for a variety of non-timber commodity uses (firewood, etc.) in the watershed.	37- Non-timber commodity user needs are met consistent with *Forest Plan* direction.	37- Respond to non-timber commodity user needs and expectations, e.g., firewood, mushrooms, etc.	37- Non-Commodity Users	37- None identified at this level of analysis.	1. L 2. M 3. M 4. L 5. M Avg M-
38- The watershed provides a variety of dispersed recreational uses on undeveloped sites, primarily river accesses in the Wild and Scenic River corridor. General guidance for W&S River management exists in the *Forest Plan* but specific objectives for the South Fork Salmon are not defined.	38- A wide array of recreational attractions and opportunities are offered, especially along the South Fork Salmon, consistent with W&S River guidelines and ACS objectives.	38- Provide river accesses, specifically at the Matthews Creek location, that do not impair W&S River values and attaining ACS objectives. Develop a River Management Plan for the SF Salmon River.	38- Recreation, Aquatic Species	38- Consider wildlife needs, ACS objectives, and recreational user needs.	1. M 2. M 3. M 4. L 5. M Avg M-

APPENDICES

A - LMP Feedback
B - Cumulative Watershed Effects
C - Road Issues and Concerns, and Resource Concerns
D - EUI Defined
E - Fire and Fuels
F - Endangered Species Act and Other Species Considerations Questions and Answers
G - Numerical Listing of Roads and Their Status
H - Visual Condition Levels
I - Timber Yield Calculations

APPENDIX A - LMP Feedback

The goal of ecosystem management is to promote sustainablilty by protecting the ecosystem elements within and across spatial and temporal scales. One roll is to guide site level projects and decision making by providing a larger scale context. Another roll of ecosystem analysis is to provide feedback to the *Forest Plan*.

The following recommendations were developed during the Lower South Fork Ecosystem Analysis process. These recommendations primarily involve data layers, estimates of land allocation acreage, and assumptions used for Forest-wide calculations.

1- The Lower South Fork analysis provides an updated estimate of Riparian Reserve acreage and a sample of ground-truthed riparian features for comparison. This allows a more accurate representation of both mapped and unmapped Riparian Reserve acreage than was used in the *Forest Plan*. It is recommended that more sampling of ground-truthed riparian features be done across the forest and future Forest-wide analyses used updated mapping and sampling to estimate Riparian Reserve acreage.

2- The Ecologic Unit Inventory in the Lower South Fork area provides the best information available for determining lands not capable of providing programmed timber harvest due to site limitations, i.e., Harsh Sites. This updated Harsh Site infor-mation should be used when updating *Forest Plan* capable, available, and suitable lands.

3- The requirement in the *Klamath Forest Plan Record of Decision* for a watershed analysis in Areas with Watersheds Concerns (AWWCs) has been met for the AWWCs in the Lower South Fork watershed. However, three subwatersheds (Indian, Negro, and McNeal) are evaluated as needing continued limitations on watershed disturbance due to very high existing disturbance levels.

APPENDIX B - Cumulative Watershed Effects

Landslide Model - The landslide model results are based on the *Salmon Sub-basin Sediment Analysis,* completed in 1993 by two geologists from the Klamath National Forest, Juan de la Fuente and Polly Haessig. The sediment study identifies landslides and estimates landslide volumes based on air photo interpretation with some ground verification. Each landslide in the Salmon River sub-basin is identified by location, geomorphic terrane, disturbance history (road, timber harvest, or fire related, or in an undisturbed area), and time period the landslide was activated. Landslide prediction is based on actual landslide production for the period 1970 to 1975. Several large floods occurred in this time period but not the exceptionally large 1964 flood. The coefficients, expressed as cubic yards per acre given a series of floods similar to the 1970 to 1975 period, are displayed in the following table.

Landslide Model Coefficients

Geomorphic Type	Road Related	Harvest/Fire		Undisturbed
	cu yd/ac	<20 years cu yd/ac	20-40 yrs cu yd/ac	cu yd/ac
Active Landslides	1,000	125	75	25
Dormant Slides/Toe Zone	225	3.2	3.0	2.8
Granitic Mtn. Slopes >60%	1,005	12	6.5	1.3
Granitic Mtn. Slopes <60%	36	11	5.9	0.6
Non-Granitic Slopes >60%	82	3.3	2.5	1.7
Non-Granitic Slopes <60%	19	2.1	1.2	0.3
Unconsolidated Inner Gorge	376	51	39	26
Granitic Inner Gorge	1,201	146	77	7.3
Other Inner Gorge	285	11	9.2	7.2
Debris Basins	25	50	3.8	1.3
Glacial Moraine & Terraces	7.5	6.5	4.9	3.2

To estimate future landslide production, the appropriate coefficient is multiplied by the acres of each geomorphic type by disturbance for each subwatershed. Roads and geomorphic type are Geographic Information System (GIS) layers. Road prism widths of 33' are assumed to convert road lengths to acreage. The harvest/fire history is derived from existing coverages. Through use of GIS, acres of different disturbance histories on different geomorphic types and in different subwatersheds are generated and plugged into sediment modeling equations. The sediment model results are displayed in Step 5.

Equivalent Roaded Area (ERA) Methodology - The ERA methodology is commonly used throughout the Forest Service Region 5 (California Region) for assessing Cumulative Watershed Effects (CWE). The basis for this methodology is converting road, harvest, fire, or other disturbance into Equivalent Roaded Area (ERA) using coefficients. The coefficients used for Lower South Fork are simplified from the *Forest Plan.* Roads have a coefficient of 4.1 ERA per road mile, 0-20 year old regeneration harvest areas 0.21 ERA/acre and 20-40 year old harvest 0.09 ERA/acre. The information needed to calculate ERA is in GIS and the percent ERA for each subwatershed is displayed in Step 5.

The percent ERA for each subwatershed is compared with a Threshold of Concern (TOC). The TOC is also calculated based on the channel sensitivity (C), beneficial uses (B), soil erodibility (E), hydrologic response (H), and slope stability (S). The index for each of these factors is plugged into the equation - Watershed Sensitivity Level (WSL) = 3C + 2B + E + H + S. Watershed Sensitivity is converted to a Threshold of Concern in the equation - Threshold of Concern (TOC) = (43 - WSL)/2. The number "43" is used because it best fits a regression of the watershed sensitivity levels and previously determined Thresholds of Concern.

The watershed sensitivity parameters for all subwatersheds are displayed in Step 3, Table 3-4. The explanation and index value for each is discussed in the following paragraphs.

Channel Sensitivity (C) is based on Pfankuch stream stability ratings for the primary stream and major tributaries through each subwatershed . Since Pfankuch ratings are not available in most of the Lower South Fork watershed, professional judgement supplements stream channel inventories.

Parameter	Sensitivity Class	Index	Pfankuch Rating
Channel Sensitivity	Very High	5	>130
	High	4	115-130
	Moderate	3	77-114
	Low	2	39-76
	Very Low	1	<39

Beneficial Use (B) is an index of relative contribution to beneficial use streams. Five beneficial use stream classes are defined in the Forest Service Manual. A Class 1A stream is a highly productive anadromous stream or is a municipal or campground water source. Knownothing and Methodist Creeks are considered Class 1A because of anadromous fish use and McNeal Creek is considered Class 1A because it is the municipal water source for the Forks of Salmon community. The remaining streams in the watershed are Class 1B to Class 4. Class 1B streams are

moderately productive anadromous streams and Class 4 have no beneficial uses.

Parameter	Significance Class	Index	Description
Beneficial Use	Very Highly	5	Contains the entire drainage area of a Class 1A stream.
	High	4	Contains 25% or more of the drainage area of a Class 1A stream or the entire drainage area of a Class 1B stream.
	Moderate	3	Contains five percent or more of the drainage area of a Class 1A stream, 25%or more of a Class 1B stream, or the entire drainage area of a Class 2 stream.
	Low	2	Contains one percent or more of the drainage area of a Class 1A stream, five percent or more of the drainage area of a Class 1B stream, 25% or more of the drainage area of a Class 2 stream, or the entire drainage area of a Class 3 stream.
	Other	1	Does not meet the criteria of any previous category.

Soil Erodibility (E) is based on the relative proportions of soils with different inherent erosion potentials where:

Erodibility = [6(A + C) + 5(B + D) + 3(E + F + H) + 2(G + I) + J]/Watershed Acres; and A = acres of granitic soils, B & D = acres of metamorphic units on steep slopes, C = acres of mica schist, E = acres of dormant landslides, F = acres of shallow soil and rock outcrops, G = acres of very to extremely gravelly surface, H = acres of cobbly surface, I = acres of glacial till, and J = acres of all other units

Parameter	Sensitivity Class	Index	Erodibility Rating
Soil Erodibility	Very High	5	> 5
	High	4	4-5
	Moderate	3	3-4
	Low	2	1.3-3
	Very Low	1	1-1.3

Hydrologic Response Potential (H) is based on the percent of the watershed in the rain on snow zone, between 3,500 and 5,500 feet elevation.

Parameter	Peak Runoff Potential	Index	Description
Hydrologic Response	High	4	Rain on snow zone > 1/2 of the watershed
	Moderate	3	Rain on snow zone 1/4 to 1/2 of watershed
	Low	2	Rain on snow zone < 1/4 of the watershed

Slope Stability (S) is based on the proportion of the watershed in various slope stability categories where

Stability Rating = [10A + 6B + 4(C + D) + 3E + F]/Watershed Area

A = acres of active landslide
B = acres of unconsolidated inner gorge
C = acres of consolidated inner gorge
D = acres on toe zones of dormant landslides
E = acres on highly dissected, steep granitics
F = acres of all other terranes

Parameter	Risk Class	Index	Stability Rating
Slope Stability	Very High	5	> 1.5
	High	4	1.3 - 1.5
	Moderate	3	1.2 - 1.3
	Low	2	1.1 - 1.2
	Very Low Risk	1	1.0 - 1.1

APPENDIX C - Road Issues and Concerns, and Resource Concerns

This appendix was developed by input and review from District specialists. It provides a watershed scale look at the transportation system, identifying general resource issues and concerns. It will provide the basis, at a later date, for the development of a Transportation Plan.

For discussion purposes, the transportation system is broken into four drainage areas: **Knownothing, Methodist, South Fork Salmon,** and **Black Bear.** The resource concerns are identified for each road(s). Attributes and definitions used by each resource are listed at the end of this section.

Some roads within this area are closed seasonally (during wet weather or for wildlife) or closed year-round (to avoid road surface problems). The other road systems, including temporary spurs, are open to the public. There is a history of small fill slope failures, sedimentation to some streams, cut bank raveling, road surface erosion, and vegetation encroaching upon the travel way.

KNOWNOTHING DRAINAGE AREA

Lists of roads within Knownothing drainage area analysis: 10N02, 10N03, 10N03A, 10N04A, 10N04B, 10N04D, 10N04E, 10N04F, 10N04G, 10N05, 10N05A, 10N07, 10N07A, 10N07B, 10N16, 10N16A, 10N16B, 10N16D, 10N16E, 10N17, 10N20, 10N34, 10N34A, 10N40, 10N41, 10N41A, 10N41B, 10N41C, 10N42, 10N42A, and all temporary spur roads (need field verification).

Roads within LSR: 09N03, 09N03A, 09N03B, 09N03C, 09N04, 09N04A, 09N04B, 10N04, and 10N04H.

DISCIPLINES

FIRE:
Issues
- Fire management access (key location for strategic fire management)
- Vegetation encroachment on roads (loss of fuel breaks)

Resource Concerns
- Critical roads to be maintained and accessible during fire management season; 09N03, 10N03, 10N04, 10N05, 10N06, 10N07 and 10N16
- Develop program to manage vegetation encroachment.

LAW ENFORCEMENT:
Issues
- Current uses

Resource Concerns
- Determine if current uses should be encouraged or restricted
- Analyze snowmobile use
- Maintain access for private land owners; 10N02, 10N04, and 10N17
- Maintain access for search and rescue

TIMBER:
Issues
- Management of plantations and vegetation manipulation for other resource concerns

Resource Concerns
- Maintain existing road system for access
- Most temporary roads should be maintained for access

RECREATION:
Issues
- Trailhead access; 10N04
- General users (hunting and wood collection)
- Vegetation encroachment on roads

Resource Concerns
- Continue seasonal access to trailhead
- Provide access for other users
- Provide and maintain trailhead access road system for assigned maintenance level
- Reduce vegetation encroachment

LANDS AND MINERALS:
Issues
- Access to private lands, and temporary roads off county road for active mining claims

Resource Concerns
- Determine if current use should be encouraged or restricted

RANGE:
Issues
- Access to drop off points for livestock within the watershed

Resource Concerns
- Maintain access and increase size of turnaround to drop off point; no current needs

SILVICULTURE:
Issues
- Roads that are needed for access to plantations

Resource Concerns
- Maintain roads for plantation inventory --criteria used to prioritize roads needed; 0 to 5 years - High, 6 to 20 years - Low, >20 years - once a year, no specific management need in next 20 years

ROAD MANAGEMENT:

Issues

- Roads not needed for management of National Forest
- Reduce road maintenance
- Traffic management for travel access
- Management of aggregate source
- Enhance public safety

Resource Concerns

- Analyze roads and decommission those no longer needed
- Identify roads that require permanent or seasonal closures
- Assign appropriate maintenance level to all roads
- Identify and correct problems that contribute to high maintenance cost
- Install and maintain signs that corresponds with the Forest Visitor's Map, and provide for adequate direction and user's safety
- Look for and investigate future aggregate source that would be more environmentally sound

WILDLIFE:

Issues

- Land allocation (Late-Successional Reserve area)
- Open road density and habitat fragmentation, poaching, and harassment
- Introduction and spread of noxious weeds through use of contaminated seed on road fill slopes (especially in cases of new or reconstruction, or rehab from inslope to outslope)
- Side casting of material in areas of sensitive plant populations

Resource Concerns

- Manage access to protect and enhance condition, serve habitat for Late-Successional Reserve
- Reduce open road density by considering decommissioning roads; 09N03A, 09N03B, 09N03C 09N04A, 09N04B, 10N41A, 10N41B, 10N41C, 10N42A, and most temporary roads
- Maintaining access to sensitive plant populations, 10N02 and 10N16
- No side casting within the areas of Roads 10N02 and 10N16

CULTURAL RESOURCES:

Issues

- Potential disturbance of Historic/Prehistoric properties through road construction or maintenance
- Protect known sites that are listed in the *National Register of Historic Places*

Resource Concerns

- Further surveys needed

VISUAL QUALITY:

Issues

- Visibility of roads (including cut/fill slopes, and location) from visually sensitive viewing

Resource Concerns

- Further surveys needed

FISHERIES/HYDROLOGY/SOILS:

Issues

- Road density, high between Hotelly Gulch and Knownothing Creek, high road density join very erodible soils in Bowerman Peak area 09N03 and spurs, 10N04, 10N04A, 10N04B, and 10N04C, proximity to streams, sedimentation from roads 10N02, and temporary roads
- Inherent soil and geologic instability; erosion problems 10N03, 10N03A, 10N04, 10N04D, 10N16D, 10N16E, 10N20, 09N03, 09N03A, 09N04A and 09N04B
- Culvert capacity meets current standards and guides; bridge over West Knownothing has a <5 year flood capacity design

Resource Concerns

- Minimize sedimentation from roads
- Identify problem areas and prioritize correction or mitigate adverse impacts

METHODIST DRAINAGE AREA

Lists of roads within Methodist drainage area analysis; 09N01, 09N02, 10N19, 10N19A, 10N19B, 10N19D, 38N21, 38N21A, 38N23, 38N23D, 38N26, 38N33, 38N33B, 38N41, 38N41B, 38N41C, 38N41D, 38N41E, 38N43, 39N32, 39N32A, 39N32B, 39N34, 39N34A, 39N34C, and all temporary spur roads (need field verification).

DISCIPLINES

FIRE:

Issues

- Fire management access (key location for strategic fire management)
- Vegetation encroachment on roads (loss of fuel breaks)

Resource Concerns

- Critical roads to be maintained and accessible during fire management season; 38N23, 39N32 and 39N34
- Develop program to manage vegetation encroachment

LAW ENFORCEMENT:

Issues

- Current uses

Resource Concerns
- Determine if current uses should be encouraged or restricted
- Analyze snowmobile use
- Maintain access for private land owners; 39N34
- Maintain access for search and rescue

TIMBER:
Issues
- Management of plantations and vegetation manipulation for other resource concerns

Resource Concerns
- Maintain existing road system for access
- Most of temporary road system should be maintained for access

RECREATION:
Issues
- Trailhead access
- General users (hunting and wood collection)
- Vegetation encroachment on roads

Resource Concerns
- Continue seasonal access to trailhead
- Provide access for other users
- Provide and maintain trailhead access road system for assigned maintenance level
- Reduce vegetation encroachment
- Hazard tree treatment (intermittent and perennial streams)

LANDS AND MINERALS:
Issues
- Access to private lands, and temporary roads off County road for active mining claims

Resource Concerns
- Determine if current use should be encouraged or restricted

RANGE:
Issues
- Access to drop-off points for livestock within the watershed

Resource Concerns
- Maintain access and increase size of turnaround to drop-off point; no current needs

SILVICULTURE:
Issues
- Roads that are needed to access plantations

Resource Concerns
- Maintain roads for plantation inventory --criteria used to prioritize roads needed; 0 to 5 years - High, 6 to 20 years - Low, >20 years - once a year, no specific management need in next 20 years

ROAD MANAGEMENT:
Issues
- Roads not needed for management of National Forest
- Reduce road maintenance
- Traffic management for travel access
- Management of aggregate source
- Enhance public safety

Resource Concerns
- Analyze and decommission roads no longer needed
- Identify roads that require permanent or seasonal closures
- Assign appropriate maintenance level to all roads
- Identify and correct problems that contribute to high maintenance cost
- Install and maintain signs that corresponds with the Forest Visitor's Map, and provide for adequate direction and user's safety
- Look for and investigate future aggregate source that would be more environmentally sound

WILDLIFE:
Issues
- Land allocation (Late-Successional Reserve area)
- Open road density and habitat fragmentation, poaching, and harassment
- Introduction and spread of noxious weeds through use of contaminated seed on road fill slopes (especially in cases of new or reconstruction, or rehab from inslope to outslope)
- Side casting of material in areas of sensitive plant populations

Resource Concerns
- Manage access to protect and enhance condition, serve habitat for Late-Successional Reserve
- Reduce open road density by considering decommissioning roads 10N19, 10N19A, 10N19B, 38N33B, 38N41B, 38N41E, and most temporary roads
- Maintaining access to sensitive plant populations; 38N33
- No side casting within the area of road 38N33

CULTURAL RESOURCES:
Issues
- Potential disturbance of Historic/Prehistoric properties through road construction or maintenance

Resource Concerns
- Further surveys needed

VISUAL QUALITY:
Issues
- Visibility of roads (including cut/fill slopes, and location) from visually sensitive viewing

Resource Concerns
- Further surveys needed

FISHERIES/HYDROLOGY/SOILS:

Issues

- Road density, proximity to streams, on east side of drainage, and temporary roads
- Inherent soil and geologic instability; 39N34, 39N34A, 39N41, 39N32, 10N02
- Culvert capacity meets current standard and guide

Resource Concerns

- Minimize sedimentation from roads
- Identify problem areas and prioritize correction or mitigate adverse impacts

SOUTH FORK SALMON DRAINAGE AREA:

Lists of roads within South Fork Salmon drainage area analysis; 10N01, 10N01B, 10N22, 10N22A, 10N22B, 10N22C, 10N38, 39, 39B, 39I, 39J, 39K, 39M, 39N12, 39N22A, 39N27, 39N29, 39N30, 39N30A, 39N30B, 39N30C, 39N30D, 39N30E, 39N35, 39N55, 39N55A, 39N67, 39N72, 39N72A, and all temporary spur roads (need field verification).

DISCIPLINES

FIRE:

Issues

- Fire management access (key location for strategic fire management)
- Vegetation encroachment on roads (loss of fuel breaks)

Resource Concerns

- Critical roads to be maintained and accessible during fire management season; 10N01, 39, 39N27, 39N28 and 39N30
- Develop program to manage vegetation encroachment

LAW ENFORCEMENT:

Issues

- Current Uses

Resource Concerns

- Determine if current uses should be encouraged or restricted
- Analyze snowmobile use
- Maintain access for private landowners; 10N38, 39, 39N29 and 39N30
- Maintain access for search and rescue

TIMBER:

Issues

- Management of plantations and vegetation manipulation for other resource concerns

Resource Concerns

- Maintain existing road system for access
- Most of temporary road system should be maintained for access

RECREATION:

Issues

- Trailhead access; 39
- General users (hunting and wood collection)
- Vegetation encroachment on roads

Resource Concerns

- Continue seasonal access to trailhead
- Provide access for other users
- Provide and maintain trailhead access road system for assigned maintenance level
- Reduce vegetation encroachment

LANDS AND MINERALS:

Issues

- Access to private lands, and temporary roads off county road for active mining claims

Resource Concerns

- Determine if current use should be encouraged or restricted

RANGE:

Issues

- Access to drop-off points for livestock within the watershed

Resource Concerns

- Maintain access and increase size of turnaround to drop-off point; no current needs

SILVICULTURE:

Issues

- Roads that are needed to access plantations

Resource Concerns

- Maintain roads for plantation inventory --criteria used to prioritize roads needed; 0 to 5 years - High, 6 to 20 years - Low, >20 years - once a year, no specific management need in next 20 years

ROAD MANAGEMENT:

Issues

- Roads not needed for management of National Forest
- Reduce road maintenance
- Traffic management for travel access
- Management of aggregate source
- Enhance public safety

Resource Concerns

- Analyze and decommission roads no longer needed
- Identify roads that require permanent or seasonal closures
- Assign appropriate maintenance level to all roads
- Identify and correct problems that contribute to high maintenance cost
- Install and maintain signs that corresponds with Forest Visitor's Map, and provide for adequate direction and user's safety

• Look for and investigate future aggregate source that would be more environmentally sound

WILDLIFE:
Issues
• Land allocation (Late-Successional Reserve area)
• Open road density and habitat fragmentation, poaching, and harassment
• Introduction and spread of noxious weeds through use of contaminated seed on road fill slopes (especially in cases of new or reconstruction, or rehab from inslope to outslope)
• Side casting of material in areas of sensitive plant populations
Resource Concerns
• Manage access to protect and enhance condition, serve habitat for Late-Successional Reserve
• Reduce open road density by considering decommissioning roads; 10N22A, 10N22B, 10N22C, 39N22A, 39N30A, 39N30B, 39N30C, 39N55A, 39N72A, and most temporary roads
• Maintaining access to sensitive plant populations; 10N01
• No side casting within the area of Road 10N01

CULTURAL RESOURCES:
Issues
• Potential disturbance of Historic/Prehistoric properties through road construction, maintenance, and increased access
Resource Concerns
• Further surveys needed

VISUAL QUALITY:
Issues
• Visibility of roads (including cut/fill slopes, and location) from visually sensitive viewing
Resource Concerns
• Further surveys needed

FISHERIES/HYDROLOGY/SOILS:
Issues
• Road density, high road density in Negro Cr. drainage, and temporary roads
Proximity to streams, temporary roads in Graham Gulch crosses landslides and goes up creek near the end; Road 39N30 part of system
• Inherent soil and geologic instability, unstable cut banks and eroding fill slopes; 39N27, unstable road crossings, chronic cut bank failure and crosses small landslides
• Culvert capacity meets current standard and guide, Road 39N30 high maintenance design with numerous pipes, Road 39N67 steep with poor drainage segments, located on landslide
Resource Concerns
• Minimize sedimentation from roads
• Identify problem areas and prioritize correction or mitigate adverse impacts

BLACK BEAR DRAINAGE AREA:

Lists of roads within South Fork Salmon drainage area analysis; 38N15, 38N17, 38N17B, 38N17F, 38N28, 38N29, 39, 39L, 39N17, 39N19, 39N19A, 39N22, 39N22B, 39N23, 39N23A, 39N24, 39N25, 39N30, 39N30D, 39N36, 39N37, 39N37A, 39N41, 39N46, 39N46A, 39N64, 39N64A, 39N71, 39N71A, 39N77, 39N77A, 39N77B, and all temporary spur roads (need field verification).

DISCIPLINES

FIRE:
Issues
• Fire management access (key location for strategic fire management)
• Vegetation encroachment on roads (loss of fuel breaks)
Resource Concerns
• Critical roads to be maintained and accessible during fire management season; 38N17, 38N29, 39, 39N23, 39N30, 39N36, 39N37, 39N41, and 39N46
• Develop program to manage vegetation encroachment

LAW ENFORCEMENT:
Issues
• Current uses
Resource Concerns
• Need to determine if current uses should be encouraged or restricted
• Analyze snowmobile use
• Maintain access for private land owners; Road 38N17, 38N29, 39, and 39N23
• Maintain access for search and rescue

TIMBER:
Issues
• Management of plantations and vegetation manipulation for other resource concerns
Resource Concerns
• Maintain existing road system for access
• Most of temporary road system should be maintained for access

RECREATION:
Issues
• Trailhead access; 39 and 39N23
• General users (hunting and wood collection)
• Vegetation encroachment on roads
Resource Concerns
• Continue seasonal access to trailhead
• Provide access for other users

• Provide and maintain trailhead access road system for assigned maintenance level
• Reduce vegetation encroachment

LANDS AND MINERALS:
Issues
• Access to private lands, and temporary roads off County road for active mining claims
Resource Concerns
• Determine if current use should be encouraged or restricted

RANGE:
Issues
• Access to drop-off points for livestock within the watershed
Resource Concerns
• Maintain access and increase size of turnaround to drop-off point; no current needs

SILVICULTURE:
Issues
• Roads that are needed plantations
Resource Concerns
• Maintain roads for plantation inventory --criteria used to prioritize roads needed; 0 to 5 years - High, 6 to 20 years - Low, >20 years - once a year, no specific management need in next 20 years

ROAD MANAGEMENT:
Issues
• Roads not needed for management of National Forest
• Reduce road maintenance
• Traffic management for travel access
• Management of aggregate source
• Enhance public safety
Resource Concerns
• Analyze and decommission roads no longer needed
• Identify roads that require permanent or seasonal closures
• Assign appropriate maintenance level to all roads
• Identify and correct problems that contribute to high maintenance cost
• Install and maintain signs that correspond with the Forest Visitor's Map, and provide for adequate direction and user's safety
• Look for and investigate future aggregate source that would be more environmentally sound

WILDLIFE:
Issues
• Land allocation (Late-Successional Reserve area)
• Open road density and habitat fragmentation, poaching, and harassment
• Introduction and spread of noxious weeds through use of contaminated seed on road fill slopes (especially in cases of new or reconstruction, or rehab from inslope to outslope)
• Side casting of material in areas of sensitive plant populations
Resource Concerns
• Manage access to protect and enhance condition, serve habitat for Late-Successional Reserve
• Reduce open road density by considering decommissioning roads; 39N36, 39N37A, and most temporary roads
• Maintaining access to sensitive plant populations; 39N77
• No side casting within the area of Road 39N77

CULTURAL RESOURCES:
Issues
• Potential disturbance of Historic/Prehistoric properties through road construction, maintenance and increased access
Resource Concerns
• Further surveys needed

VISUAL QUALITY:
Issues
• Visibility of roads (including cut/fill slopes, and location) from visually sensitive viewing
Resource Concerns
• Further surveys needed

FISHERIES/HYDROLOGY/SOILS:
Issues
• Road density, proximity to streams, sedimentation from roads 10N02, and temporary roads
• Inherent soil and geological instability, unstable cut banks and major fill slope erosion; 39, 39N41, 38N17 and 39N36
• Culvert capacity meets current standards and guides
Resource Concerns
• Minimize sedimentation from roads
• Identify problem areas and prioritize correction or mitigate adverse impacts

ATTRIBUTES AND DEFINITIONS BY RESOURCE

FIRE:
Critical Roads - Roads that are critical for fire access, control points, and those that provide a fuelbreak situation.
Important Roads - Roads that are important for fire access and those that are needed for strategic type project work (i.e., prescribed burning, fuels clean-up, etc.).

LAW ENFORCEMENT;
Law Enforcement Problems - Will highlight which roads or system of roads currently encountering law enforcement problems.

Current Use - Roads that need to have current use analyzed. It may not necessarily be an enforcement problem, but needs to be explored for current use needs to be encouraged or restrictions needed to be implemented. Other uses that have the potential to encourage or discourage use include snowmobiles, mountain bikes, and four-wheel-drive vehicles.
Law Enforcement Needs - Will identify roads or road system law enforcement needs for access and personal safety.

TIMBER:
Matrix Lands - Areas where access is needed for timber management opportunities.
Other Lands - Areas where access may be needed to provide vegetative manipulation for other resource concerns.

RECREATION:
Trailhead Access - Roads that currently serve as trailhead access into the Marble Mountain Wilderness.
General Recreation Use - Roads that are heavily used for dispersed recreation (i.e., hunting, sightseeing, woodcutting, fishing, etc.).

LANDS AND MINERAL:
Active Claims - Roads utilized for access to active mining claims.
Private Land - Roads needed to access private property or have special-use easements attached to them.

RANGE:
<>

SILVICULTURE:
<>

ROAD MANAGEMENT:
Notes - Roads below maintenance level 3 normally do not receive brush treatment.
Final Transportation Plan - A realistic look at maintenance wants vs. dollars expected needs to occur. Included public input during the decision making process.

WILDLIFE:
Disturbance - Deals with disturbance in terms of proximity to active nest sites for threatened, endangered, or sensitive species. Deals with harassment to some critical games species.
Fragmentation - Deals with fragmentation of habitats for particular species.
Road Density - Deals with areas of high road density. Can be closely correlated with the harassment issue and fragmentation of habitats.

CULTURAL RESOURCE:
Protection and field verification for actual know sites and future historic or cultural sites.

VISUAL QUALITY:
Visuals are being analyzed as roads or portions of roads that may not currently meet the established VQO for the area. Roads addressed here are designated as needing additional field verification for actual vantage points and locations in need of visual restoration.

FISHERIES/HYDROLOGY/SOILS:
Stream Proximity - Roads that are located very close to streams. This issue is very closely related to the chronic sedimentation issue for watershed.

APPENDIX D - EUI Defined

INTRODUCTION

Ecological Unit Inventory (EUI) provides information about the production capabilities, management opportunities, and limitations to land use. EUIs are developed by an interdisciplinary team and form the basis for land capability determinations for land management planning (*FSH 2090.11*, Ch. 3, p.2).

A primary function of EUI is to build a Forest-wide GIS database that is compatible, coordinated, and ecological-based. A coordinated database is one where all data layers, i.e., bedrock geology, landform, soils, potential vegetation, and existing vegetation, use coincident lines. This is accomplished by an interdisciplinary team approach to mapping rather than each resource mapper working independently of each other and inputting into GIS their data layer separately. An ecological-based database consists of an integrated ecosystem classification system and mapping of ecological types that are nested within a National hierarchical framework of Ecological Units.

The EUI process is National in scope and directed by National guidelines. *Forest Service Handbook 2090.11*, Chapter 3, provides specific direction for conducting EUIs. This is Washington Office direction and must be used in conducting EUI by the Forest Service.

In January of 1992, Forest Service Region 5 developed a Draft Supplement to *FSH 2090.11* providing specific direction on mapping procedures, processes, and format. This direction was taken from the Natural Resources Conservation Service's *National Soils Handbook* and was formatted to fit the EUI concept of lithology, geomorphology, soil, and potential natural community, rather than just soils.

KNF PROCESS

The following description is for the basic mapping process currently occurring on the Klamath National Forest. This process has evolved since 1992 due to changing technology, Forest needs, and budgets.

The first step is to take existing Forest bedrock and geomorphology layers and coordinate them with the existing Order 3 soils layer; using paper maps. This final product now uses the computer's capability to display these layers on the monitor's screen and changes are made directly in GIS using ARC-INFO, thus eliminating numerous chances for line error.

The next step is for the vegetation mapper to take this information into the field and describe/map potential and existing vegetation. During this mapping process, changes to soil, bedrock geology, and landform can be made. The soil scientist also makes changes to the soil, bedrock geology, and landform boundaries. Currently, we do not have a geologist available to assist in this mapping process.

When the field mapping process is completed, the vegetation mapper and soil scientist agree on the final location of polygon boundaries and ecological types. This process used to be finalized on 1:16,000 photos and later transferred to 1:24,000 orthophotos. Now, the new process is to finalize the product directly onto digital orthophotos displayed on the computer screen. This eliminates most transfer errors that occurred in the past when work was done by hand.

A database is constructed that connects polygons to each of the mapped data elements, such as soils, bedrock, landform, potential vegetation, and existing vegetation.

Currently, the Forest's EUI program is mapping at Order 3 intensity using a 1:24,000 scale map base. The minimum ecological map unit polygon size is approximately twenty acres. Data analysis of three completed EUI mapping projects; Main Salmon, Lower South Fork, and Callahan, show 61% of the coordinated EUI polygons were 100 acres or less in size and 37% were 101-500 acres.

To date approximately 355,368 acres have been mapped at the Order 3 intensity.

INDIVIDUAL EUI DATA ELEMENTS

The following discussion will provide more information for each data layer of the EUI process:

Bedrock Geology - EUI uses the recently updated (1996) Forest bedrock geology database in GIS. Major lithologic boundaries are field verified when encountered and corrections made. Lithologic units less than twenty acres are not recognized unless they are strongly contrasting or are important for management interpretation.

Geomorphology - EUI uses a combination of the draft *A Classification System for Geomorphology* (March 1996) which is the Forest Service's standard, in conjunction with the Forest geomorphic type coding system. The EUI currently recognizes 17 geomorphic types.

Soil - The soil survey portion of the EUI process is guided by direction from the *National Soil Survey Handbook* (1996), *Soil Survey Manual* (1993), *Forest Service Handbook 2090.11* and numerous technical guidelines and support from the Natural Resources Conservation Service.

The EUI uses the existing Order 3 Soil Survey which was completed in the early 1980s and published in 1994. This survey was mapped at 1:60,000 and enlarged to 1:24,000 in GIS. During the EUI mapping process, soils are examined more closely in the field and refined where needed.

Comparing the existing soil survey and the EUI soil survey shows that the existing soil survey used 74 soil map units to describe the soils on the westside of the Forest (west of I-5). Currently, the updated EUI soil survey uses 249 soil map units to describe soils.

Comparing the polygon size frequency distribution, shows that the existing soil survey has 37% of its polygons between 0-100 acres compared to 61% for the EUI soil survey. Also, the existing soil survey has 19% of its polygons between 501 and >2,000 acres compared to two percent for the EUI soil survey. This comparison clearly shows that the EUI soil survey is much more detailed and descriptive than the existing soil survey.

Potential Vegetation - Direction and guidance for the potential vegetation (PV) component of the EUI is provided by *Forest Service Manual 2060, Ecosystem Classification, Interpretation, and Application* (1991), *Forest Service Handbook 2090.11, Ecological Classification and Inventory Handbook* (1991), *Forest Inventory and Analysis User's Guide* (1997), and numerous plant association field guides as well as draft plant association guides.

The EUI process at the Order 3 mapping intensity maps potential vegetation to the sub-series level, which is appropriate for the mapping scale currently used.

The polygon size frequency distribution shows 24% of the PV polygons are 100 acres or less in size, 28% are 101-200 acres, and 21% are 201-500 acres in size; mean polygon size is 118 acres.

Existing Vegetation - Direction and guidance for the existing vegetation component is provided by the R5 Supplement to *Forest Service Handbook 2090.11.*

The existing vegetation component of the EUI was not an original part of the EUI process but was added when the users of EUI indicated that it was the most useful component of vegetation in making interpretations. The existing vegetation polygons are nested within the coordinated EUI polygons.

Comparing the EUI existing vegetation to the existing timber type existing vegetation shows that the timber type has three data identifiers; conifer/hardwood species, size class, and density class, while the EUI existing vegetation uses nine data identifiers; seral stage, conifer size class, hardwood size class, percent total vegetation cover, percent total tree cover, percent conifer cover, percent hardwood cover, primary species, and secondary species. In addition, a code for vegetative disturbance; any type of harvest, fire + salvage or fire + no salvage, is included in the seral stage coding.

Comparing the polygon size frequency distribution shows 45% of the EUI existing vegetation polygons are 1-15 acres in size while 29% of the timber type polygons are 1-15 acres in size. Also, 78% of the EUI existing vegetation polygons are 1-40 acres in size, while 72% of the timber type polygons are 1-40 acres in size.

The mean polygon size for the timber type is 37 acres, and 30 acres for the EUI existing vegetation.

PEER REVIEW

The Forest's EUI Program was reviewed in 1995 as part of the Regional Office's quality control program. In attendance were Paul Johnson (acting Director for Minerals and Watershed Management), Rob Griffith (Regional Soil Scientist), Scott Miles (North Zone Soil Scientist), numerous ecologists, geologists, botanists, and other soil scientists from the Six Rivers, Shasta-Trinity, Mendocino, and Klamath National Forests.

The purpose of this Klamath Administrative Province Review was for the province EUI Teams to meet and share techniques, successes, and enhance the consistency and quality of EUI methods and products across the Province and Region.

WORK PLAN

Currently, the Klamath National Forest's EUI Program is operating under the guidance of a 1995 Landtype Ecological Unit Survey Work Plan for the Klamath National Forest Area.

Submitted: September 1997; TOM LAURENT, Soil Scientist, EUI Program Leader

APPENDIX E - Fire and Fuels

The following is a description of the components and the process involved in determining fire behavior potential and risk for the Lower South Fork watershed.

FUEL MODEL DEFINITIONS

The prediction of fire behavior is valuable for assessing potential fire damage to resources. A quantitative basis for rating fire danger and predicting fire behavior became possible with the development of mathematical fire behavior fuel models. Fuels have been classified into four groups; **grasses, shrubs, timber,** and **slash**. The differences in these groups are related to the fuel load and distribution of fuel among size classes. Size classes are: 0-1/4" (1 hour fuels), 1/4-1" (10 hour fuels), 1-3" (100 hour fuels), and 3" and greater (1,000 hour fuels).

A description of fuel models used in fire behavior as documented by Albini (1976) is in the following table:

FUEL MODEL Typical Fuel Complex	FUEL LOADING tons/acre				FUEL BED DEPTH in ft.
	1 Hr	10 Hr.	100 Hr.	Live	
GRASS AND GRASS-DOMINATED					
1-Short Grass (1 ft.)	0.74	0.00	0.00	0.00	1.0
2-Timber (Grass and Understory)	2.00	1.00	0.50	0.50	1.0
3-Tall Grass (2.5 ft.)	3.01	0.00	0.00	0.00	-
CHAPARRAL AND SHRUB FIELDS					
4-Chaparral (6 ft.)	5.01	4.01	2.00	5.01	6.0
5-Brush (2 ft.)	1.00	0.50	0.00	2.00	2.0
6-Dormant Shrub & Hdwd. Slash	1.50	2.50	2.00	0.00	2.5
7-Southern Rough	1.13	1.87	1.50	0.37	2.5
TIMBER LITTER					
8-Closed Timber Litter	1.50	1.00	2.50	0.00	0.2
9-Hardwood Litter	2.92	0.41	0.15	0.00	0.2
10-Timber (Litter and Understory)	3.01	2.00	5.01	2.00	1.0
SLASH					
11-Light Logging Slash	1.50	4.51	5.51	0.00	1.0
12-Medium Logging Slash	4.01	14.03	16.53	0.00	2.3
13-Heavy Logging Slash	7.01	23.04	28.05	0.00	3.0

The criteria for choosing a fuel model (Anderson 1982) includes the fact that fire burns in the fuel stratum best conditioned to support fire. Fuel models are simply tools to help the user realistically estimate fire behavior. Modifications to fuel models are possible by changes in the live/dead ratios, moisture contents, fuel loads, and drought influences. Thirteen fire behavior predictive fuel models are used during the severe period of fire season when wildfire pose greater control problems and impacts on land resources.

Following is a brief description of each of the 13 fire behavior fuel models:

GRASS GROUP

Fire Behavior Fuel Model 1 - Fire spread is governed by the very fine, porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass. Very little timber or shrub is present.

Fire Behavior Fuel Model 2 - Fire spread is primarily through cured or nearly cured grass where timber or shrubs cover one to two-thirds of the open area. These are surface fires that may increase in intensity as they hit pockets of other litter.

Fire Behavior Fuel Model 3 - Fires in this grass group display the highest rates of spread and fire intensity under the influence of wind. Approximately one-third or more of the stand is dead or nearly dead.

SHRUB GROUP

Fire Behavior Fuel Model 4 - Fire intensity and fast spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous secondary overstory. Stands of mature shrubs, six feet tall or more are typical candidates. Besides flammable foliage, dead woody material in the stands contributes significantly to the fire intensity. A deep litter layer may also hamper suppression efforts.

Fire Behavior Fuel Model 5 - Fire is generally carried by surface fuels that are made up of litter cast by the shrubs and grasses or forbs in the understory. Fires are generally not very intense because the fuels are light and shrubs are young with little dead material. Young green stands with little dead wood would qualify.

Fire Behavior Fuel Model 6 - Fires carry through the shrub layer where the foliage is more flammable than fuel model 5, but requires moderate winds, greater than eight miles per hour.

Fire Behavior Fuel Model 7 - Fires burn through the surface and shrub strata with equal ease and can occur at higher dead fuel moistures because of the flammability of live foliage and other live material.

TIMBER GROUP

Fire Behavior Fuel Model 8 - Slow burning ground fuels with low flame lengths are generally the case, although the fire may encounter small "jackpots" of heavier concentrations of fuels that can flare up. Only under severe weather conditions do the fuels pose a threat. Closed canopy stands of short-needled conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mostly twigs, needles, and leaves.

Fire Behavior Fuel Model 9 - Fires run through the surface faster than in fuel model 8 and have a longer

flame length. Both long-needle pine and hardwood stands are typical. Concentrations of dead, down woody material will cause possible torching, spotting, and crowning of trees.

Fire Behavior Fuel Model 10 - Fires burn in the surface and ground fuels with greater intensity than the other timber litter types. A result of overmaturing and natural events creates a large load of heavy down, dead material on the forest floor. Crowning out, spotting, and torching of individual trees is more likely to occur, leading to potential fire control difficulties.

SLASH GROUP

Fire Behavior Fuel Model 11 - Fires are fairly active in the slash and herbaceous material intermixed with the slash. Fuel loads are light and often shaded. Light partial cuts or thinning operations in conifer or hardwood stands. Clearcut operations generally produce more slash than is typical of this fuel model.

Fire Behavior Fuel Model 12 - Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts it is generally sustained until a fuelbreak or change in conditions occur. Fuels generally total less than 35 tons per acre and are well distributed. Heavily thinned conifer stands, clearcuts, and medium to heavy partial cuts are of this model.

Fire Behavior Fuel Model 13 - Fire is generally carried by a continuous layer of slash. Large quantities of material three inches and greater is present. Fires spread quickly through the fine fuels and intensity builds up as the large fuels begin burning. Active flaming is present for a sustained period of time and firebrands may be generated. This contributes to spotting as weather conditions become more severe. Clearcuts are depicted where the slash load is dominated by the greater than three inch fuel size, but may also be represented by a "red slash" type where the needles are still attached because of high intensity of the fuel type.

Fuel models identified and used in this analysis are in the following table:

LOWER SOUTH FORK FUEL MODELS

VEGETATION TYPE	SERAL STAGE 1/	FM@≤ 25% CROWN CLOSURE	FM@ 25-50% CROWN CLOSURE	FM@>50% CROWN CLOSURE
Douglas-Fir/Live Oak	E/M	2	5	10
Douglas-Fir/Live Oak	L/O	2	12	10
Douglas-Fir/Live Oak	S/P	2	5	6
Douglas-Fir/Tanoak	E/M	2	5	10
Douglas-Fir/Tanoak	L/O	N/A	N/A	10
Douglas-Fir/Tanoak	S/P	2	5	6
Gray Pine	E/M	2	5	6
Gray Pine	S/P	2	5	6
Jeffrey Pine	E/M	2	5	9
Jeffrey Pine	L/O	2	5	9
Jeffrey Pine	S/P	2	5	6
Live Oak/Scattered Conifer	E/M	2	2	6 on S&W Aspects, 5 on N&E Aspects
Live Oak/Scattered Conifer	L/O	N/A	2	8
Live Oak/Scattered Conifer	S/P	2	5	6 on S&W Aspects, 5 on N&E Aspects
Mixed Conifer Site 1-5	E/M	2	2	8
Mixed Conifer Site 1-5	L/O	2	2	10
Mixed Conifer Site 1-5	S/P	2	5	6
Mixed Conifer Site 6-9	E/M	2	2	8
Mixed Conifer Site 6-9	L/O	2	2	8
Mixed Conifer Site 6-9	S/P	2	5	6
Meadow/Lake	E/M	14	N/A	N/A
Meadow/Lake	LAKE	NON 2/	N/A	N/A
Meadow/Lake	S/P	14	N/A	N/A
Subalpine Conifer	E/M	NON	8	8
Subalpine Conifer	L/O	NON	8	10
Subalpine Conifer	S/P	NON	N/A	N/A
True Fir	E/M	2	8	8
True Fir	L/O	2	8	10
True Fir	S/P	2	5	6

1/ S/P = Sapling/Pole E/M = Early/Mid L/O = Late/Old-Growth
2/ NON = Nonflammable

Fire Behavior Fuel Model 14 is virtually non-flammable due to wet conditions.

The percent of each fuel model identified in the watershed is shown in the following table:

FUEL MODEL	ACRES	PERCENT
2	9,145	14
5	13,160	20
6	9,730	15
8	10,795	16
9	440	<1
10	21,600	32
12	105	<1
14	185	<1
Nonflammable	1,540	2

WEATHER DATA

The following weather parameters were taken from the data collected from the Sawyers Bar weather station from 1973 through 1992. These parameters are representative of 90th percentile weather conditions.

FUEL MOISTURE	PERCENT
1 Hour	2
10 Hour	4
100 Hour	7
1000 Hour	8
Live Woody	80
Herbaceous	30
20 Foot Wind Speed = 9 MPH	

FIRE BEHAVIOR POTENTIAL

To determine Fire Behavior Potential Classes, each fuel model is run through the BEHAVE program. This program uses fuel model, slope, and weather parameters to predict fire behavior and resistance to control for fire suppression purposes. The 90th percentile weather from the most representative weather station was used to model late summer afternoons, typical of late July through early September.

Three slope classes are used, consistent with the slope classes used in the LMP geologic hazard classification (0-34%, 35-65%, and >65%). All fuel models were run through each of the three slope classes, to determine increases in fire behavior with increased steepness of terrain.

The output of this is a rating of Low, Moderate, or High fire behavior based on flame lengths, which are good indicators of fire line intensity and resistance to control, and/or rate of spread (ROS), which is also a good indicator of resistance to control.

Fire behavior potential modeling is done in order to estimate the severity and resistance to control that can be expected, when a fire occurs during what is considered the worst case weather conditions. Late summer weather conditions are referred to as the 90th percentile weather data, which is a standard used when calculating fire behavior (90th percentile weather is defined as the severest 10% of the historical fire weather, i.e., hot, dry, windy conditions occurring on mid afternoons during the fire season). The modeling incorporates fuel condition, slope class, and 90th percentile weather conditions in calculating projections on flame lengths and rates of spread. A **low** rating indicates that fires can be attacked and controlled directly by ground crews building fireline and will be limited to burning in understory vegetation. A **moderate** rating indicates that hand built firelines alone would not be sufficient in controlling fires and that heavy equipment and retardant drops would be more effective. Areas rated as **high** represent the most hazardous conditions in which serious control problems would occur i.e., torching, crowning, and spotting, control lines are established well in advance of flaming fronts with heavy equipment and backfiring may be necessary to widen control lines.

Using the CONTAIN model of BEHAVE, it was determined whether or not a fire with Low Flame Lengths could be contained by the initial attack forces. These runs indicated that given, typical response times, terrain, fuels, and available forces, a Low rating had to have a ROS <30 chains per hour, for containment to be accomplished during initial attack.

FIRE BEHAVIOR POTENTIAL CLASSES

Low- Flame lengths <4' and ROS <30chs/hr
Fires can generally be attacked at the head or flanks by firefighters using handtools. Handline should hold the fire.

Moderate- Flame lengths 4-8'
Fires are too intense for direct attack at the head of the fire by firefighters using handtools. Handline cannot be relied on to hold the fire. Equipment such as dozers, engines, water and/or retardant dropping aircraft can be effective.

High- Flame lengths >8'
Fires may present serious control problems, such as torching, crowning, and spotting. Control efforts at the head of the fire will be ineffective.

These are the acres associated with each Fire Behavior Class in the watershed:

High - 27,700 acres (42% of the watershed)
Moderate - 26,040 acres (39% of the watershed)
Low - 12,960 acres (19% of the watershed)

FUEL MODEL DATA TABLE

Fuel Model	Aspect	1 HR	Wind	R25	R55	R75	F25	F55	F75	H@25	H@55	H@75
2	S&W	2	4	50	74	100	8	10	11	High	High	High
2	E	3	4	45	66	90	8	9	10	High	High	High
2	N	4	4	*41	60	82	7	8	10	High	High	High
5	S&W	2	4	30	42	56	7	9	10	Mod	High	High
5	E	3	4	28	40	53	7	8	9	Mod	High	High
5	N	4	4	27	38	51	7	8	9	Mod	High	High
6	S&W	2	4	43	61	81	8	9	10	High	High	High
6	E	3	4	*39	55	72	7	8	9	High	High	High
6	N	4	4	*35	49	65	7	8	9	High	High	High
8	S&W	2	2	1	3	4	1	1	2	Low	Low	Low
8	E	3	2	1						Low	Low	Low
8	N	4	2							Low	Low	Low
9	S&W	2	3	8	13	18	3	4	5	Low	Low	Mod
9	E	3	3			16			4	Low	Low	Mod
9	N	4	3			14			4	Low	Low	Low
10	S&W	2	2	5	10	16	5	6	8	Mod	Mod	High
10	E	3	2	5	10	15	4	6	7	Mod	Mod	**High
10	N	5	2	6	11	17	5	6	7	Mod	Mod	**High

Fuel Model	Aspect	1 HR	Wind	R25	R55	R75	F25	F55	F75	H@25	H@55	H@75
12	S&W	2	3	14			9			High	High	High
12	E	3	3	13			8			High	High	High
12	N	4	3	11			8			High	High	High
14	S&W	10	3	3	N/A	N/A	1	N/A	N/A	Low	Low	Low
14	E	12	3	3	N/A	N/A	1	N/A	N/A	Low	Low	Low
14	N	14	3	3	N/A	N/A	1	N/A	N/A	Low	Low	Low

* Fire behavior potential is based on rate of spread rather than flame length.
** Enhanced fire behavior potential (slope >60% and crown closure >70%).

INITIAL ATTACK ACCESS

Another consideration when determining fire behavior potential is the ability of initial attack fire suppression forces to successfully contain a fire that can be quickly accessed.

The initial attack fire suppression forces used for this analysis were:

Two Model 42 Engines/Crew
One 5-Person Handcrew
One Type 3 Helicopter/Bucket
One Type 1 Airtanker

Based on the flame lengths and rates of spread modeled at the 90th percentile weather and the line building capabilities of the initial attack fire suppression forces, it was determined that fires with <8' flame length and a rate of spread <30 chains per hour could be contained, if they originated within 1/4 mile of a road.

This is the crosswalk from fuel models to fire behavior potential taking into account initial attack fire suppression capabilities. Within 1/4 mile from a road, fire suppression will be credited for lowering fire behavior potential from a moderate rating to a low rating. In areas where fuels and topographyindicate a high rating, the rating will stay as high. Areas identified as low will stay low. The only areas that will change are those with moderate fire behavior potential where the rate of spread is lower than the line building capabilities of the initial attack forces and are within 1/4 mile of a road.

FUEL MODEL	FIRE BEHAVIOR POTENTIAL	FIRE BEHAVIOR POTENTIAL WITHIN 1/4 MILE OF A ROAD
2	High	
5	Mod on Slopes ≤ 35%	Low on Slopes ≤ 35%
5	High on Slopes > 35%	
6	High	
8	Low	
9	Mod on S,W&E Aspects, with >65% Slope	Low on S,W&E Aspects, with >65% Slope
9	Low on S,W&E Aspects , with <65% Slope	
9	Low on N Aspects	
10 _	High on S&W Aspects with >65% Slope	Low on all Aspects with <65% Slope and 70% Crown Closure
10	High on N&E Aspects with >65% Slope and >70% Crown Closure	
10	Mod on all Aspects with <65% Slope	

FUEL MODEL	FIRE BEHAVIOR POTENTIAL	FIRE BEHAVIOR POTENTIAL WITHIN 1/4 MILE OF A ROAD
10	Mod on N&E Aspects with <65% Slope and <70% Crown Closure	
12	High	
14	Low	

Using this crosswalk, the fire behavior potential ratings have been changed. These are the new acres associated with each Fire Behavior Potential class in the watershed, taking into account fire suppression capabilities.

High- 27,280 acres (41% of the watershed)
Moderate- 20,485 acres (31% of the watershed)
Low- 18,700 acres (28% of the watershed)

FIRE RISK

Historical records indicate lightning and human caused fires have been common in the watershed. Little precipitation (May to September) and high summer temperatures allow fuels to dry, which allows for ease and spread of wildfire ignitions.

There are numerous fire risks within the watershed. Many year-round residences, industrial endeavors, many dispersed camp sites, recreational use, and travel corridors all contribute to the possibility of a wildfire occurrence from human causes.

The greatest risk of fire starts is from the occurrence of lightning. Thunder storms are common throughout the summer months in and near the watershed. Lightning, erratic winds and usually precipitation accompany these storms, the latter which limits the actual number of ignitions.

The Klamath National Forest fire history data base indicates that the portion of the watershed within the Forest boundary had 332 fire starts from 1922-1994. Using this information and the vegetative composition of the watershed, determines the general fire risk assessment.

It is important to realize that risk is not the probability of a fire occurring, but the probability of when a fire will occur. In this watershed, the fire **will** occur.

A mathematical formula is used to derive a risk value. Included in the formula are the number of starts, number of years of historical information, and number of acres involved. The values in the formula are:

x =Number of starts recorded for the area from the fire start data base (332).
y = Period of time covered by the data base (for this analysis, 72 years).
z = Number of acres analyzed (displayed in thousands 66,470 = 66.47).

{(x/y)10}/z = Risk rating

{(332/72)10}/66.47 = 0.69

The value derived corresponds to a likelihood of fire starts per 1,000 acres per decade. The following are the risk ratings and range of values used to determine the risk.

Low Risk = 0-0.49 This projects one fire every 20 or more years per thousand acres.
Moderate Risk = 0.5-0.99 This projects one fire every 11-20 years per thousand acres.
High Risk = $\geq$ 1.0 This level projects one fire every in 0-10 years per thousand acres.

The rating of 0.69 falls into a moderate risk, although it is very close to being a high risk. This rating indicates that the average number of fire starts for this watershed are .69 per 1,000 acres per decade, or 46 fires per decade, or an average of five fires per year.

APPENDIX F - Endangered Species Act and Other Species Considerations Questions and Answers

As requested by the U. S. Fish and Wildlife service, the following questions are to be answered through watershed analysis. The resulting baseline information will then be available for use in planning and subsequent Section 7 consultation and monitoring of these species.

Northern Spotted Owl

1. Are spotted owl activity centers located within the watershed? Yes; ten activity centers.

1a. If so, how many and in what ROD land allocations are they located? Of the ten activity centers, seven are located in LSRs and three are in wilderness.

1b. Which of these are currently above take thresholds and which are below? Activity centers KL-0262, KL-1013, KL-1014, KL-4005, and KL-4017 are below the take threshold.

1c. When were the activity centers located? Refer to table below under the "History" column.

1d. Describe the reproductive history.

Activity Center	Acres in 0.7 Mile Circle	Acres in 1.3 Mile Circle	History (Since 1980; # of years surveyed varies) P=Presence (1 adult)/O=Pair Status/ R=Reproduct
KL-0262	292	916	P-1 yr./M-F (didn't meet protocol-1 yr. for pair status)
KL-1013	426	1,046	P-3 yrs./O-2 yrs./R-2 yrs. (1983 latest)
KL-1014	582	1,307	P-2 yrs./O-none/R-1 yr. (1983 latest)
KL-1033	794	2,074	P-0 yrs./O-9 yrs./R-3 yrs. (1991)
KL-1035	674	1,998	P-2 yrs./O-4 yrs./R-4 yrs. (1996)
KL-4005	186	274	P-1 yr./O-1 yr./<>
KL-4015	511	1,488	P-4 yrs./O-4 yrs./R-1 yr. (1996)
KL-4016	647	1,758	P-2 yrs./O-2 yrs./R-1 yr. (1987)
KL-4017	311	1,175	P-6 yrs./O-1 yr./R-2 yrs. (1988)
KL-4018	628	1,742	P-1 yr./O-3 yrs./<>

2. Has a 100 acre core area seen designation around each activity center located in matrix lands? N/A

3. How many acres of nesting, roosting, and foraging (NRF) habitat are there in the watershed? There are 20,060 acres of nesting/roosting habitat and 24,200 acres of foraging habitat in the watershed.

3a. What percentage of the watershed is this? Nesting/roosting = 30%; Foraging = 36%

3b. Which of these stands have been surveyed to protocol (two years)? 3c. Which were not? About 45% have been surveyed to protocol, mostly in the LSRs.

4. What is the amount of NRF habitat in each ROD land allocation within the watershed? See Table 3-18 Suitable Spotted Owl Nesting/Roosting and Dispersal Habitat in the document.

5. Does any portion of the watershed contain LSRs? Yes, it contains a portion of the Eddy Gulch LSR and the Bowerman LSR.

5a. What percent of the total watershed is this? It is 16,870 acres which is 26% of the watershed.

5b. What are the current totals of NRF habitat and capable habitat in the LSR?

Eddy Gulch LSR	
Nesting/Roosting	6,235 Ac.
Foraging	3,245 Ac.
Capable	845 Ac.
Bowerman LSR	
Nesting/Roosting	2,845 Ac.
Foraging	1,760 Ac.
Capable	1,100 Ac.

6. What is the amount of dispersal habitat (11-40 and above) in each ROD land allocation within the watershed? See Table 3-18 Suitable Spotted Owl Nesting/Roosting and Dispersal Habitat.

7. Is distance between LSRs (those over 10,000 acres) greater than four miles?
7a. If so, then what is the amount of dispersal habitat on Federal lands for all 1/4 townships between the LSRs?
7b. What % of the total Federal lands in these 1/4 townships is this?
7c. How much (% and total) of the dispersal habitat is in Riparian Reserves, Admin. Withdrawal (which provide long-term protection), Congressionally Reserved, 100 acre cores, and smaller (<10,000 acres) LSRs?
7d. Is this total greater than 50%?
7e. Describe, if present, the natural barriers to dispersal.
7f. Is connectivity, or dispersal habitat, sufficient to allow movement? **See the late-successional habitat and connectivity section of the document for a discussion of dispersal habitat and connectivity for spotted owls.**

8. How much critical habitat has been designated within the watershed? 9,875 acres.

8a. How much of this total overlaps with LSRs? 9,219 acres.

8b. For areas that do not overlap, how much is currently NRF habitat? And how much is

capable? Nesting/roosting = 174 acres, foraging = 157 acres, and capable = 163 acres.

8c. How many activity centers are located in this non-overlap area of CHU? None.

8d. How many are currently above take? How many below (use acres established by FWS for .7 and 1.3 mile radius)? N/A

8e. What role does this non-overlap critical habitat play in this watershed in relation to the reasons for the designation of the CHU? The non-overlap critical habitat is a result of small changes in the administrative boundary of the Eddy Gulch LSR and at this level of analysis no specific role can be determined.

Bald Eagle

For a discussion of bald eagle use of the watershed, see the Terrestrial Wildlife section of the document.

1. Are occupied bald eagle activity areas (nesting, foraging, winter roosts, or concentration areas) located within the watershed?
1a. If so, what type?
1b. How many?
1c. What ROD land allocations are they located?
1d. Describe reproductive history based on monitoring data.
1e. Has a final site-specific protection/management assessment been developed for each site?
1f. Does this watershed analysis corroborate the findings of the management assessment?

2. Has an assessment been made as to whether there are potential bald eagle activity areas (nesting, foraging, winter roosts, or concentration areas) located within the watershed?
2a. If so, what type?
2b. How many?
2c. What ROD land allocations are they located?
2d. Have these areas been surveyed to protocol to determine they are unoccupied?
3. Describe historical bald eagle occurrence and nesting within the watershed.
4. What is the status of the watershed as it relates to the Recovery Plan (target territories, including beyond watershed boundaries)?
4a. Does the watershed and the surrounding area meet objectives of the Recovery Plan?
4b. If not, then are there capable eagle activity areas located within the watershed?
4c. If capable activity areas are present, what type are they? 1). How many? 2). What ROD land allocations are they located?
4d. What type of project or enhancement could develop sites into potential or occupied sites?
5. If present, describe significant habitat within the watershed that is not under Federal ownership.

Amphibians

1. Have any amphibian inventories been done on a project or watershed level? Yes, Del Norte salamanders were surveyed for on the Bower/Methodist TS. The portioned surveyed was in Sign and Methodist Creeks.

1a. What species does the literature suggest may be present in the watershed? Rough-skinned newt, long-toed salamander, Pacific giant salamander, black salamander, ensatina, Del Norte salamander, Siskiyou Mountain salamander, tailed frog, foothill yellow-legged frog, Cascades frog, western toad, and Pacific tree frog.

2. Are sensitive species and ROD Table C-3 species present or possibly occur? Del Norte salamander and possibly Siskiyou Mountain salamander.

3. Have intensive or extensive inventories been conducted in adjoining drainages/sub-watersheds? Intensive survey on some units of the Upper South Fork TS for Del Nortes was accomplished.

3a. If so, can those inventories be extrapolated to this watershed? Del Nortes have also been found in this watershed.

4. Are endemic species known to occur in the general geographic region? Del Norte salamander, Siskiyou Mountain salamander, and tailed frog.

5. Are exotic species known or suspected to be in the watershed (e.g. bullfrogs)? Bullfrogs.

Peregrine Falcon

1. Are any cliffs located within the watershed (rock wall >50 feet)? Yes.

2. Are any cliffs present that are historic (pre-1975) or traditional (post-1975) peregrine eyries? Traditional - Knownothing Creek.

3. For past projects near historic cliffs, have mitigation measures for habitat been considered? Yes, noise disturbance during helicopter logging.

3a. At these historic cliffs, have surveys to protocol (Pagel 1992) been accomplished for at least two years prior to the activities? N/A

4. For traditional cliffs, have surveys/monitoring been conducted to determine nest site occupancy and reproductive status? Yes.

4a. Has a draft or final site management plan been created? 1). Is this plan based on site specific and PNW sub-population nesting ecology? No site plan has been done.

5. Have the cliffs located been rated or moni-tored for falcon potential or presence? Yes, Murphy Rock has been surveyed a couple of times with no activity noted; (T38N, R12W, Sec 1 NE/NE).

6. If cliffs are unrated, have surveys been accomplished to protocol? No.

7. Describe site habitat variables within a three mile radius of historic and traditional nest sites (cliff parent material, distance to water/riparian, vegetative habitat, seral stages, human activities). Limestone parent material, 1/4 to water, Mixed conifer/live oak, mostly mature to old-growth, consistent mining operations nearby.

Marbled Murrelet (Zone 1 & 2)

The Lower South Fork Watershed is outside of Marbled Murrelet Zone 2.

1. Are occupied sites within the watershed? N/A

2. Has a 0.5 mile radius management area been delineated for each site? N/A

3. Within this management area, what stands are currently murrelet habitat? 3a. What stands are recruitment habitat (capable of becoming suitable within 25 years; see ROD description)? 3b. What stands are non-habitat? N/A

4. Do stands of potential habitat exist in the watershed? 3a. Describe habitat (acres, quality, quantity, spatial relationship to nearby habitat). 3b. Describe past surveys. 3c. What stands of habitat have not been surveyed? N/A

5. Is there recruitment habitat in the watershed? At various points in the future (e.g. 25, 50, 100, 200 years), what will the be the percent of the watershed that will be suitable habitat? N/A

APPENDIX G - Numerical Listing of Roads and Their Status

Forest Road	Name	Length (mi.)	Mtc. Level	Lanes	Surface Class	Template	Closure	Average. Daily Traffic	Highway Safety	Primary User	Existing Mgmt. Strategy	Year Const.
09N01	Hotel View	1.00	2	S	Native	O	N	L	N	T	A	88
09N02	Hoe	0.20	2	S	Native	O	S	L	N	T	A	88
09N03	Gilta	2.40	2	S	Native	O	S	L	N	T	A	88
09N03A	Gilta	0.70	2	S	Native	O	S	L	N	T	A	88
09N03B	Gilta	0.30	2	S	Native	O	S	L	N	T	A	88
09N03C	Gilta	0.50	2	S	Native	O	S	L	N	T	A	88
09N04	Bowerman	0.50	2	S	Native	O	S	L	N	T	A	88
09N04A	Bowerman	0.20	2	S	Native	O	S	L	N	T	A	88
09N04B	Bowerman	0.40	2	S	Native	O	S	L	N	T	A	88
10N01	Umber	2.80	1	S	Native	O	Y	L	N	T	P	82
10N01B	Umber	0.40	1	S	Pit Run	O	Y	L	N	T	P	82
10N02	Knownothing	2.10	2	S	Native	O	N	L	N	T	A	20
10N03	Poverty Gulch	1.30	2	S	Pit Run	O	S	L	N	T	A	63
10N03	Poverty Gulch	2.70	2	S	Native	O	S	L	N	T	A	63
10N03A	Poverty Gulch	0.40	2	S	Native	O	S	L	N	T	A	63
10N04	High Point	13.80	3	S	Native	O	S	M	Y	T	E	62
10N04	High Point	11.10	2	S	Native	O	S	L	Y	T	E	62
10N04A	High Point	0.70	2	S	Native	O	S	L	N	T	A	78
10N04B	High Point	0.40	2	S	Native	O	S	L	N	T	A	78
10N04D	High Point	0.50	2	S	Native	O	S	L	N	T	A	78
10N04E	High Point	0.70	2	S	Native	O	S	L	N	T	A	78
10N04F	High Point	0.60	2	S	Native	O	S	L	N	T	A	78
10N04G	High Point	0.60	2	S	Native	O	S	L	N	T	A	78
10N04H	High Point	0.40	2	S	Native	O	S	L	N	T	A	78
10N05	Horn Creek Gap	1.00	1	S	Native	O	Y	L	N	T	P	63
10N05A	Horn Creek Gap	1.90	1	S	Native	O	Y	L	N	T	P	79
10N07	Cold Springs	1.30	2	S	Pit Run	O	S	L	N	T	A	62
10N07	Cold Springs	3.40	2	S	Native	O	S	L	N	T	A	62
10N07A	Cold Springs	0.60	2	S	Pit Run	O	S	L	N	T	A	78
10N07B	Cold Springs	0.80	2	S	Native	O	S	L	N	T	A	78
10N16	Knowtelling	5.00	2	S	Pit Run	O	S	L	Y	T	A	88
10N16A	Knowtelling	0.70	2	S	Pit Run	O	S	L	N	T	A	88
10N16B	Knowtelling	0.20	2	S	Pit Run	O	S	L	N	T	A	88
10N16D	Knowtelling	0.30	2	S	Pit Run	O	S	L	N	T	A	88
10N16E	Knowtelling	0.60	2	S	Pit Run	O	S	L	N	T	A	88
10N17	Hornfield	0.50	2	S	Native	O	N	L	N	R	A	1890
10N19	Knowtelling Gulch	1.40	2	S	Pit Run	O	S	L	N	T	A	88
10N19A	Knowtelling Gulch	0.70	2	S	Pit Run	O	S	L	N	T	A	88
10N19B	Knowtelling Gulch	0.40	2	S	Pit Run	O	S	L	N	T	A	88
10N19D	Knowtelling Gulch	0.20	2	S	Pit Run	O	S	L	N	T	A	88
10N20	Blackberry	1.80	2	S	Native	O	S	L	N	T	A	64
10N22	Henry Bell Gulch	0.40	1	S	Pit Run	O	Y	L	N	T	P	78
10N22	Henry Bell Gulch	0.50	1	S	Native	O	Y	L	N	T	P	78
10N22A	Henry Bell Gulch	0.20	1	S	Native	O	Y	L	N	T	P	78
10N22B	Henry Bell Gulch	0.10	1	S	Pit Run	O	Y	L	N	T	P	78
10N22C	Henry Bell Gulch	0.20	1	S	Native	O	Y	L	N	T	P	78
10N34	Horn	0.90	1	S	Native	O	Y	L	N	T	P	79
10N34A	Horn	0.50	1	S	Native	O	Y	L	N	T	P	79
10N38	Stanshaw Mine	0.80	1	S	Native	O	Y	L	N	M	P	30
10N40	Horn Creek	2.20	2	S	Native	O	S	L	N	T	A	79
10N41	Bell Hop	1.00	2	S	Pit Run	O	S	L	N	T	A	79
10N41A	Bell Hop	1.00	2	S	Pit Run	O	S	L	N	T	A	79
10N41B	Bell Hop	0.20	2	S	Pit Run	O	S	L	N	T	A	89
10N41C	Bell Hop	0.30	2	S	Pit Run	O	S	L	N	T	A	89
10N42	Hotel	0.90	2	S	Pit Run	O	S	L	N	T	A	89
10N42A	Hotel	0.10	2	S	Pit Run	O	S	L	N	T	A	89
38N15	Lower Windy	1.10	2	S	Native	O	S	L	N	T	A	84
38N17	King Solomon	7.40	2	S	Pit Run	O	S	L	Y	T	A	80
38N17	King Solomon	2.70	2	S	Native	O	S	L	Y	T	A	80
38N17B	King Solomon	1.00	2	S	Pit Run	O	S	L	N	T	A	80
38N17F	King Solomon	0.20	2	S	Native	O	S	L	N	T	A	80
38N21	John Paul	0.50	2	S	Native	O	N	L	N	T	A	82
38N21A	John Paul	0.30	2	S	Native	O	N	L	N	T	A	82

Forest Road	Name	Length (mi.)	Mtc. Level	Lanes	Surface Class	Template	Closure	Average. Daily Traffic	Highway Safety	Primary User	Existing Mgmt. Strategy	Year Const.
38N23	Gronchi	2.60	2	S	Pit Run	O	N	L	Y	T	A	70
38N23	Gronchi	3.90	2	S	Native	O	N	L	N	T	A	70
38N23D	Gronchi	0.30	2	S	Native	O	N	L	N	T	A	70
38N26	Sign Creek	1.80	2	S	Native	O	N	L	N	T	A	88
38N28	Lower Matthews	1.30	2	S	Pit Run	O	S	L	N	T	A	75
38N28	Lower Matthews	0.80	2	S	Native	O	S	L	N	T	A	75
38N29	Butcher Gulch	2.10	2	S	Native	O	S	L	N	T	A	83
38N33	Atoka	2.10	2	S	Native	O	N	L	N	T	A	80
38N33B	Atoka	0.50	2	S	Native	O	N	L	N	T	A	08
38N41	Mazzuchi	2.20	2	S	Native	O	N	L	N	T	A	80
38N41B	Mazzuchi	1.90	2	S	Native	O	N	L	N	T	A	88
38N41C	Mazzuchi	0.50	2	S	Native	O	N	L	N	T	A	88
38N41D	Mazzuchi	1.20	2	S	Native	O	N	L	N	T	A	88
38N41E	Mazzuchi	0.70	2	S	Native	O	N	L	N	T	A	88
38N43	Matthews Creek Campgr.	0.10	3	S	Native	O	N	M	Y	R	E	60
39	Grasshopper Picayun	10.30	3	S	Pit Run	O	N	H	Y	T	E	60
39B	Grasshopper Picayun	0.10	1	S	Pitrun	O	Y	L	N	T	P	78
39I	Grasshopper Picayun	0.20	2	S	Native	O	N	L	N	T	A	78
39J	Grasshopper Picayun	0.60	1	S	Native	O	Y	L	N	T	P	78
39K	Grasshopper Picayun	0.30	1	S	Native	O	Y	L	N	T	P	78
39L	Grasshopper Picayun	0.70	2	S	Native	O	N	L	N	T	A	78
39M	Grasshopper Picayun	0.30	2	S	Pit Run	O	N	L	N	T	A	78
39N12	Heiney	0.50	2	S	Native	O	N	L	N	T	A	78
39N17	Graharn Gulch	0.80	2	S	Native	O	N	L	N	T	A	82
39N19	Blue Indian	2.70	2	S	Native	O	N	L	N	T	A	79
39N19A	Blue Indian	1.00	2	S	Native	O	N	L	N	T	A	79
39N22	Blue Mud	0.40	2	S	Native	O	N	L	N	T	A	83
39N22	Blue Mud	0.50	2	S	Native	O	N	L	N	T	A	83
39N22A	Blue Mud	1.30	2	S	Native	O	N	L	N	T	A	83
39N22B	Blue Mud	0.70	2	S	Native	O	N	L	N	T	A	83
39N23	Crawford Creek	9.00	3	S	Pit Run	O	N	H	N	T	E	30
39N23A	Crawford Creek	1.40	1	S	Native	O	Y	L	N	T	P	84
39N24	Blue Ridge	2.30	2	S	Native	O	N	L	Y	A	A	81
39N25	White Bear	2.30	2	S	Native	O	N	L	N	T	A	81
39N27	Orin E Lewis Road	1.40	3	S	Pit Run	O	N	M	N	T	E	30
39N29	Black Salmon	0.50	2	S	Native	O	N	L	N	T	A	79
39N29	Black Salmon	0.60	2	S	Native	O	N	L	Y	P	A	79
39N29	Black Salmon	0.80	2	S	Native	O	N	L	N	T	A	79
39N30	Godfrey Ranch	3.60	3	S	Native	O	N	H	N	T	E	30
39N30	Godfrey Ranch	4.50	3	S	Pit Run	O	N	M	N	R	E	30
39N30A	Godfrey Ranch	0.60	1	S	Pit Run	O	Y	L	N	T	P	78
39N30B	Godfrey Ranch	0.90	1	S	Pit Run	O	Y	L	N	T	P	78
39N30C	Godfrey Ranch	0.40	1	S	Native	O	Y	L	N	T	P	78
39N30D	Godfrey Ranch	0.50	2	S	Pit Run	O	N	L	N	T	A	78
39N30E	Godfrey Ranch	0.30	1	S	Native	O	Y	L	N	T	P	78
39N32	Hotelling Ridge	9.20	2	S	Native	O	S	M	N	T	A	60
39N32	Hotelling Ridge	2.20	2	S	Pit Run	O	S	L	N	T	A	60
39N32A	Hotelling Ridge	1.00	2	S	Native	O	S	L	N	T	A	88
39N32B	Hotelling Ridge	0.50	2	S	Native	O	S	L	N	T	A	88
39N34	Methodist Creek	3.60	2	S	Pit Run	O	N	M	N	T	A	60
39N34	Methodist Creek	4.00	2	S	Native	O	N	M	N	T	A	60
39N34A	Methodist Creek	0.60	2	S	Native	O	N	L	N	T	A	70
39N34C	Methodist Creek	1.00	2	S	Pit Run	O	N	L	N	T	A	70
39N35	Picayune Lake	0.30	2	S	Pit Run	O	S	L	N	T	A	78
39N36	Murphy Rock	2.10	2	S	Native	O	S	L	N	T	A	82
39N36	Murphy Rock	0.40	1	S	Native	O	Y	L	N	T	P	82
39N37	Murphy Point	0.60	2	S	Native	O	S	L	N	T	A	82
39N37A	Murphy Point	0.60	2	S	Native	O	S	L	N	T	A	82
39N41	Blue Ridge Tie	0.90	3	S	Native	O	N	M	N	T	E	79
39N46	Black Murphy	1.50	2	S	Native	O	N	L	N	T	A	82
39N46A	Black Murphy	0.70	2	S	Native	O	N	L	N	T	A	82
39N55	O'Farrill	1.20	2	S	Pit Run	O	Y	L	N	T	A	79
39N55A	O'Farrill	1.10	2	S	Pit Run	O	Y	L	N	T	A	79
39N64	Chelly Gulch	4.00	2	S	Native	O	Y	L	N	T	A	84
39N64A	Chelly Gulch	1.10	2	S	Native	O	Y	L	N	T	A	88
39N67	Picayune Godfrey Ti	0.70	2	S	Pit Run	O	N	L	N	T	A	78
39N68	Callahan Gulch	1.40	1	S	Native	O	Y	L	N	T	P	85
39N71	Dry Ridge	2.40	2	S	Native	O	N	L	N	T	A	83
39N71A	Dry Ridge	0.60	2	S	Native	O	N	L	N	T	A	83
39N72	Shadow	0.50	1	S	Pit Run	O	Y	L	N	T	P	78

Forest Road	Name	Length (mi.)	Mtc. Level	Lanes	Surface Class	Template	Closure	Average. Daily Traffic	Highway Safety	Primary User	Existing Mgmt. Strategy	Year Const.
39N72A	Shadow	0.20	1	S	Native	O	Y	L	N	T	P	78
39N77	Indian	4.50	2	S	Native	O	S	L	N	T	A	79
39N77A	Indian	0.40	2	S	Native	O	S	L	N	T	A	79
39N77B	Indian	0.10	2	S	Native	O	S	L	N	T	A	79
FH 93	South Fork Salmon Road	13.50	5	S	Asphalt	O	N	H	N	GP/T	E	50
1E001	Black Bear Rd	3.80	5	S	Native	O	N	L	N	P	A	1830

DEFINITION OF TERMS

NOTE: (Source TIS & RMO Report 3/18/95)

MAINTENANCE LEVELS:

1 = Assigned to intermittent service roads during the time they are closed to vehicular traffic.
2 = Assigned to roads open for use by high clearance vehicles.
3 = Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car.
4 = Assigned to roads that provide a moderate degree of user comfort and convenience at moderate speeds.
5 = Assigned to roads that provide a high degree of user comfort and convenience; normally paved roads. Aggregate roads would be treated for dust abatement.

SURFACING:

NAT = Existing Material AGG = Gravel Surface PAV = Pavement CHP = Chip Seal

TEMPLATE:

O = Outslope, assumes no ditch, or outside berm unless needed for short stretches.
I = Inslope, assumes inboard ditch, with no outside berm unless needed for short stretches.
C = Crown, assumes inboard ditch, with no outside berm unless needed for short stretches.

ROAD CLOSURES:

Y = Yearlong for the following reason(s); Road Maintenance, Wildlife, and Sensitive Soils
N = Road Open Year-round
S = Seasonal Closure/Open (minimize resource/use conflicts such as wildlife, sensitive soils, public safety, or road maintenance, normally during winter conditions).

ADT (Average Daily Traffic):

Low (L) = 0 to 1 Moderate (M) = 2 to 4 High (H) = 5 to 15 Very High (VH) = 16+

HSA (Highway Safety Act):

If road is passable by passenger car, then HSA applies; normally applies to Maintenance Level 3, 4, & 5 roads).
Y = Yes N = No

PRIMARY USER:

P = Private Land Access Use R = Recreation Use T = Timber Use H = Human Development/ Administration
GP = General Public Use (public highway, open to all users)

EXISTING MGMT. STRATEGY:

A = Accept E = Encourage L = Eliminate P = Prohibit (road closure order applies)
N/A = Not Applicable for County roads; ***Note:*** Will be expanded when opportunity warrants.
D = Decommission (close system, seed roadway, pull drainages, ripping road bed).

APPENDIX H - Visual Condition Levels

All lands within the analysis area have been identified as to the public's concern for scenic quality (sensitivity levels) as well as diversity of natural features (variety classes). The development of measurable standards or objectives for the visual management of these lands is the primary task. The following visual quality objectives (VQO) and their equivalent existing visual condition (EVC) are designed to accomplish this purpose:

VISUAL QUALITY OBJECTIVE	EXISTING VISUAL CONDITION
Preservation	Untouched
Retention	Unnoticed
Partial Retention	Minor Disturbance
Modification	Disturbance
Maximum Modification	Major Disturbance
(No Corresponding VQO)	Drastic Disturbance

Except for preservation, each objective describes a different degree of acceptable alteration of the natural landscape based upon the importance of esthetics. The degree of alteration is measured in terms of visual contrast with the surrounding natural landscape.

The following **VQO** and corresponding **EVC** narratives also have a **Duration of Visual Impact** description; information from *FSM2300-Supplement 113, USDA 1974*, and *KNF Forest Plan*.

VQO - Preservation - This visual quality objective allows ecological changes only. Management activities, except for very low visual impact recreation facilities, are prohibited.

This objective applies to wilderness areas, primitive areas, other special classified areas, areas awaiting classification, and some unique management units which do not justify special classification.

EVC - Untouched - Areas in which only ecological change has taken place except for trails needed for access. They appear to be untouched by human activities.

VQO - Retention - Provides for management activities which are not visually evident. Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident.

Duration of Visual Impact - Immediate reduction in form, line, color, and texture contrast in order to meet Retention should be accomplished upon completion of the project wherever possible and, at the maximum, within three years of project completion. It may be done by such means as seeding vegetative clearings and cut or fill slopes, hand planting of large stock, painting structures, etc.

EVC - Unnoticed - Areas in which changes in the landscape are not visually evident to the average person unless pointed out. They appear to be unnoticed.

VQO - Partial Retention - Management activities remain visually subordinate to the characteristic landscape when managed according to the partial retention visual quality objective.

Activities may repeat form, line, color, or texture common to the characteristic landscape but changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape. Activities may also introduce form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but they should remain subordinate to the visual strength of the characteristic landscape.

Duration of Visual Impact - Reduction in form, line, color, and texture to meet partial retention should be accomplished as soon after project completion as possible and at the maximum, within three years of project completion.

EVC - Minor Disturbance - Areas in which changes in the landscape are noticed by the average forest visitor, but they do not attract attention. The natural appearance of the landscape still remains dominant. They appear to be minor disturbances.

VQO - Modification - Management activities may visually dominate the original characteristic landscape. However, activities of vegetative and landform alteration must borrow from naturally established form, line, color, or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Additional parts of these activities such as structures, roads, slash, root wads, etc., must remain visually subordinate to the proposed composition.

Activities which are predominately introduction of facilities such as buildings, signs, roads, etc., should borrow naturally established form, line, color, and texture so completely and at such scale that its visual characteristics are compatible with the natural surroundings.

Duration of Visual Impact - Reduction in form, line, color, and texture should be accomplished in the first year or at a minimum should meet existing regional guidelines.

EVC - Disturbance - Areas in which changes in the landscape are easily noticed by the average forest visitor and may attract some attention. They appear to be disturbances but resemble natural patterns.

VQO - Maximum Modification - Management activities of vegetative and landform alterations may dominate the characteristic landscape. However, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding area or character type. When viewed as foreground or middle ground, they may not appear to completely borrow from naturally established form, line, color, or texture. Alterations may also be out of scale or contain detail which is incongruent with natural occurrences as seen in foreground or middle ground.

Introduction of additional parts of these activities such as structures, road, slash, and root wads must remain visually subordinate to the proposed composition as viewed in background.

Duration of Visual Impact - Reduction of contrast should be accomplished within five years.

EVC - Major Disturbance - Areas in which changes in the landscape are strong and would be obvious to the average forest visitor. These changes stand out as a dominating impression of the landscape. Yet they are shaped so they might resemble natural patterns when viewed from three to five miles or more distant. They appear to be major disturbances.

Unacceptable Modification - Following are examples of excessive modification or what not to do to any landscape regardless of the distance from which the management activity may be observed.
One or more of these characteristics are indicative of unacceptable modification:

- Size of activities is excessive or poorly related to scale of landform and vegetative patterns in characteristic landscape.
- Overall extent of management activities is excessive.
- Activities or facilities that contrast in form, line, color, or texture are excessive. All dominance elements in the management activity are visually unrelated to those in the characteristic landscape.

Duration of Visual Impact - Unacceptable Modification includes those visual impacts which exceed ten years duration.

EVC - Drastic Disturbance - Areas in which changes in the landscape are in glaring contrast to the natural appearance. Almost all forest visitors would be displeased with the effect. They appear to be drastic disturbances.

REFERENCES:

USDA, Forest Service. 1974. National Forest Landscape Management Volume 2, Chapter 1 - The Visual Management System. Agriculture Handbook Number 462, 47 p., illus. U.S. Government Printing Office, Washington, DC

USDA, Forest Service. 1980. FSM2300 (5/80), R-5, Supplement 113.

_____ 1995. Klamath National Forest Final Land and Resource Management Plan

APPENDIX I - Timber Yield Calculations

This appendix describes in detail the method used in this analysis to estimate timber yields from matrix lands in the watershed. Estimates are intended to be used as a comparison with *Forest Plan* estimates, using the latest refined data and assumptions.

The *Forest Plan* estimates a 1.1MMBF/year output from the Lower South Fork watershed. Since completion of the *Forest Plan*, an updated vegetation inventory (EUI), and an updated estimate of unmapped Riparian Reserves has been done. Also, estimates of harsh sites were updated under the EUI inventory (see Appendix D - EUI Defined). This recent inventory has a better breakdown of site classes than the old timber type inventory used in the *Forest Plan*, therefore volume and growth estimates should be more accurate.

The following estimates are made using the updated EUI data, with recent estimates of acres in Riparian Reserves.

Yield Based On Estimated 140 Year Rotation

This method assumes even-aged management and in its most simple form divides the acres available for regeneration harvest by the rotation age to get a number of acres to be regenerated each year. The acreage to be harvested is multiplied by the volumes per acre to get a yield for acres to be regenerated.

Acreage available for regeneration harvest in the watershed is estimated to be the Site Class 1-5 lands in Regulation (Reg) Class 2 (14,455 acres), minus 15% for green tree retention. This leaves 12,300 acres available for regeneration harvest. Acreage available for harvest in Site Class 6 in Reg 2 and all acres available for harvest in Reg Class 3 will have harvest estimated based on growth, since it is not considered feasible to regenerate these acres with the constraints they have. Acreage available for harvest in the area not suited for regeneration are the acres in the category.

Yield for acres available for regeneration harvest (Site Class 1-5, Reg Class 2): acres available for regeneration harvest = 12,300 acres, divided by 14 (140 year rotation) to get 878 acres/decade x 25 MBF/acre = 21,964MBF X .75 (percent of biological potential) = **16,473MBF**

Yield for Site class 6, Reg Class 2: Acres available for harvest is 1,955 acres x 2.1MBF/acre/decade growth = 4,105MBF/decade growth, or potential yield x .75 (percentof biological potential) = **3,079MBF**

Total Potential Harvest for Reg Class 2 is 16,473 MBF + 3,079MBF = 19,552MBF/Decade

Yield for Site Class 1-4, Reg Class 3: Acres available for harvest = 247 acres x 7.2MBF/acre/decade growth = 1,778MBF/decade growth, or potential yield x .2 (percent of biological potential) = **356MBF.**

Yield for Site Class 5, Reg Class 3: Acres available for harvest = 110 acres x 3.9MBF/acre/decade growth = 429MBF/decade growth, or potential yield x .2 (percent of biological potential) = **86 MBF.**

Yield for Site Class 6, Reg Class 3: Acres available for harvest = 00 acres x 2.1MBF/acre/decade = 50 MBF/decade growth, or potential yield x .2 (percent of biological potential) = **00MBF.**

Total Potential Yield for Reg Class 3 is 356MBF + 86MBF + 00MBF = 442MBF/Decade

Reg Class 2 potential yield of 22,297

Reg Class 3 potential yield of 442

Total Expected Yield from Reg Class 2 and 3 = 22,739MBF/Decade or 2.2MMBF/Year

Conclusion

There are considerations which are hard to factor into planning. **These estimates have to be used as a starting point, and not as a hard and fast rule.** It appears that somewhere between 11 and 22MMBF harvest for the next decade is approximated for the watershed. **Actual harvest will be determined by site/stand-specific needs throughout the analysis area.**

LITERATURE CITED

Literature Cited

Albini, F. 1976. Estimating Wildfire Behavior and Effects. USDA Forest Service General Tech. Rep. INT-30.

Anderson, Hal E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. GTR-INT-122. Intermountain Forest and Range Experiment Station, USDA, Ogden, UT.

Bower, R. W. 1978. Chronological History of the Klamath National Forest. Volume I. The Formative Years 1905-1910. Unpublished Manuscript, R. W. Bower, USFS (retired).

California Department of Fish and Game. 1994. Draft Environmental Document, Title 14, California Code of Regulations Regarding Deer Hunting, State of California. The Resources Agency Department of Fish and Game, Sacramento, California.

CDWR. 1960, from CH2M Hill. 1985. Klamath River Basin Fisheries Resource Plan. USDI, Contract No. R16744.AO.11: 270 pp.

Ch2M Hill. 1985. Klamath River Basin Fisheries Resource Plan. USDI, Contract No. R16744.AO.11: 270 pp.

de la Fuente, Juan and **Polly Haessig**. 1991. Salmon Subbasin Sediment Analysis. USDA, Forest Service, Klamath National Forest, Project No. 91-HP-9 11333-1331-1046.

Gudde, Erwin. 1975. California Gold Camps: 381 pp.

Holt, Catherine. 1977. Shasta Ethnography. In: Anthropological Records, Vol. 3, No. 4. University of California Press, Berkeley and Los Angeles., p 335.

Hume, R. D. in **J. O. Snyder's** report. 1931. Salmon of the Klamath River, California. Division of Fish and Game of California, Fish Bulletin No. 34.

Moffet, J. W. and **S. H. Smith.** 1950 Biological Investigation of the Fisheries Resources of the Trinity River. USDI, US Fish and Wildlife Service. Special Scientific Report --Fisheries No. 12.

National Soil Survey Handbook. 1996. Soil Survey Staff. Natural Res. Con. Service, Title 430-VI, Washington, DC, U.S. Government Printing Office.

Olson, A. D. and **O. J. Dix.** 1993. Lower Salmon River Sub-Basin Fish Habitat Condition and Utilization Assessment, 1990/1991. USDA, Forest Service, Klamath National Forest, Yreka, California.

Pagel, J. E. and **W. M. Jarman.** 1992. Peregrine Falcons, Pesticides, and Contaminants in the Pacific Northwest. Journal of Pesticide Reform 11:7-12.

RIEC. 1997. Regional Interagency Executive Committee, Riparian Reserve Evaluation Techniques and Synthesis: Transmittal of the "Final Working Draft" Module for Fiscal Year 1997 Field Testing., Version 2.2.

Reichert, Mark and **A. D. Olson.** 1993. Stream Temperature Analysis and Data Compilation Klamath River Basin, R-5 Fish Habitat Relationship Technical Report. No. 1.

Reichert, Mark. 1994. Stream Temperature Analysis and Data Compilation Klamath River Basin, R-5 Fish Habitat Relationship Technical Report. No. 2.

Rosgen, Dave. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado. 1-1 - 8-43 pp.

Schultz, David. 1994 PSW Entomologist., personal communication.

Shannon, C. E. and W. Weaver. 1949. The Mathematical Theory of Communication. University of Illinois, Urbana.

Snyder, J. O. 1931. Salmon of the Klamath River, California. Division of Fish and Game of California, Fish Bulletin No. 34.

Taft, A. C. and **Leo Shapovalov**. 1935. A Biological Survey of Streams and Lakes in the Klamath and Shasta National Forests of California. Department of Commerce, Bureau of Fisheries, Washington D.C.

USDA Forest Service. 1974. National Forest Landscape Management Volume 2, Chapter 1 - The Visual Management System. Agriculture Handbook Number 462, 47 p., illus. U.S. Government Printing Office, Washington, DC.

_____ 1980. FSM2300 (5/80), R-5, Supplement 113.

_____ 1990. A Classification System for Geomorphology. USDA, FS Common Survey Data Structure Project, Geomorphology Working Group, Review Draft March 11, 1996.

_____ 1991. FSH2090.11. Ecological Classification and Inventory Handbook. Washington Amendment No. 2090.11-91-1. Effective April 26, 1991.

_____ 1992. FSM2060. Ecosystem Classification, Interpretations and Application. Washington Office Amendment 2000-91-1. Effective April 26, 1991. R-5 Supplement Effective June 15, 1992.

_____ 1993. Soil Survey Manual; Soil Survey Staff. Handbook No. 18. U.S. Gov. Print. Off., Washington, DC.

_____ 1994. Soil Survey, Klamath National Forest Area, California. Yreka, California.

_____ 1995. Landtype Ecological Unit Survey Work Plan. Klamath National Forest, Yreka, California.

_____ 1995. Klamath National Forest Final Land and Resource Management Plan.

_____ 1997. Forest Inventory and Analysis User's Guide. R-5. Published by the Land Management Staff, San Francisco, CA.

Wills Robin D. 1991. Fire History and Stand Development of Douglas-Fir/Hardwood Forests in Northern California. M.S. Thesis, Humboldt State University, Arcata, California.

Wills Robin D., and **John D. Stuart.** 1994. Published in Northwest Science, Volume 68, No. 3, 1994; Fire History and Stand Development of a Douglas-Fir/Hardwood Forest in Norther California.

Wells, H. L. 1881. History of Siskiyou County, California, D. J. Stewart & Co., Oakland (reprinted in 1971), 240 pp.

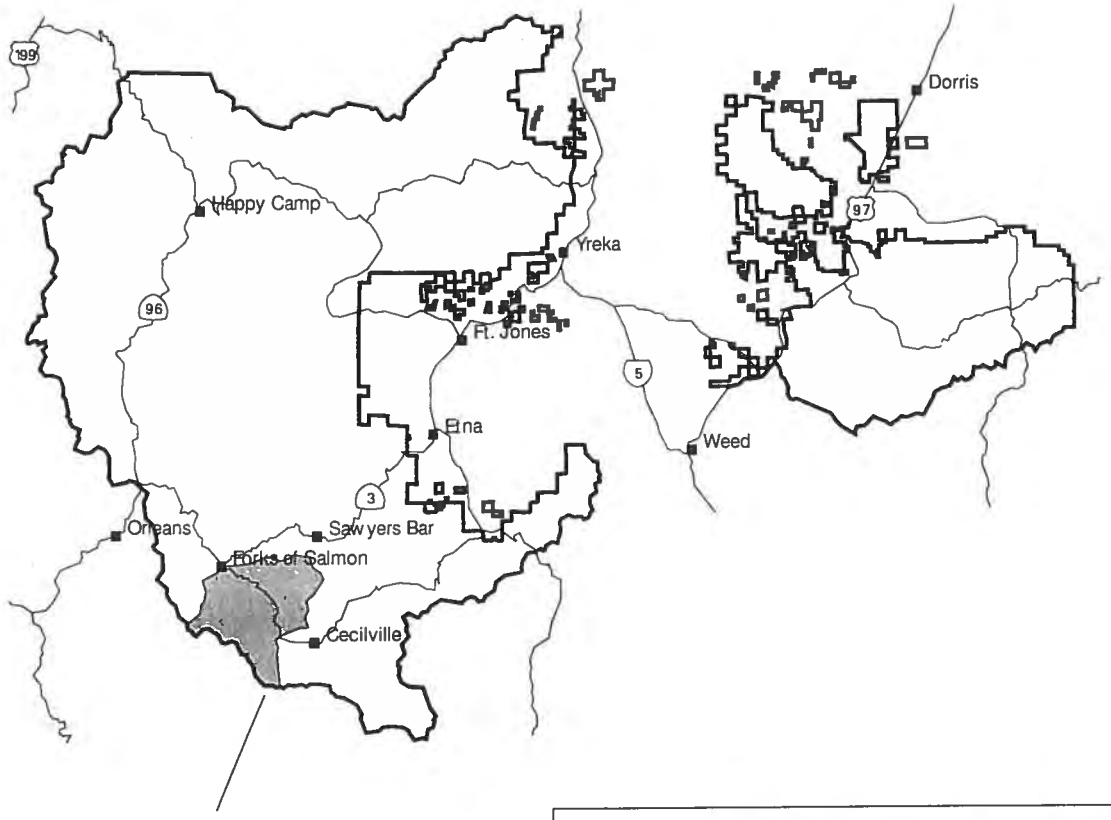
MAP PACKET

MAP PACKET --*TABLE OF CONTENTS*

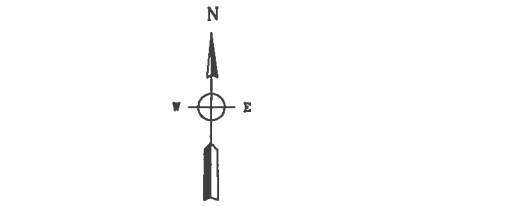
Figure 0-1

Klamath Basin Vicinity

Lower South Fork Watershed



Lower South Fork Watershed



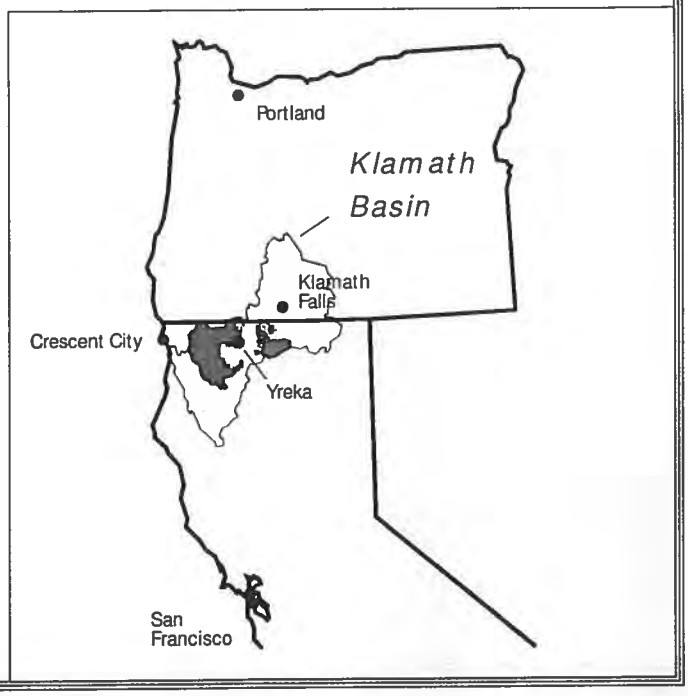


Figure 1-1

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

Lower South Fork Watershed

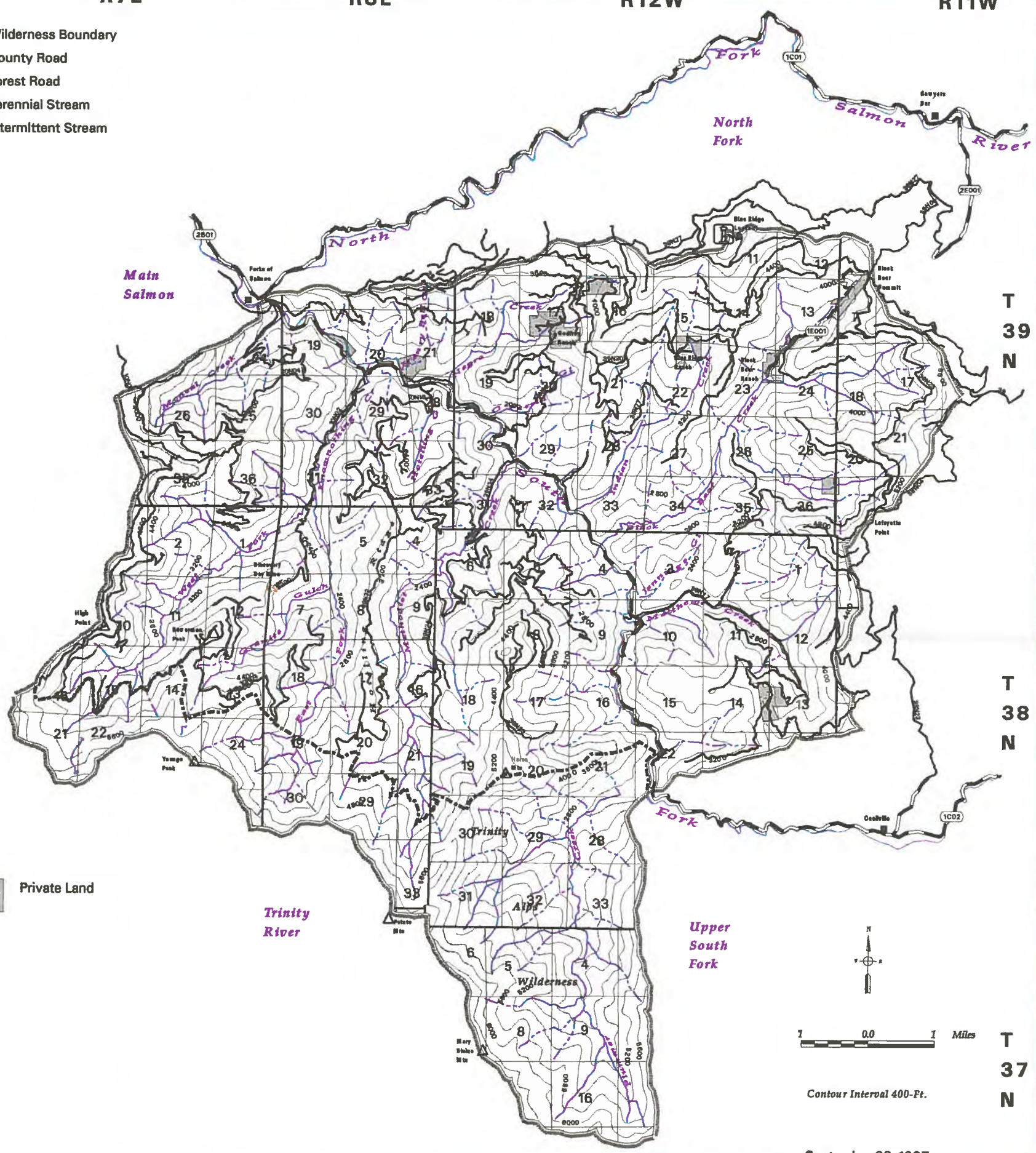
Base Map

Klamath National Forest

R7E R8E R12W R11W

T 10 N
T 9 N
T 8 N
T 39 N
T 38 N
T 37 N

Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream
Private Land



1 0.0 1 Miles

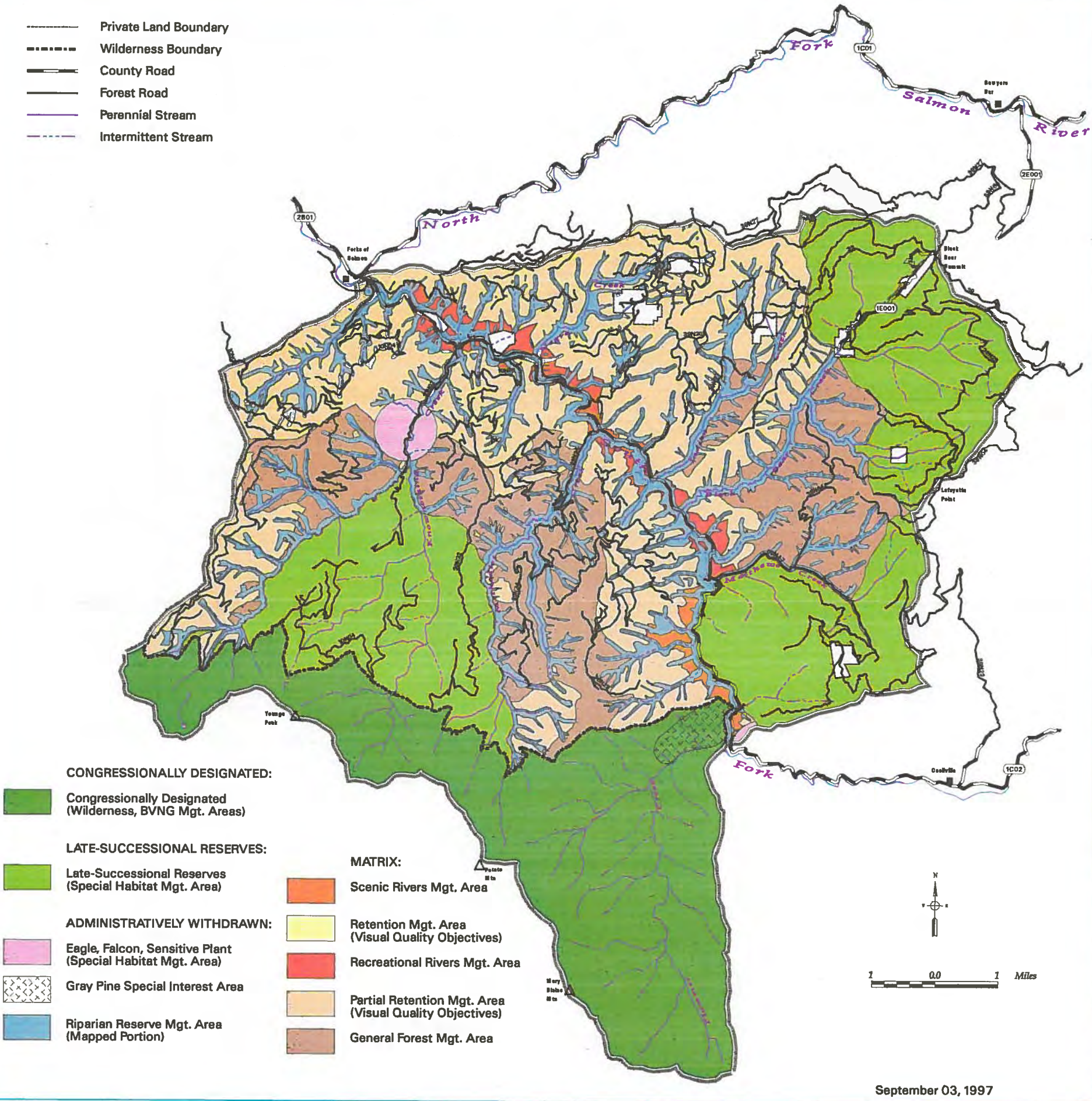
Contour Interval 400-Ft.

September 03, 1997

Figure 1-2

Lower South Fork Watershed
Forest Plan Management Areas
Updated During This Analysis

Klamath National Forest



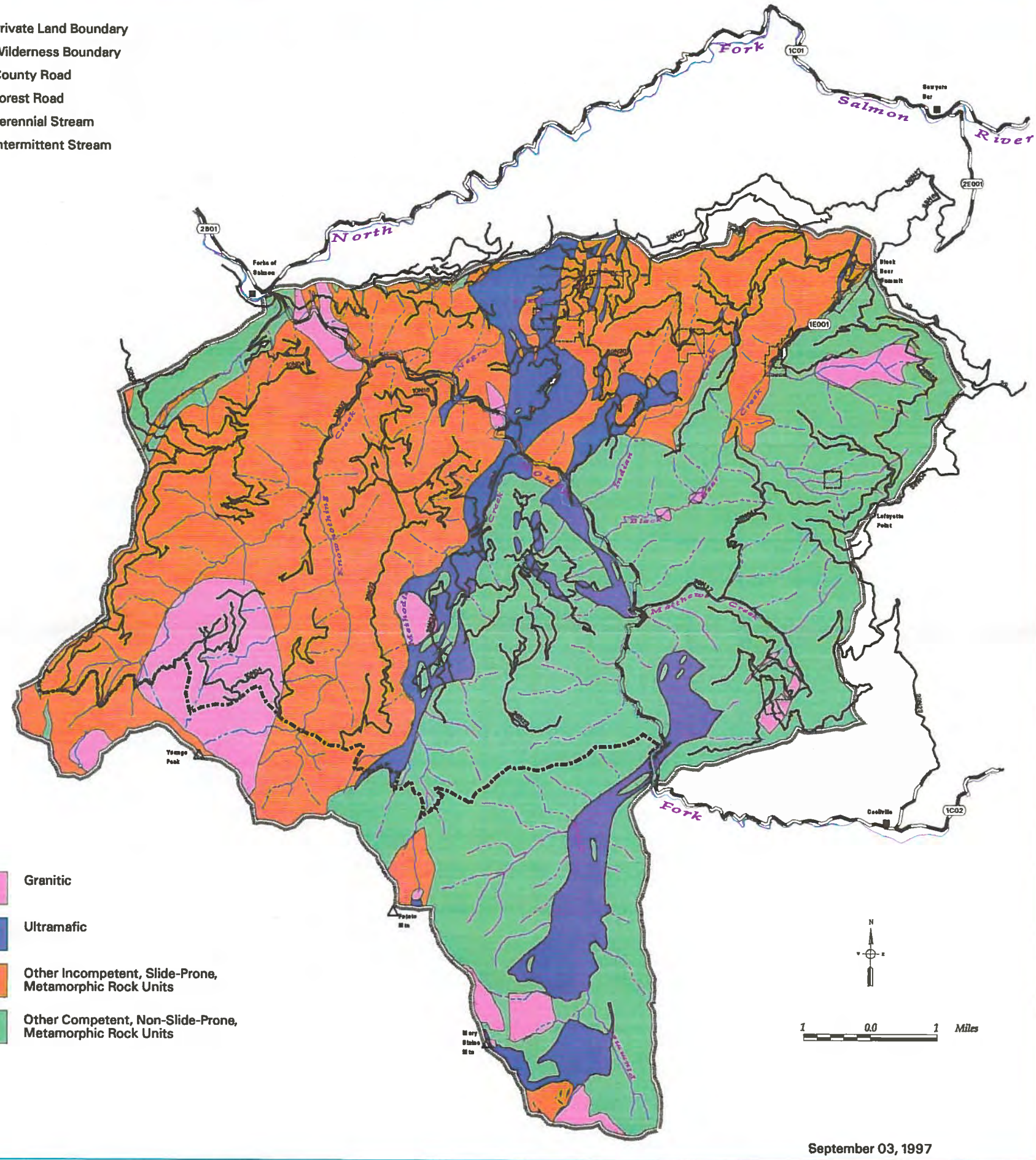
September 03, 1997

Figure 3-1

Lower South Fork Watershed

Simplified Lithology

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



September 03, 1997

Figure 3-2

Lower South Fork Watershed Subwatersheds and Forest Plan Areas with Watershed Concerns

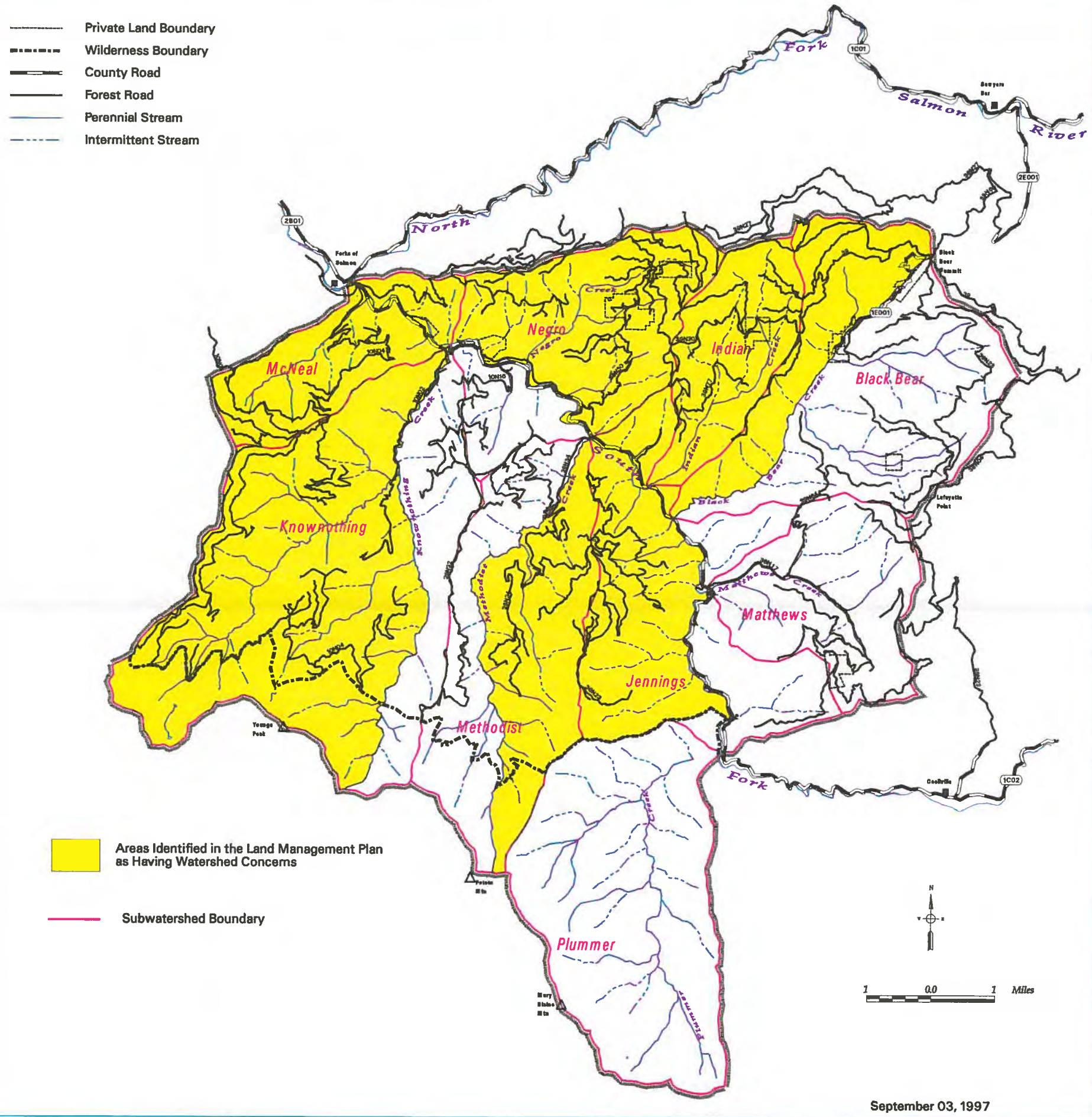


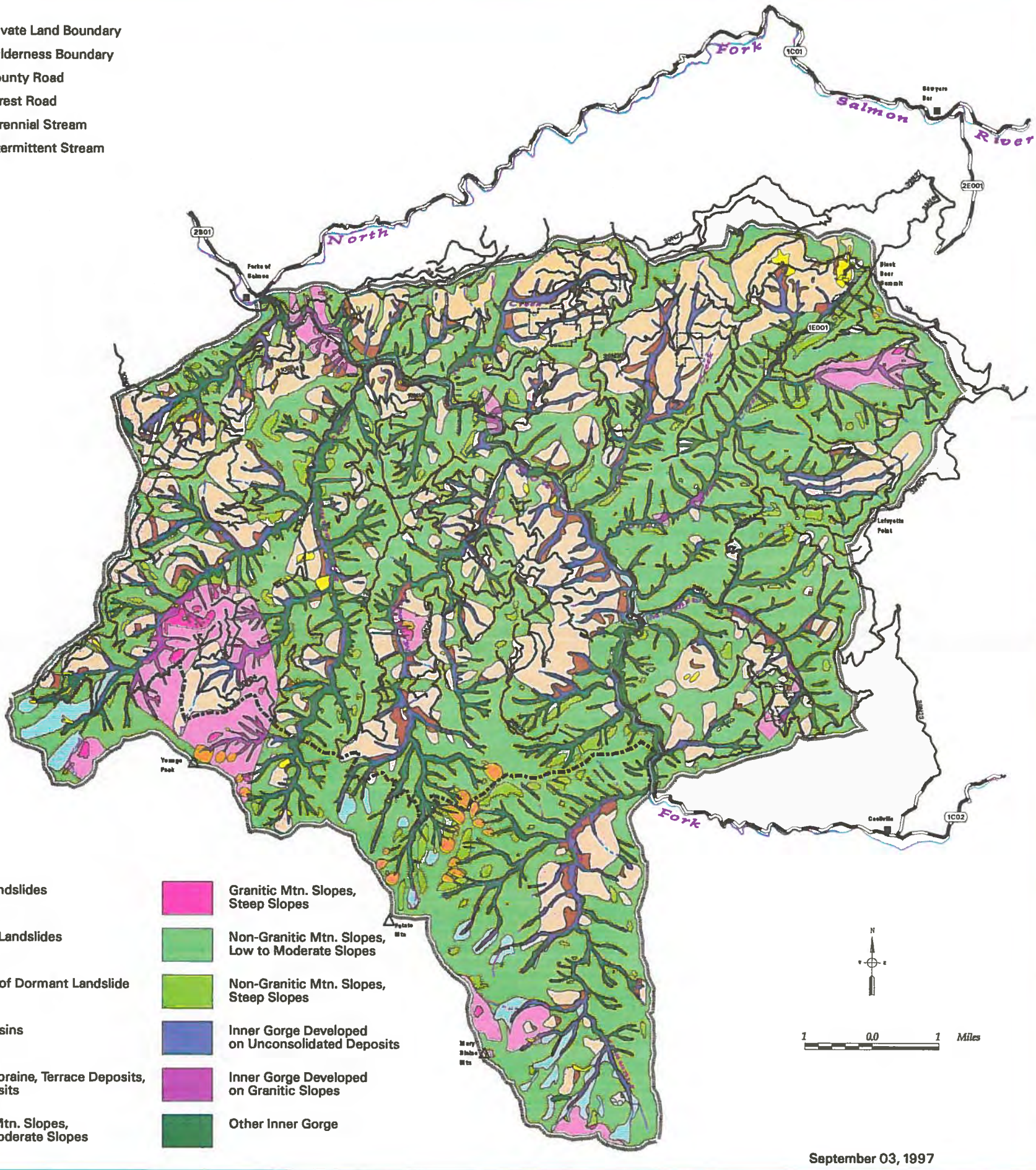
Figure 3-3

Lower South Fork Watershed

Geomorphic Terranes

Klamath National Forest

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



Active Landslides
Dormant Landslides
Toe Zone of Dormant Landslide
Debris Basins
Glacial Moraine, Terrace Deposits, Fan Deposits
Granitic Mtn. Slopes, Low to Moderate Slopes
Granitic Mtn. Slopes, Steep Slopes
Non-Granitic Mtn. Slopes, Low to Moderate Slopes
Non-Granitic Mtn. Slopes, Steep Slopes
Inner Gorge Developed on Unconsolidated Deposits
Inner Gorge Developed on Granitic Slopes
Other Inner Gorge

September 03, 1997

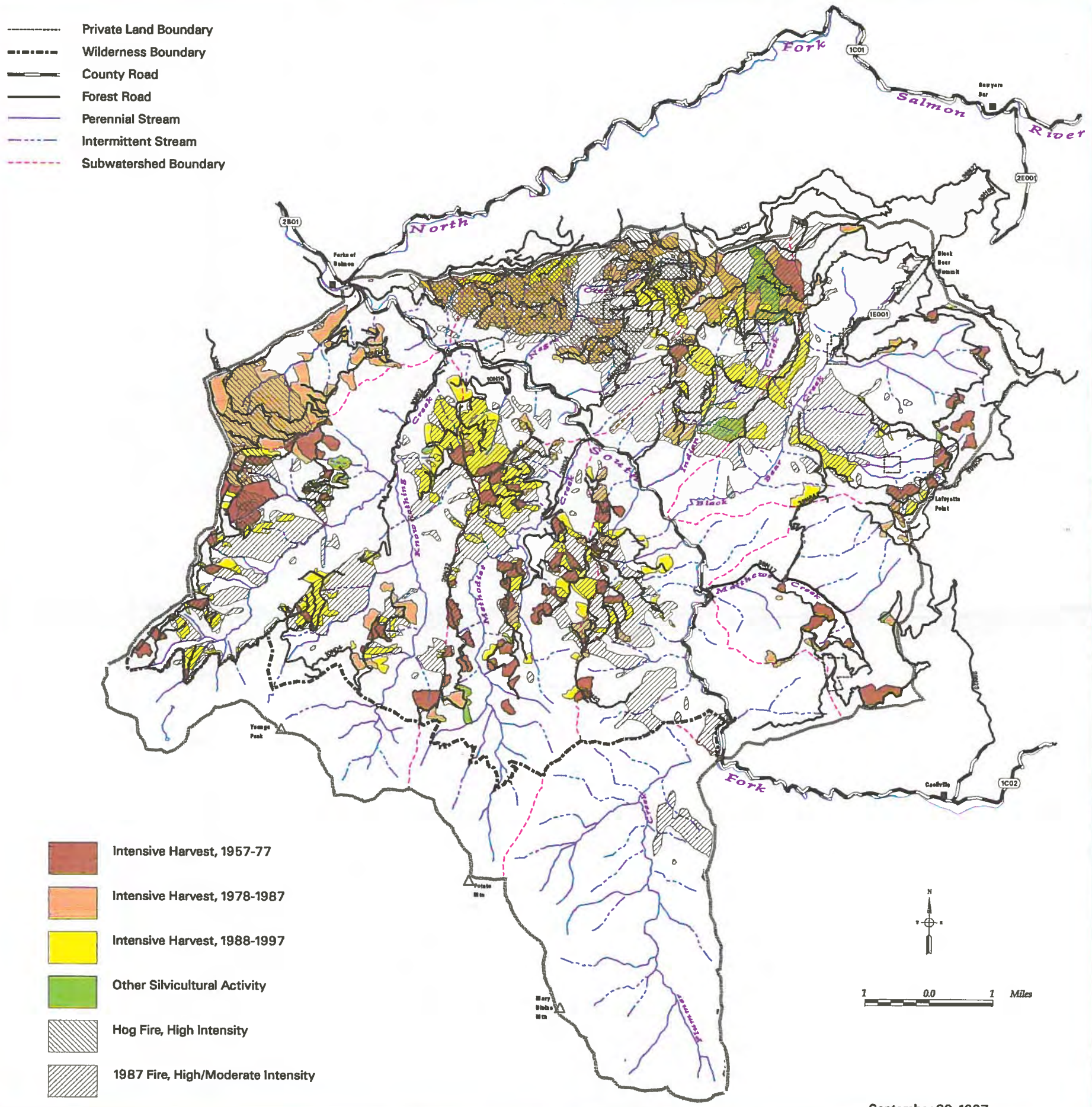
Figure 3-4

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

Lower South Fork Watershed

Watershed Disturbances

Klamath National Forest



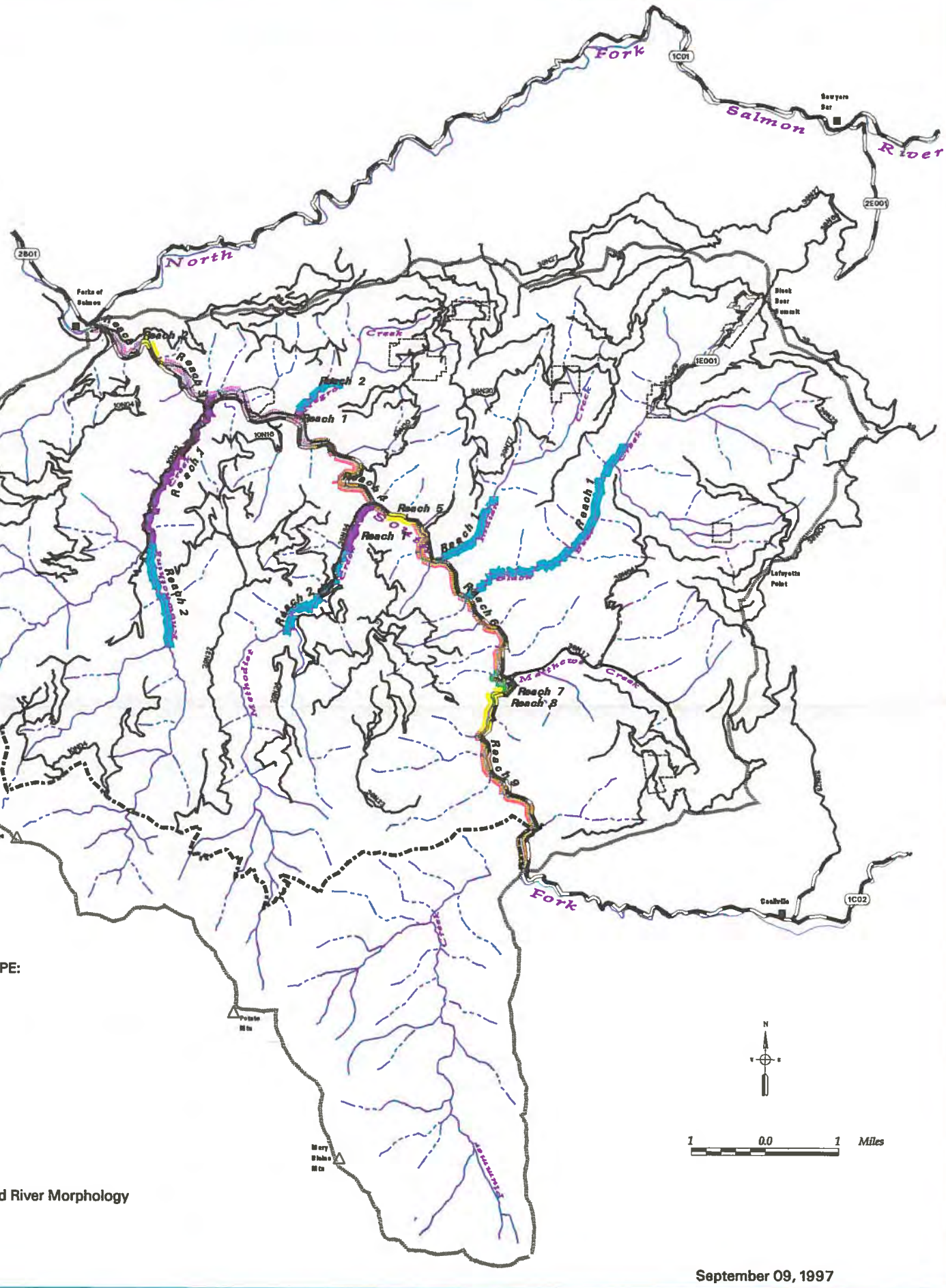
September 03, 1997

Figure 3-5

Lower South Fork Watershed

Habitat Inventory Reaches

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



ROSGEN CHANNEL TYPE:

A2
B2
C3
F1
F2
F3

Source: Rosgen, Dave (1996), Applied River Morphology

N

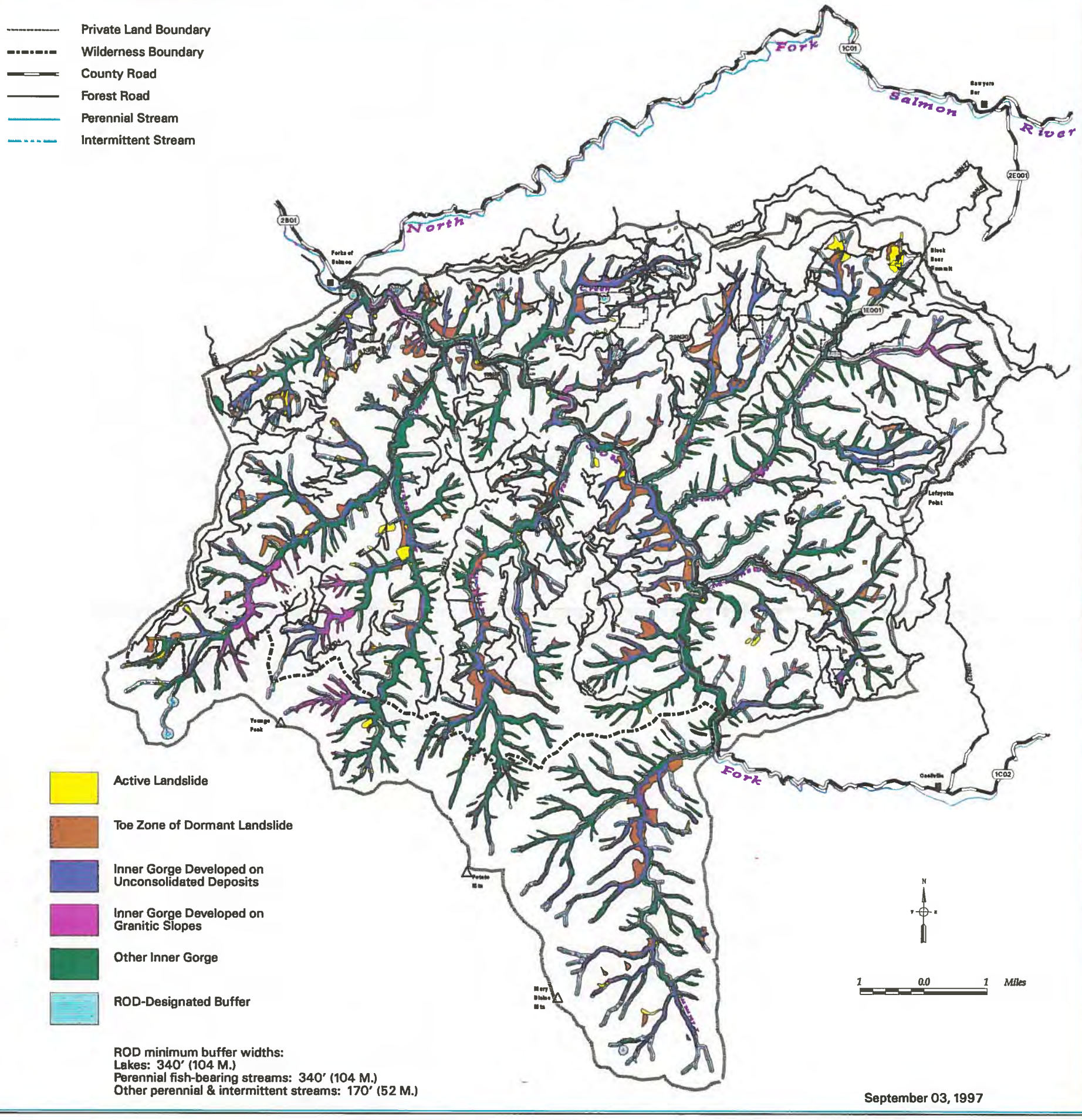
1 0.0 1 Miles

September 09, 1997

Figure 3-6

Lower South Fork Watershed

Riparian Reserve Types



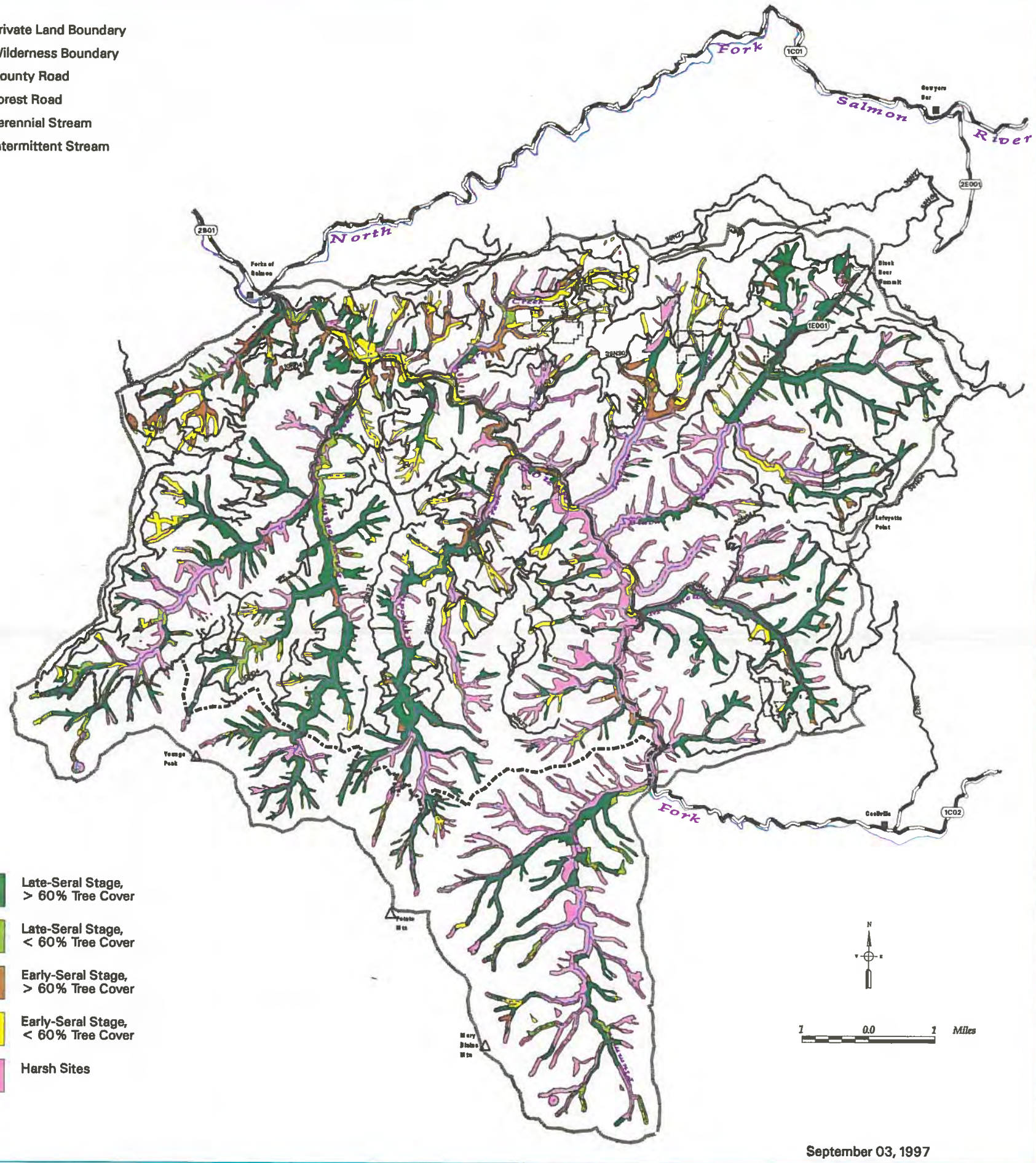
September 03, 1997

Figure 3-7

Lower South Fork Watershed

Riparian Reserve Vegetation

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



Late-Seral Stage, > 60% Tree Cover
Late-Seral Stage, < 60% Tree Cover
Early-Seral Stage, > 60% Tree Cover
Early-Seral Stage, < 60% Tree Cover
Harsh Sites

N

1 0.0 1 Miles

September 03, 1997

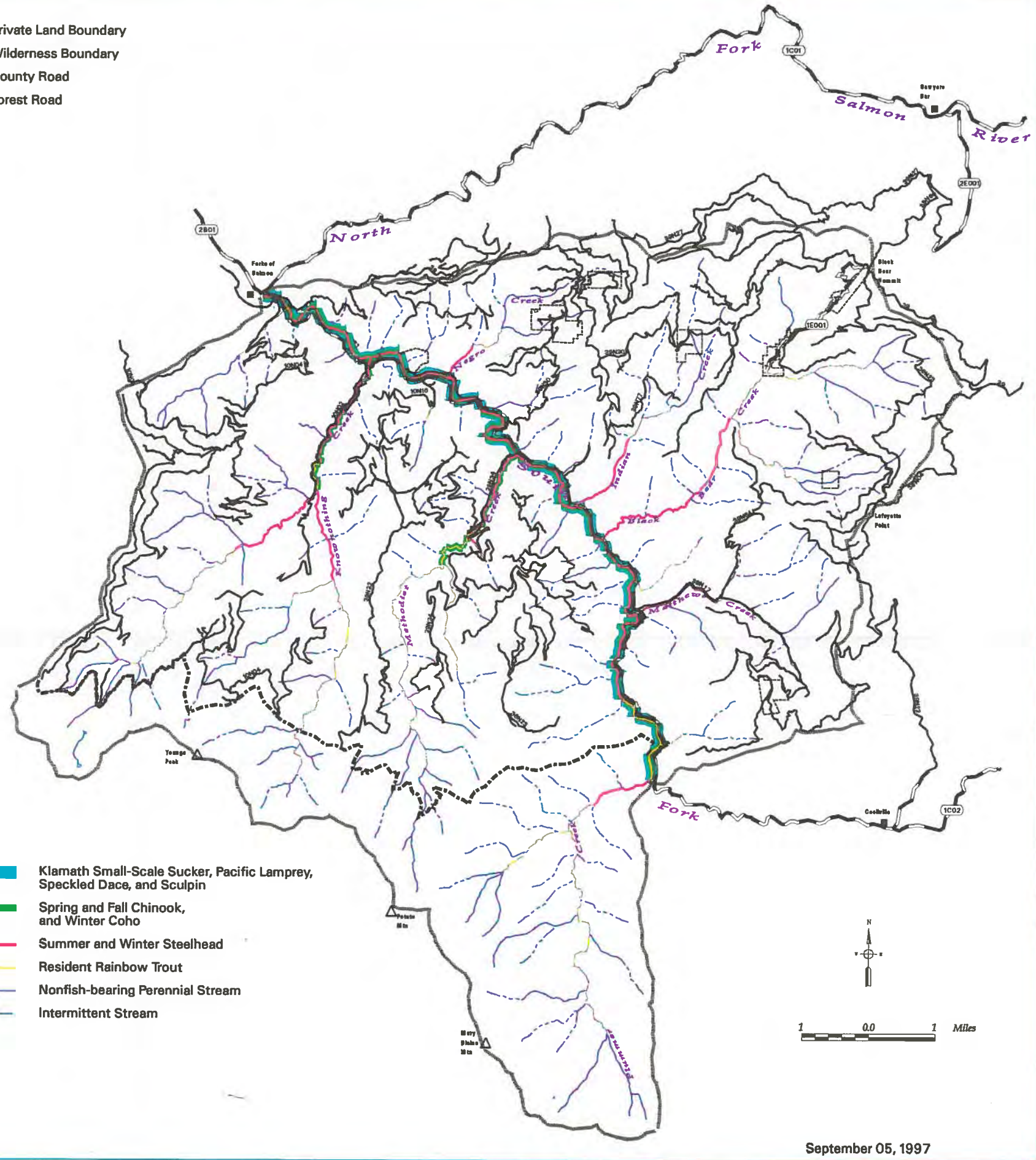
Figure 3-8

Lower South Fork Watershed

Fish Species Range

Klamath National Forest

Private Land Boundary
Wilderness Boundary
County Road
Forest Road



Klamath Small-Scale Sucker, Pacific Lamprey, Speckled Dace, and Sculpin
Spring and Fall Chinook, and Winter Coho
Summer and Winter Steelhead
Resident Rainbow Trout
Nonfish-bearing Perennial Stream
Intermittent Stream

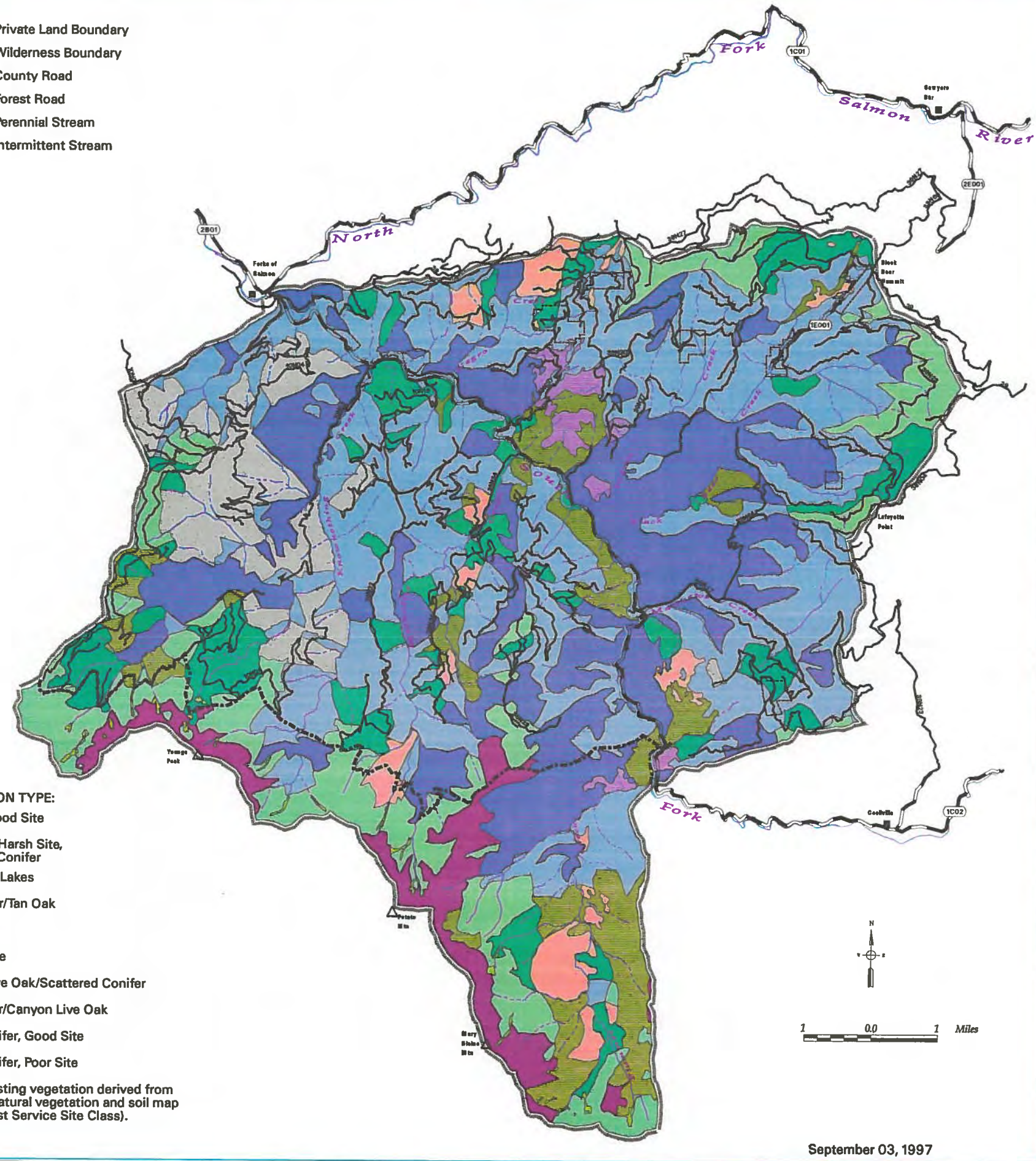
September 05, 1997

Figure 3-9

Lower South Fork Watershed

Existing Vegetation

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



VEGETATION TYPE:

- True Fir, Good Site
- Subalpine Harsh Site, Scattered Conifer
- Meadows, Lakes
- Douglas-Fir/Tan Oak
- Gray Pine
- Jeffrey Pine
- Canyon Live Oak/Scattered Conifer
- Douglas-Fir/Canyon Live Oak
- Mixed Conifer, Good Site
- Mixed Conifer, Poor Site

NOTE: Existing vegetation derived from potential natural vegetation and soil map units (Forest Service Site Class).

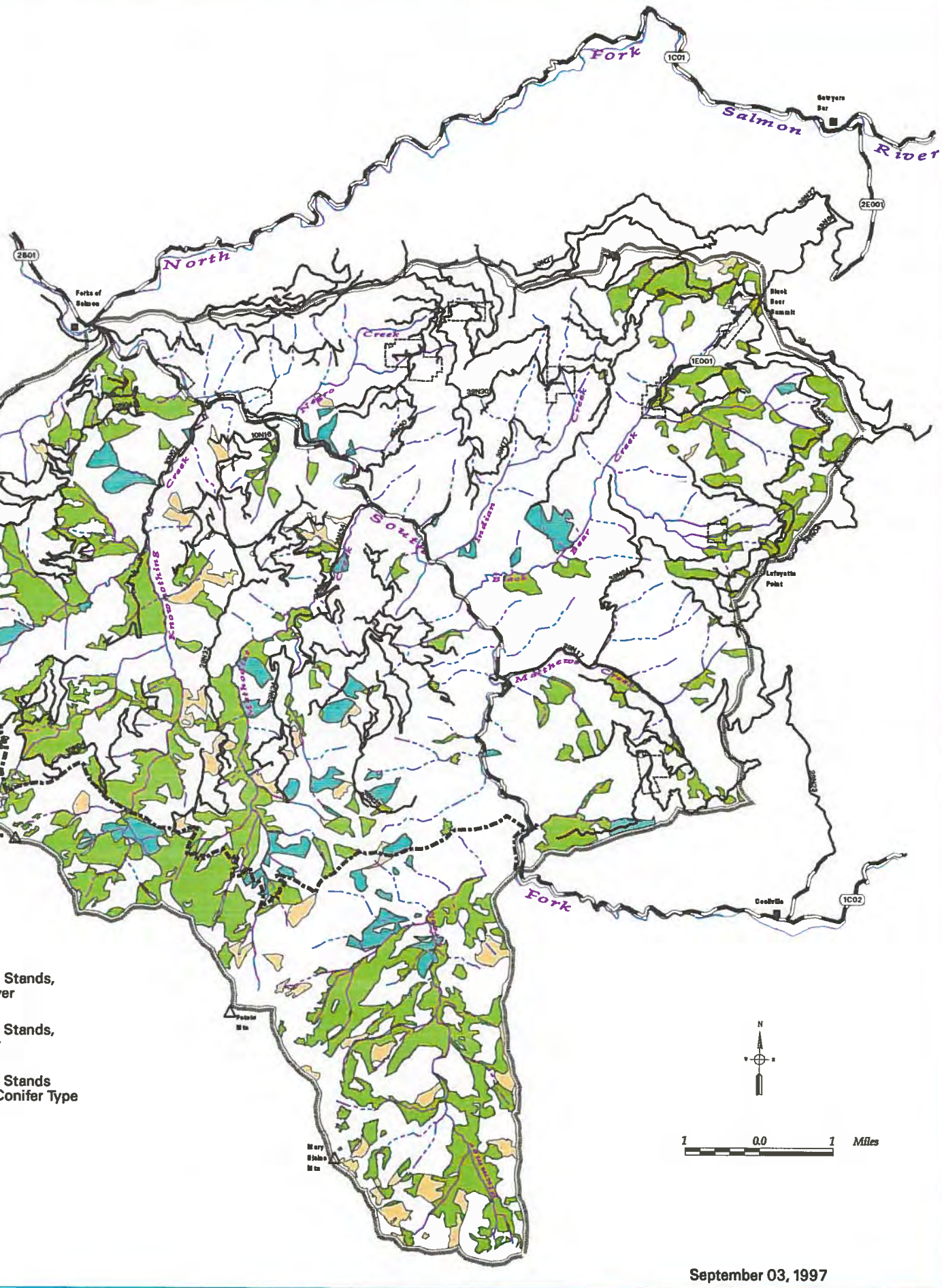
September 03, 1997

Figure 3-10

Lower South Fork Watershed

Late-Mature & Old-Growth Stands

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



Late-Mature & Old-Growth Stands, > =40% Total Conifer Cover

Late-Mature & Old-Growth Stands, <40% Total Conifer Cover

Late-Mature & Old-Growth Stands in the Live Oak/Scattered Conifer Type

N

1 0.0 1 Miles

September 03, 1997

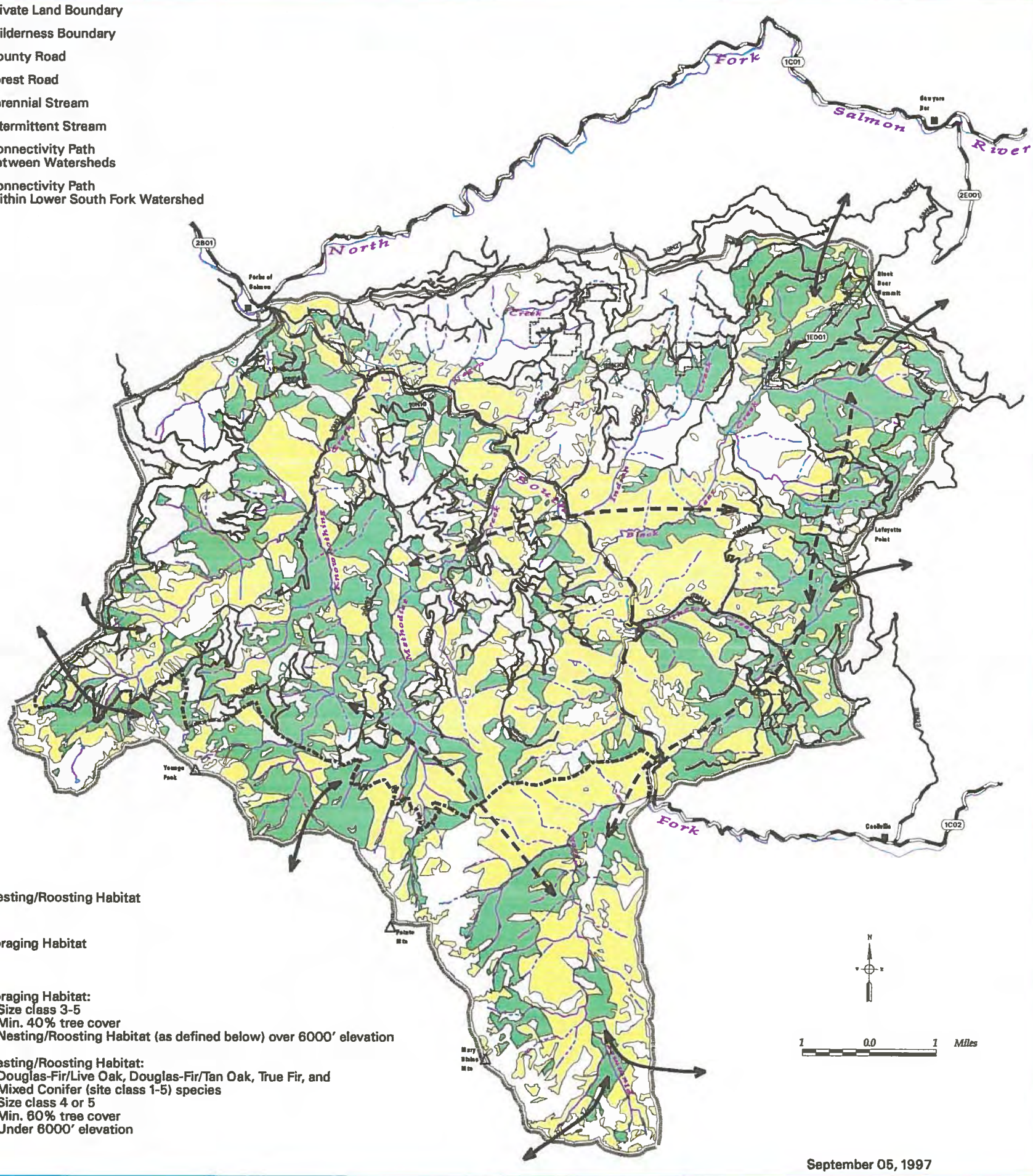
Figure 3-11

Lower South Fork Watershed

Suitable Northern Spotted Owl Habitat

Klamath National Forest

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream
Connectivity Path Between Watersheds
Connectivity Path Within Lower South Fork Watershed



Nesting/Roosting Habitat

Foraging Habitat

Foraging Habitat:
- Size class 3-5
- Min. 40% tree cover
- Nesting/Roosting Habitat (as defined below) over 6000′ elevation

Nesting/Roosting Habitat:
- Douglas-Fir/Live Oak, Douglas-Fir/Tan Oak, True Fir, and Mixed Conifer (site class 1-5) species
- Size class 4 or 5
- Min. 60% tree cover
- Under 6000′ elevation

September 05, 1997

Figure 3-12

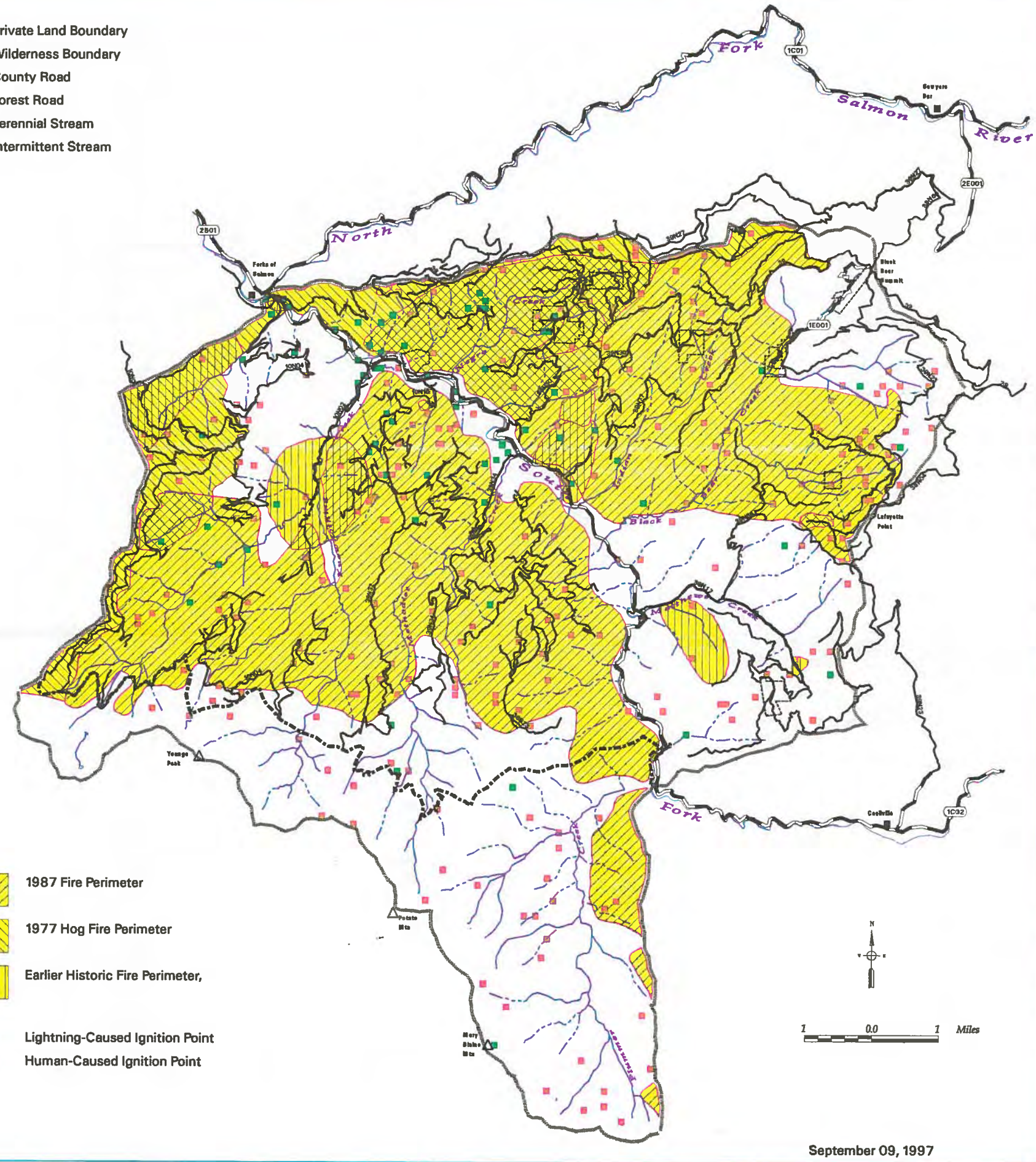
FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

Lower South Fork Watershed

Fire History

Klamath National Forest

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



1987 Fire Perimeter

1977 Hog Fire Perimeter

Earlier Historic Fire Perimeter,

Lightning-Caused Ignition Point

Human-Caused Ignition Point

N

1 0.0 1 Miles

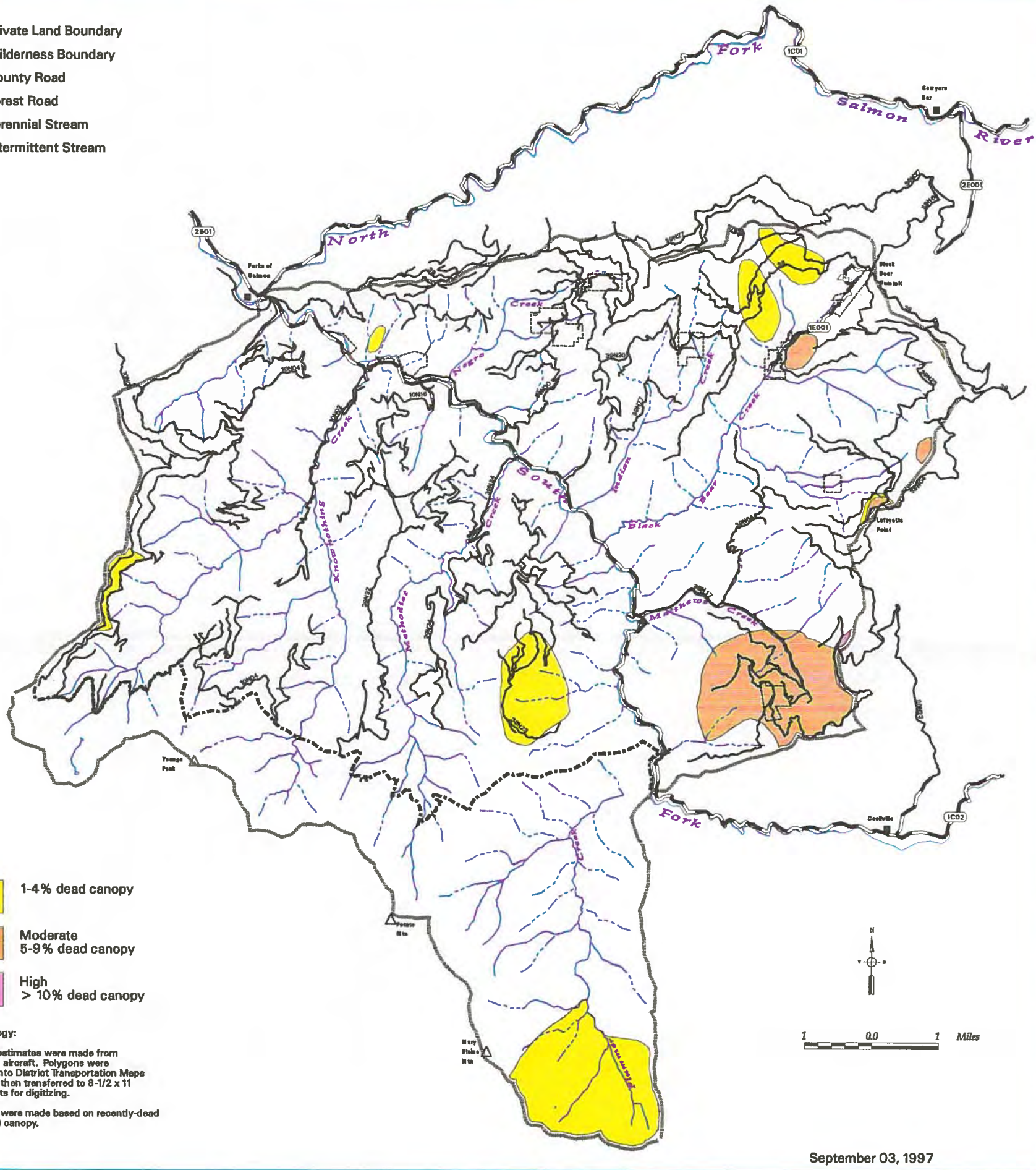
September 09, 1997

Figure 3-13

Lower South Fork Watershed
Timber Mortality
(1993-1996 Aerial Surveys)

Klamath National Forest

- Private Land Boundary
- Wilderness Boundary
- County Road
- Forest Road
- Perennial Stream
- Intermittent Stream



1-4% dead canopy

Moderate
5-9% dead canopy

High
> 10% dead canopy

Methodology:

Mortality estimates were made from fixed wing aircraft. Polygons were mapped onto District Transportation Maps (1:62500) then transferred to 8-1/2 x 11 quad sheets for digitizing.

Estimates were made based on recently-dead (past year) canopy.

1 0.0 1 Miles

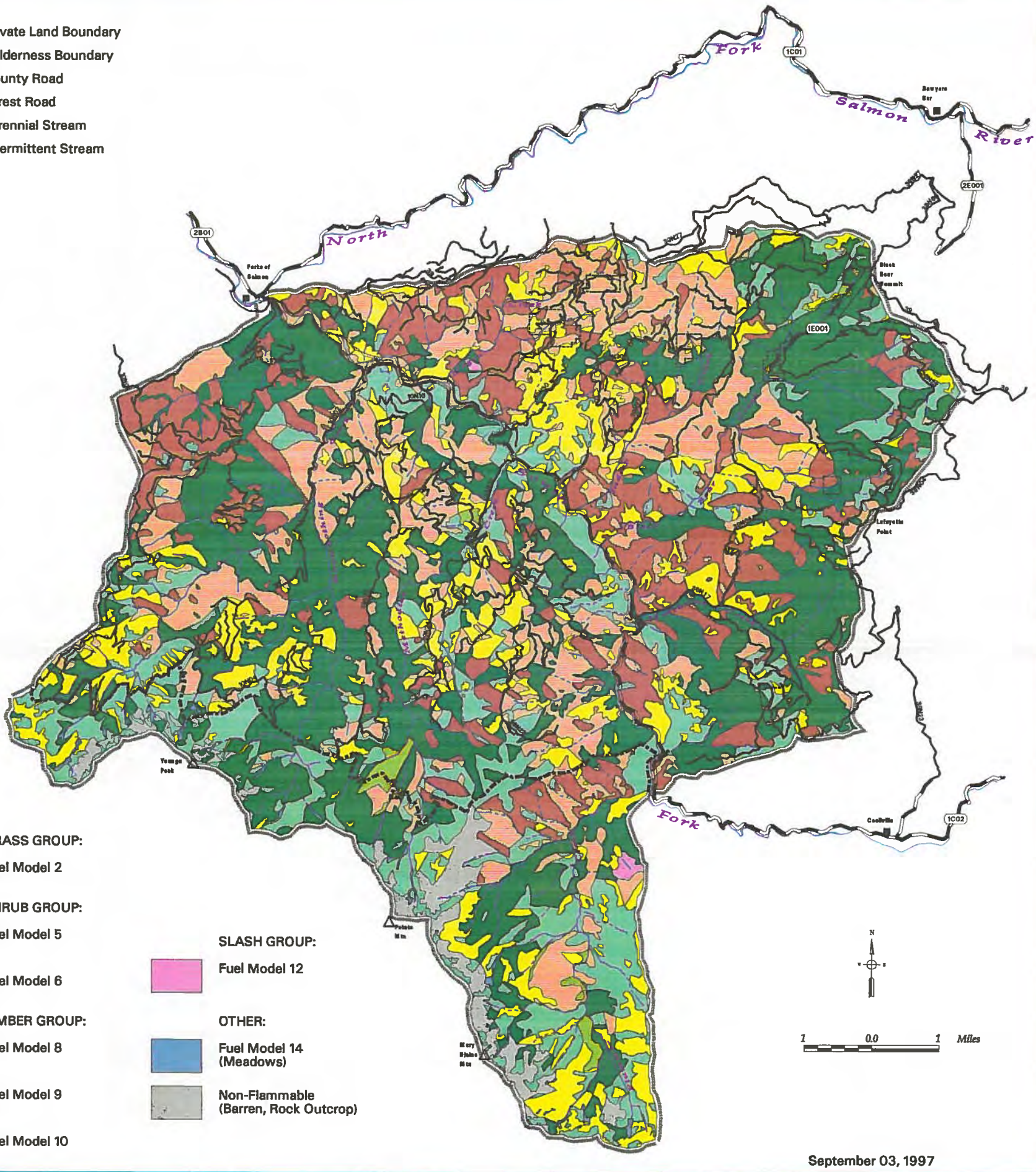
September 03, 1997

Figure 3-14

Lower South Fork Watershed

Fuel Models

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



GRASS GROUP:
Fuel Model 2

SHRUB GROUP:
Fuel Model 5
Fuel Model 6

TIMBER GROUP:
Fuel Model 8
Fuel Model 9
Fuel Model 10

SLASH GROUP:
Fuel Model 12

OTHER:
Fuel Model 14 (Meadows)
Non-Flammable (Barren, Rock Outcrop)

N

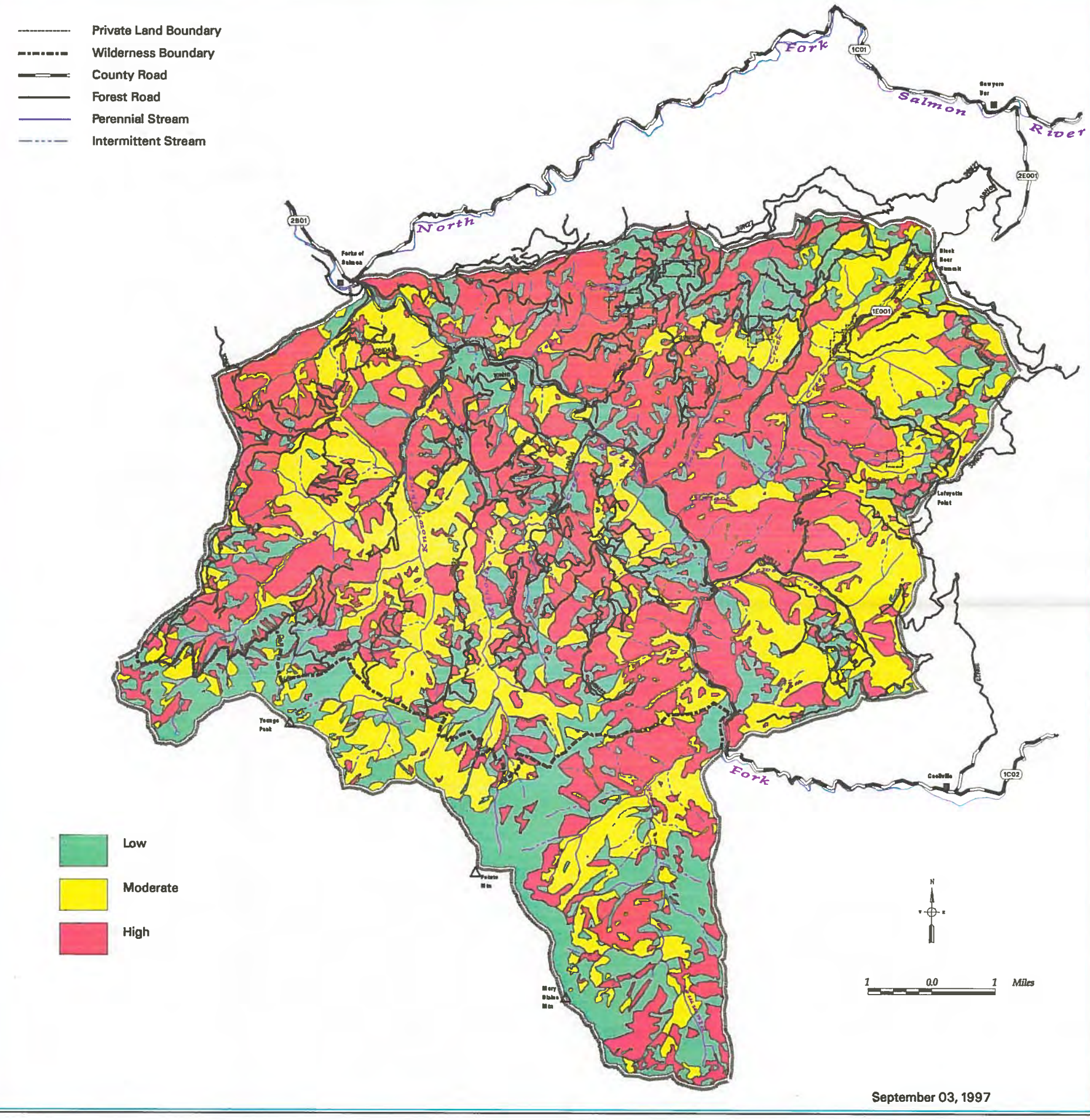
1 0.0 1 Miles

September 03, 1997

Figure 3-15

Lower South Fork Watershed

Fire Behavior Potential



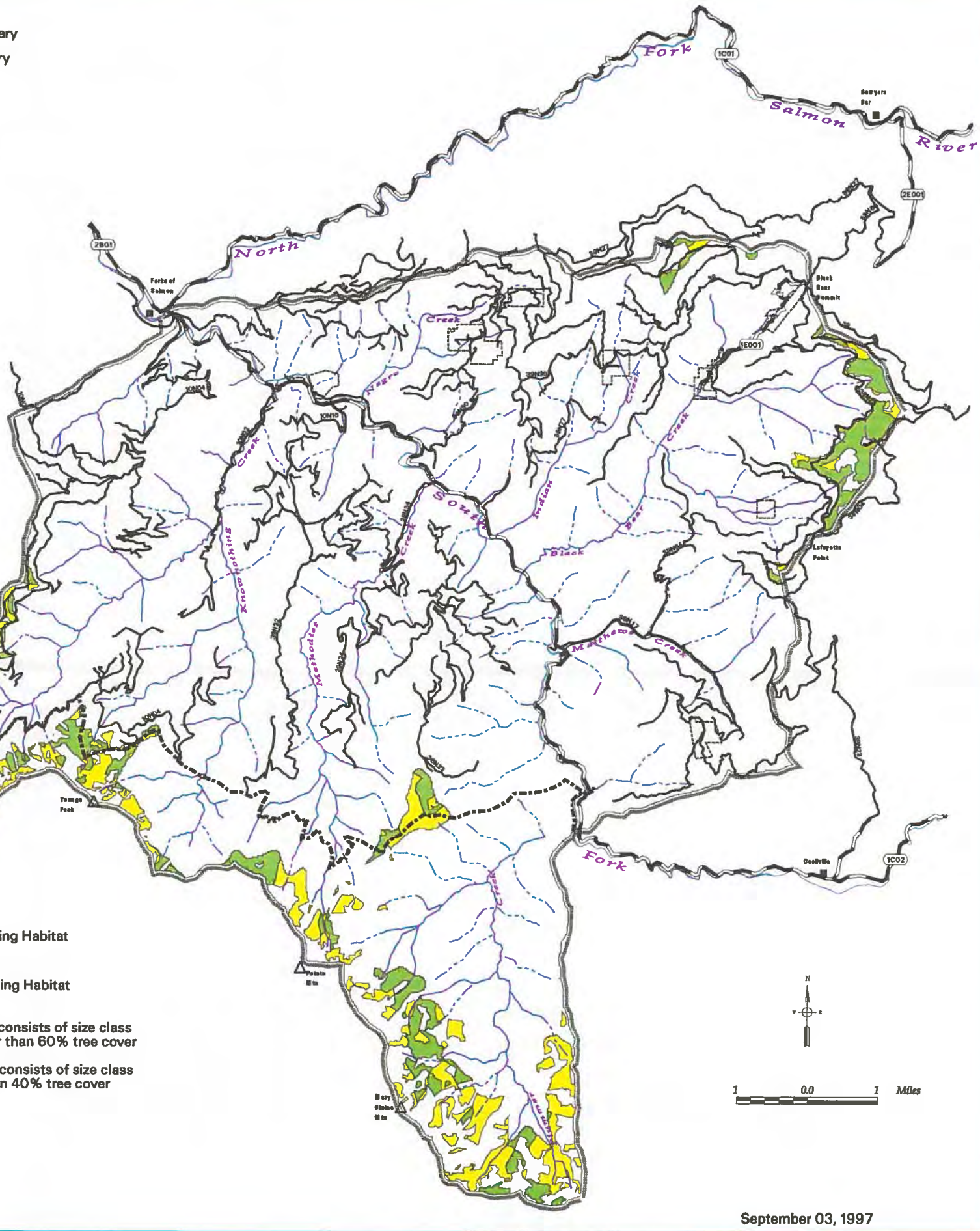
September 03, 1997

Figure 3-16

Lower South Fork Watershed

Suitable Habitat for Pine Marten

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



Suitable Denning Habitat

Suitable Foraging Habitat

Suitable denning habitat consists of size class 4 & 5 stands with greater than 60% tree cover above 5000' elevation.
Suitable foraging habitat consists of size class 3 stands with greater than 40% tree cover above 5000' elevation

N

1 0.0 1 Miles

September 03, 1997

Figure 3-17

Lower South Fork Watershed

Current Transportation System

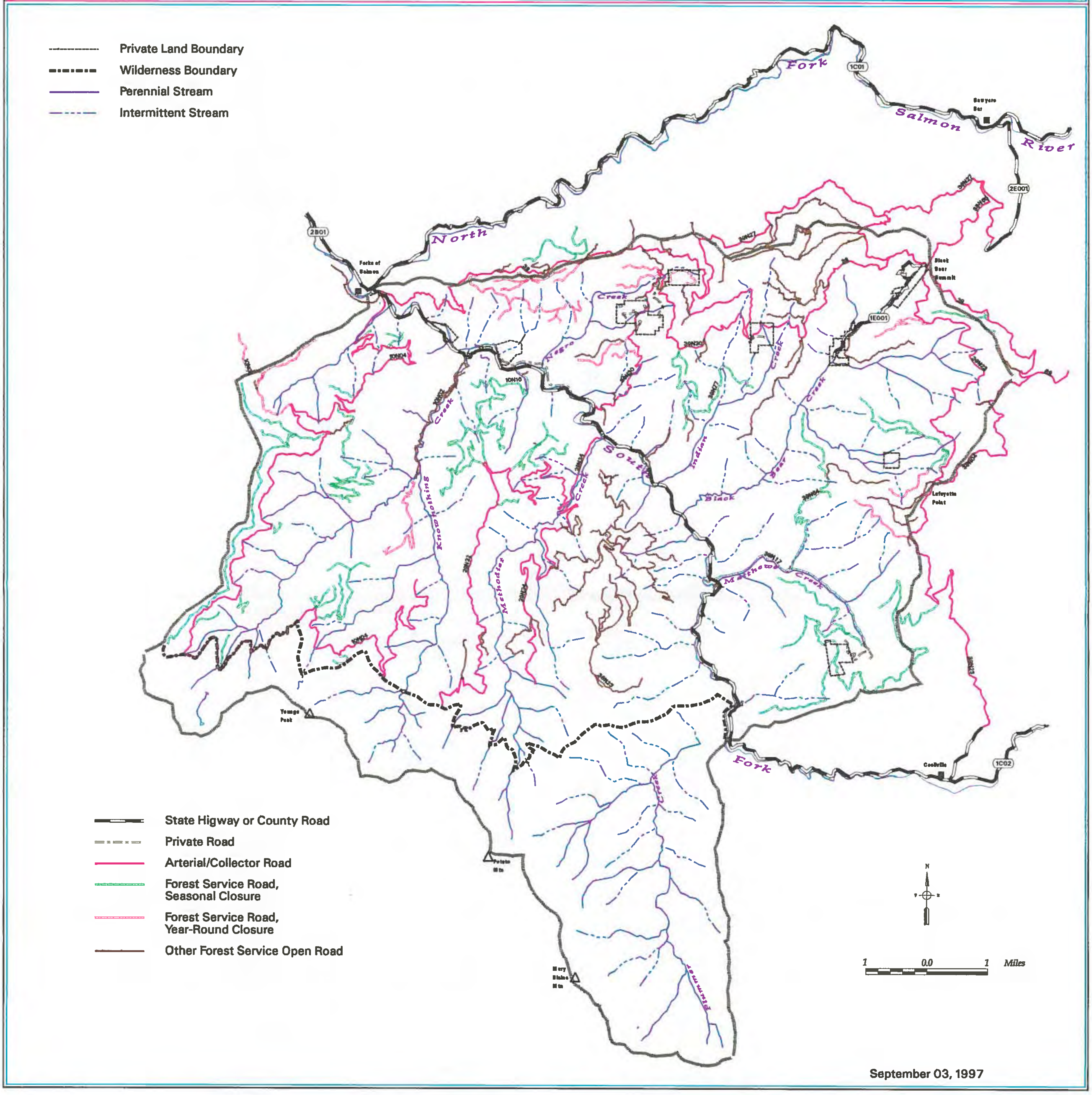


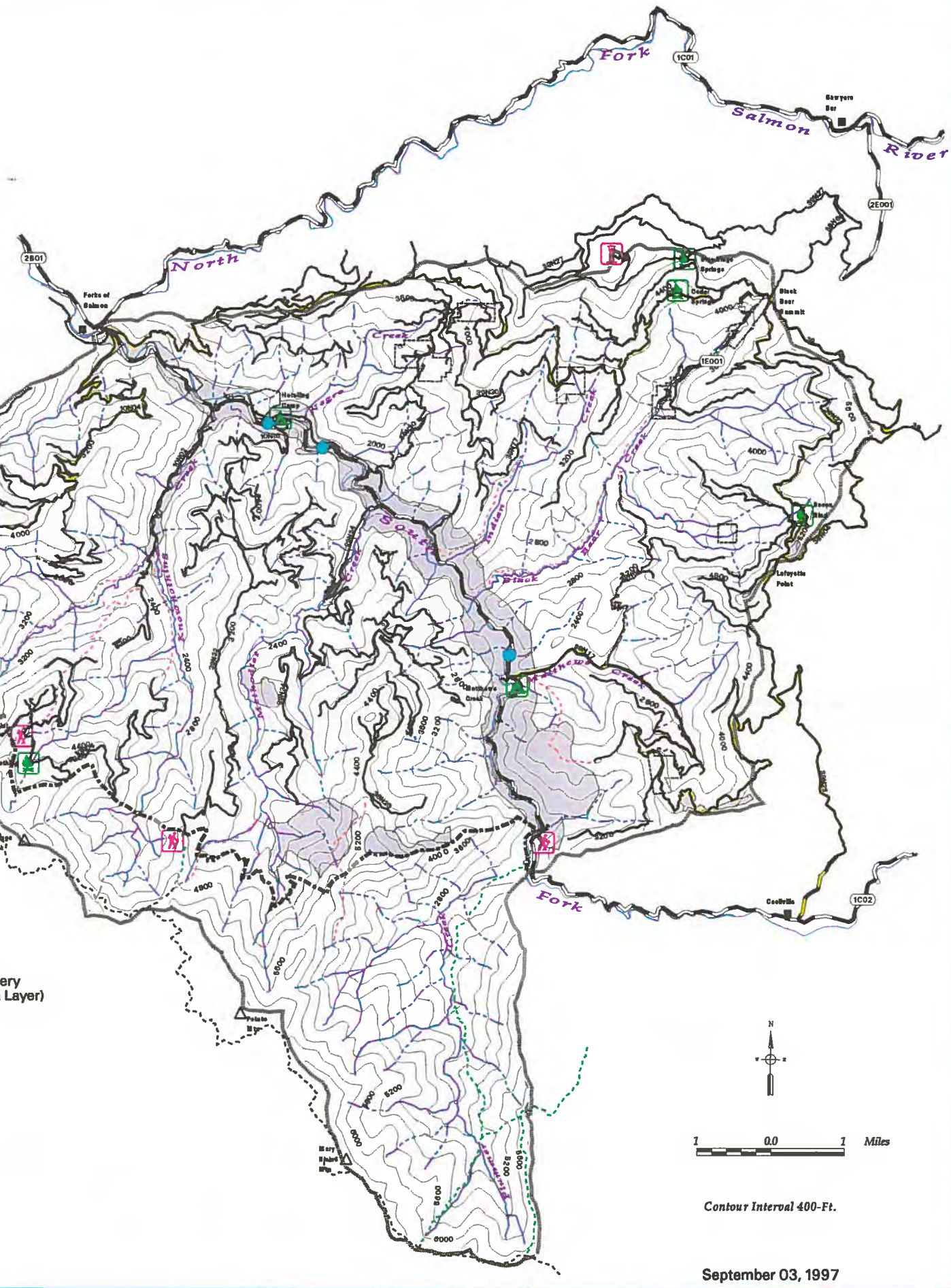
Figure 3-18

Lower South Fork Watershed

Recreation Features

Klamath National Forest

- Private Land Boundary
- Wilderness Boundary
- County Road
- Forest Road
- Perennial Stream
- Intermittent Stream
- Primary Trail
- Secondary Trail
- Inactive Reserve Trail
- Other Trail



Areas With Distinct Scenery
(Source: LMP IVQO Data Layer)

Mountain Bike Route

Trailhead

Blue Ridge Lookout

Campground

Dispersed Camping

River Access

N

1 0.0 1 Miles

Contour Interval 400-Ft.

September 03, 1997

Figure 4-1

Lower South Fork Watershed

Historic Features

FOREST SERVICE U S DEPARTMENT OF AGRICULTURE

Klamath National Forest

R7E R8E R12W R11W

T 10 N

T 9 N

T 8 N

T 39 N

T 38 N

T 37 N

Main Motor Highway (1943)

Good Motor Road (1943)

Stream

Historically Logged (Source: EUI data)

Lookout

Campground

Mine

NOTE: Only select historic features are displayed on this map, consistent with the National Historic Preservation Act of 1966, as amended, and the Archaeological Resources Protection Act of 1979, as amended.
Source: Klamath National Forest maps, various dates, 1921-1968

1 0.0 1 Miles

Contour Interval 400-Ft.

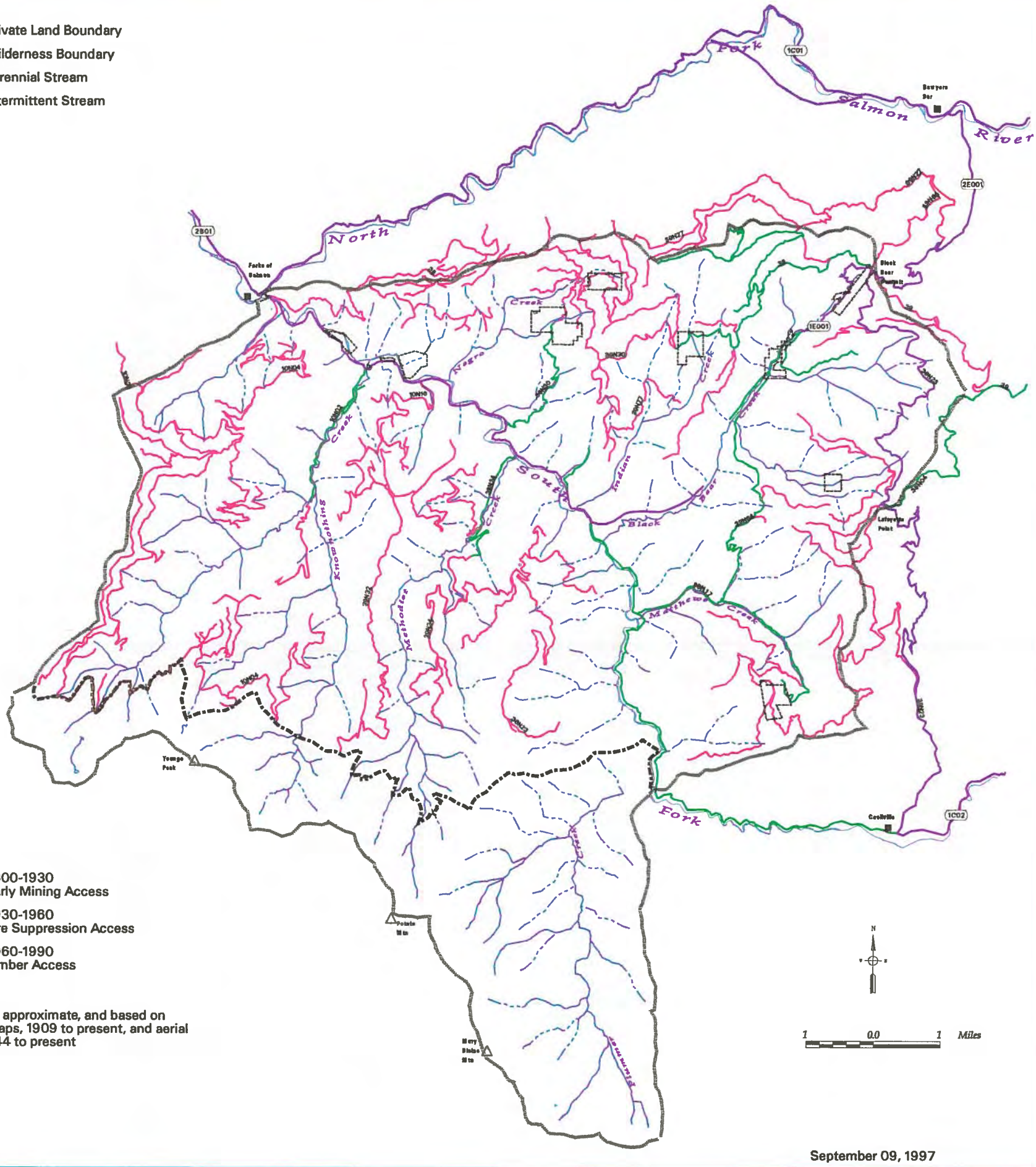
September 05, 1997

Figure 4-2

Lower South Fork Watershed

Road System Development

Private Land Boundary
Wilderness Boundary
Perennial Stream
Intermittent Stream



1900-1930
Early Mining Access

1930-1960
Fire Suppression Access

1960-1990
Timber Access

Note: Dates are approximate, and based on Forest Visitor Maps, 1909 to present, and aerial photos from 1944 to present

N

1 0.0 1 Miles

September 09, 1997

Figure 5-1

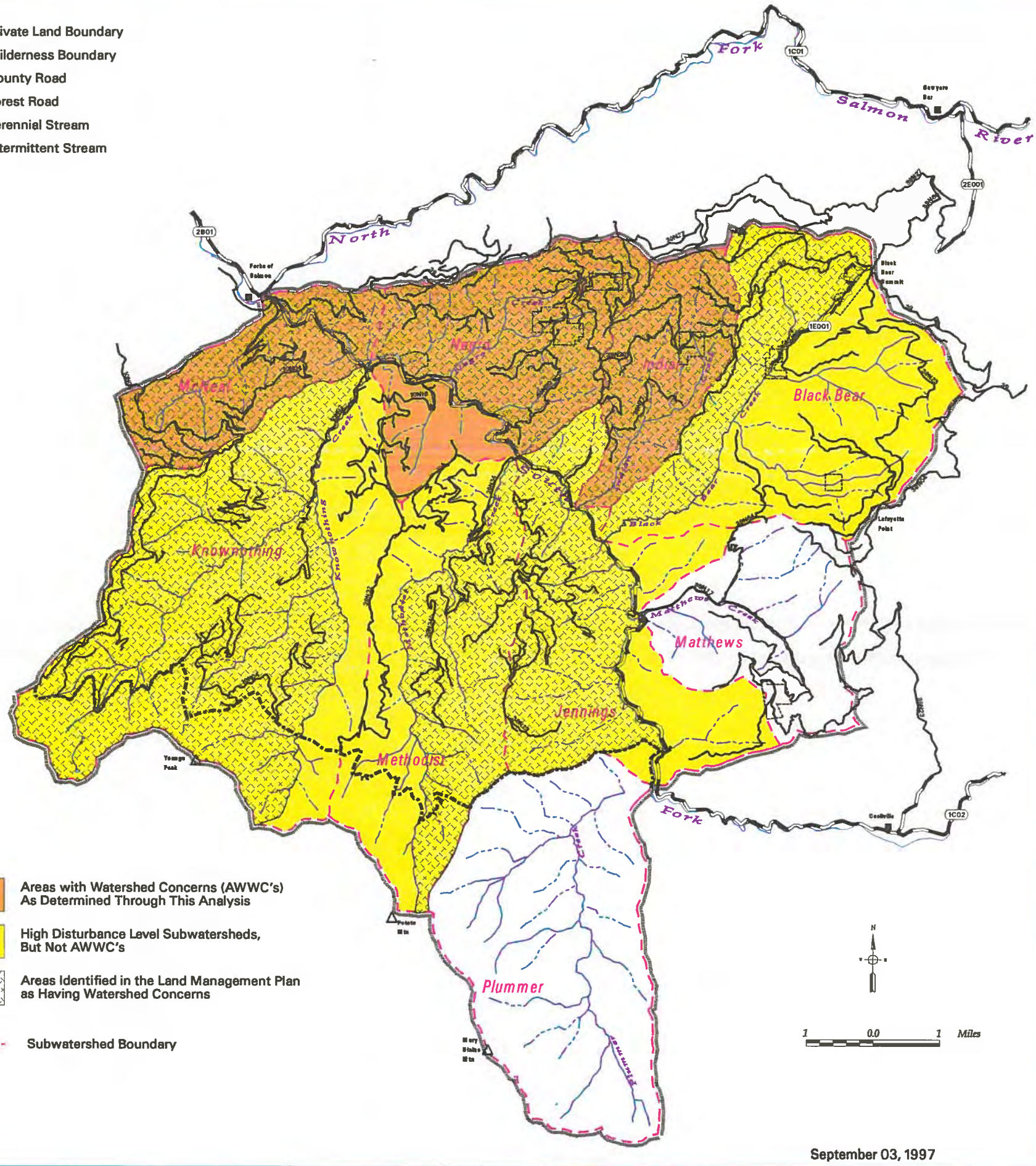
FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

Lower South Fork Watershed

Updated Areas with Watershed Concerns

Klamath National Forest

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



Areas with Watershed Concerns (AWWC's) As Determined Through This Analysis

High Disturbance Level Subwatersheds, But Not AWWC's

Areas Identified in the Land Management Plan as Having Watershed Concerns

Subwatershed Boundary

September 03, 1997

Figure 5-2

Lower South Fork Watershed

Methodist Creek Stream Study

Study Area Extent

USGS Perennial Stream

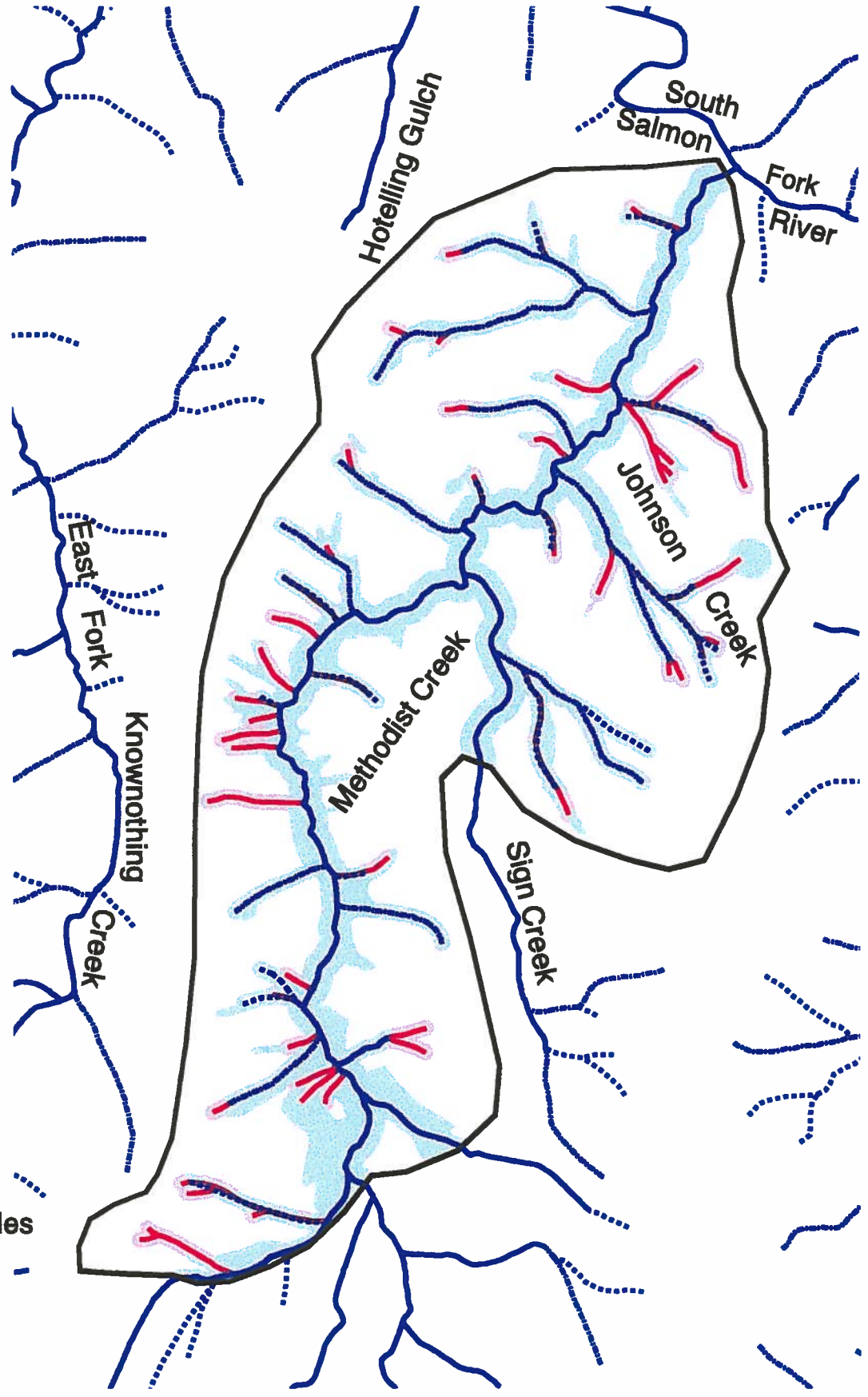
USGS Intermittent Stream

Additional Stream based on DEM

Additional Stream based on Ground Inventory

Riparian Reserves based on USGS and DEM Stream Buffers and Unstable Lands

Additional Riparian Reserve based on Ground Inventory of Streams



Scale 1:40,000

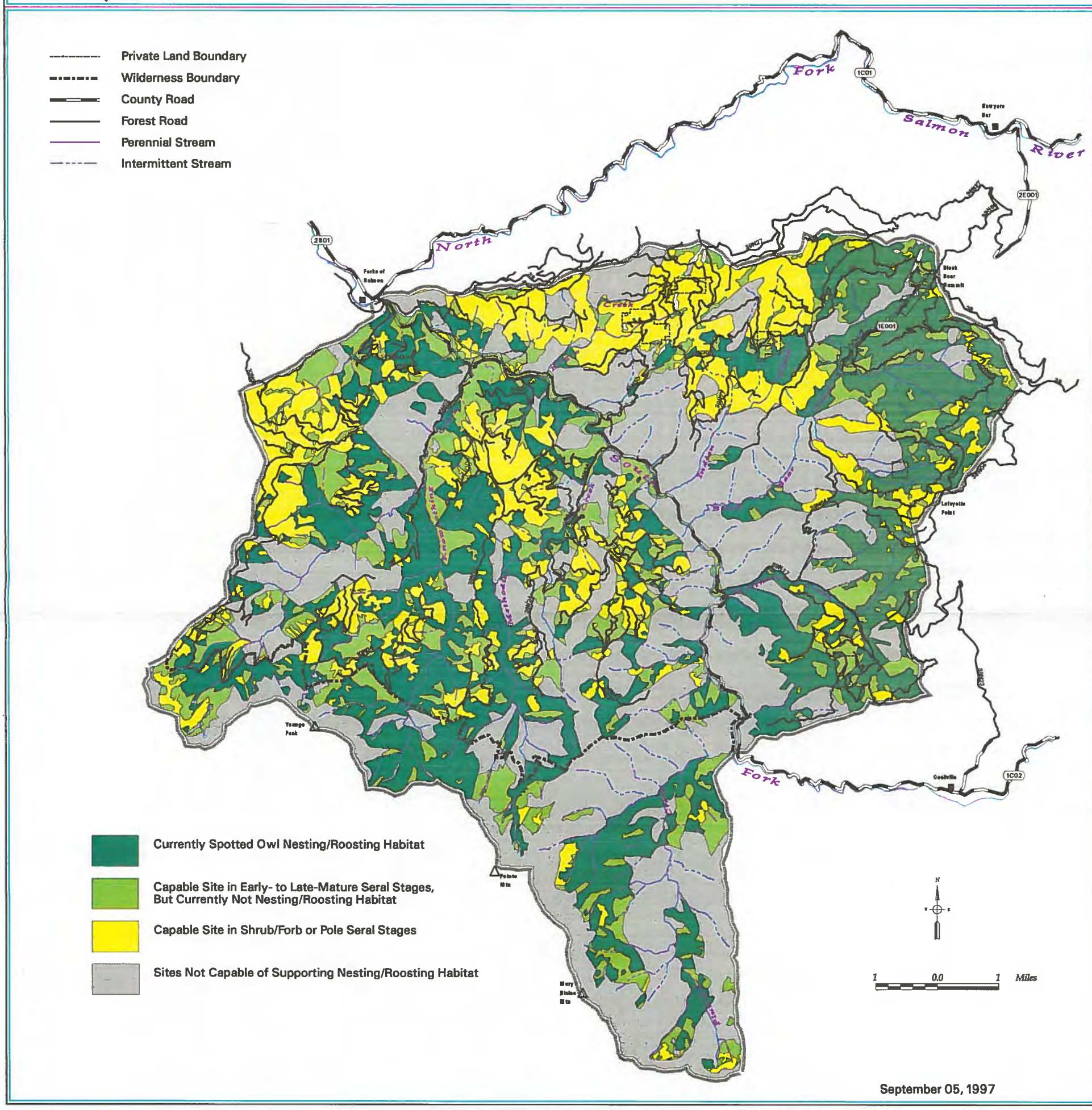
0.5 0 0.5 1 Miles

August 27, 1997

Figure 5-3

Lower South Fork Watershed

Potential Late-Successional Habitat

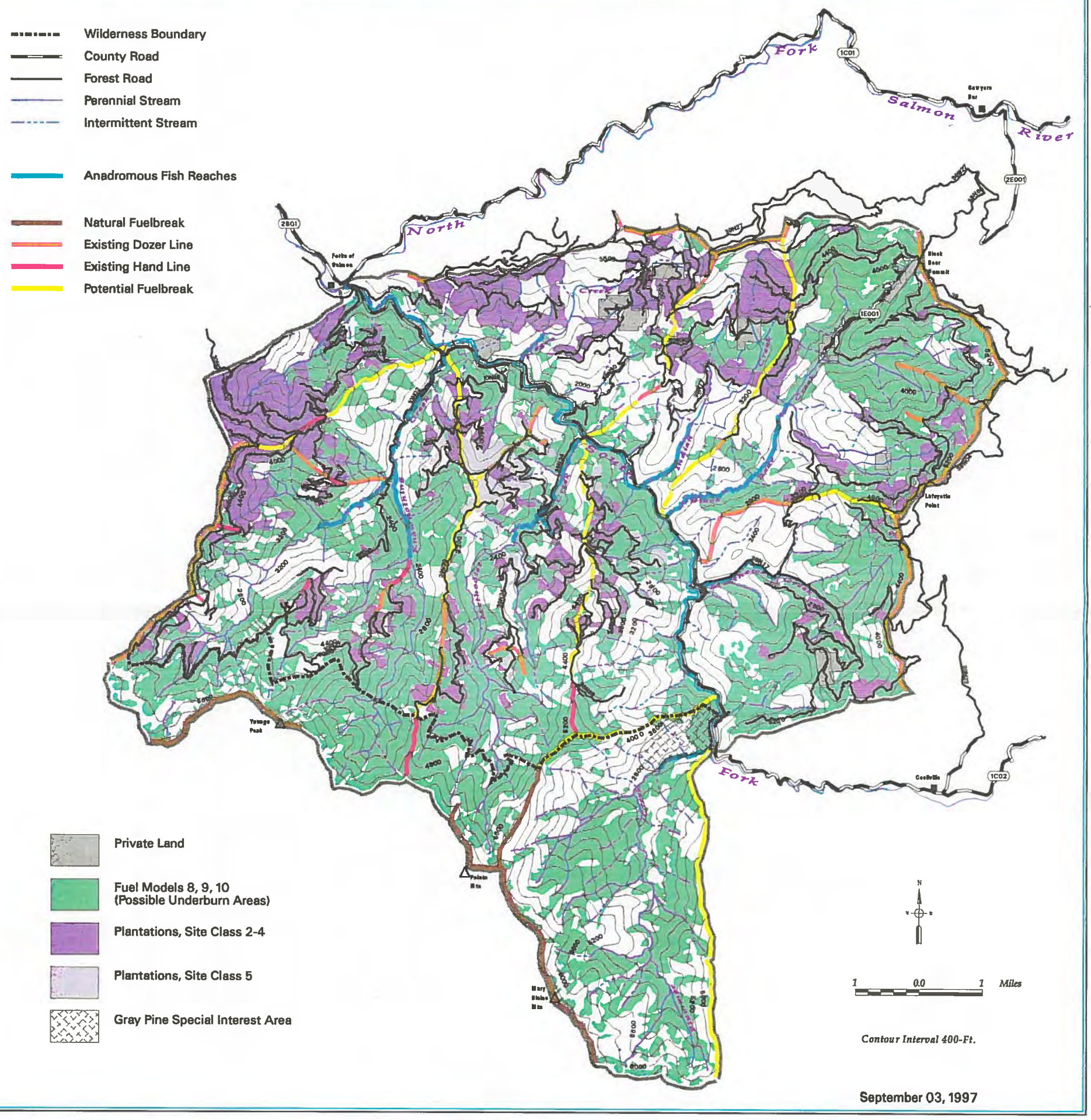


September 05, 1997

Figure 5-4

Lower South Fork Watershed Fuels Treatment and Fire Management Considerations

Klamath National Forest



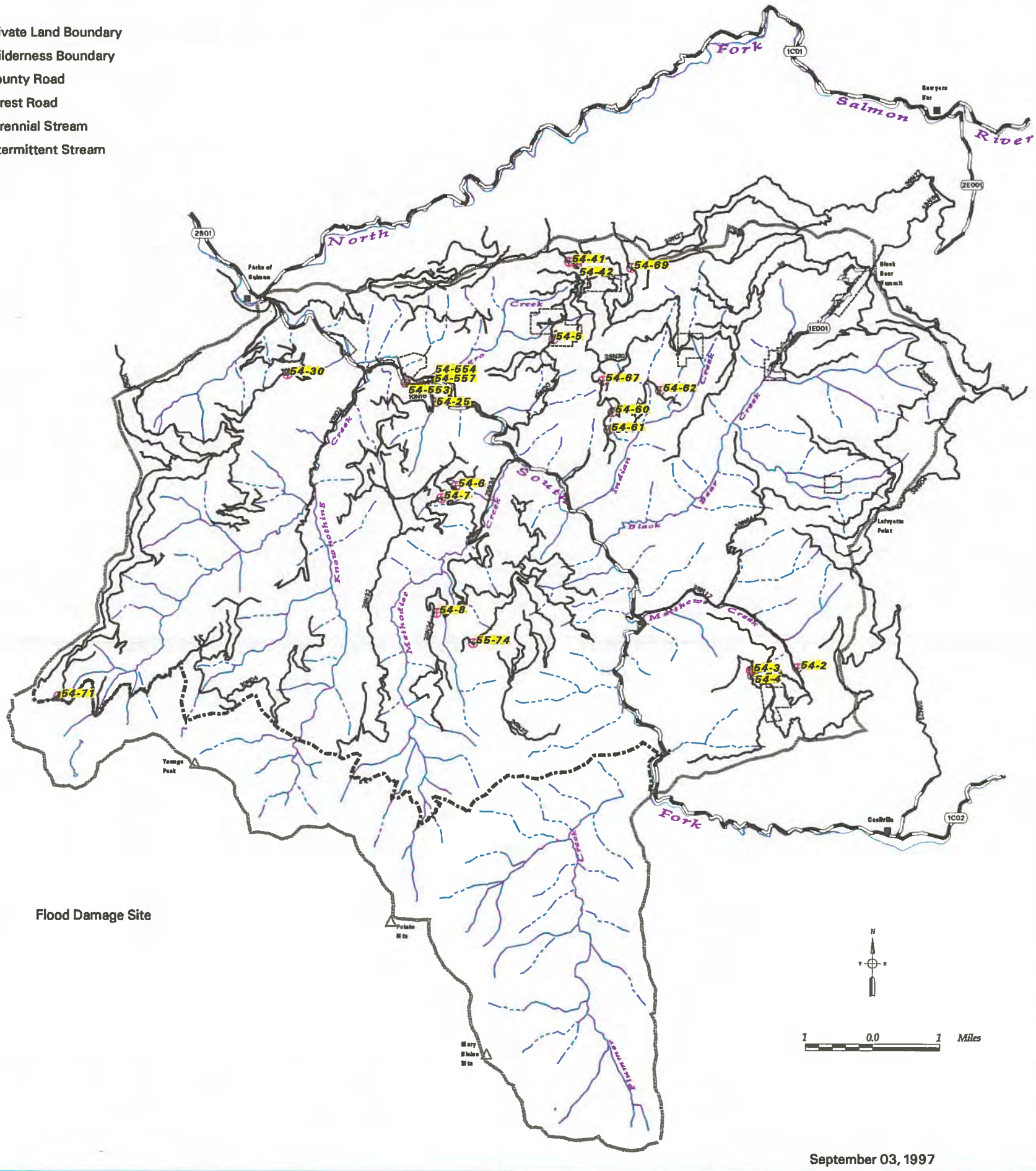
September 03, 1997

Figure 5-5

Lower South Fork Watershed

Road Damage - 1997 Flood

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



Flood Damage Site

1 0.0 1 Miles

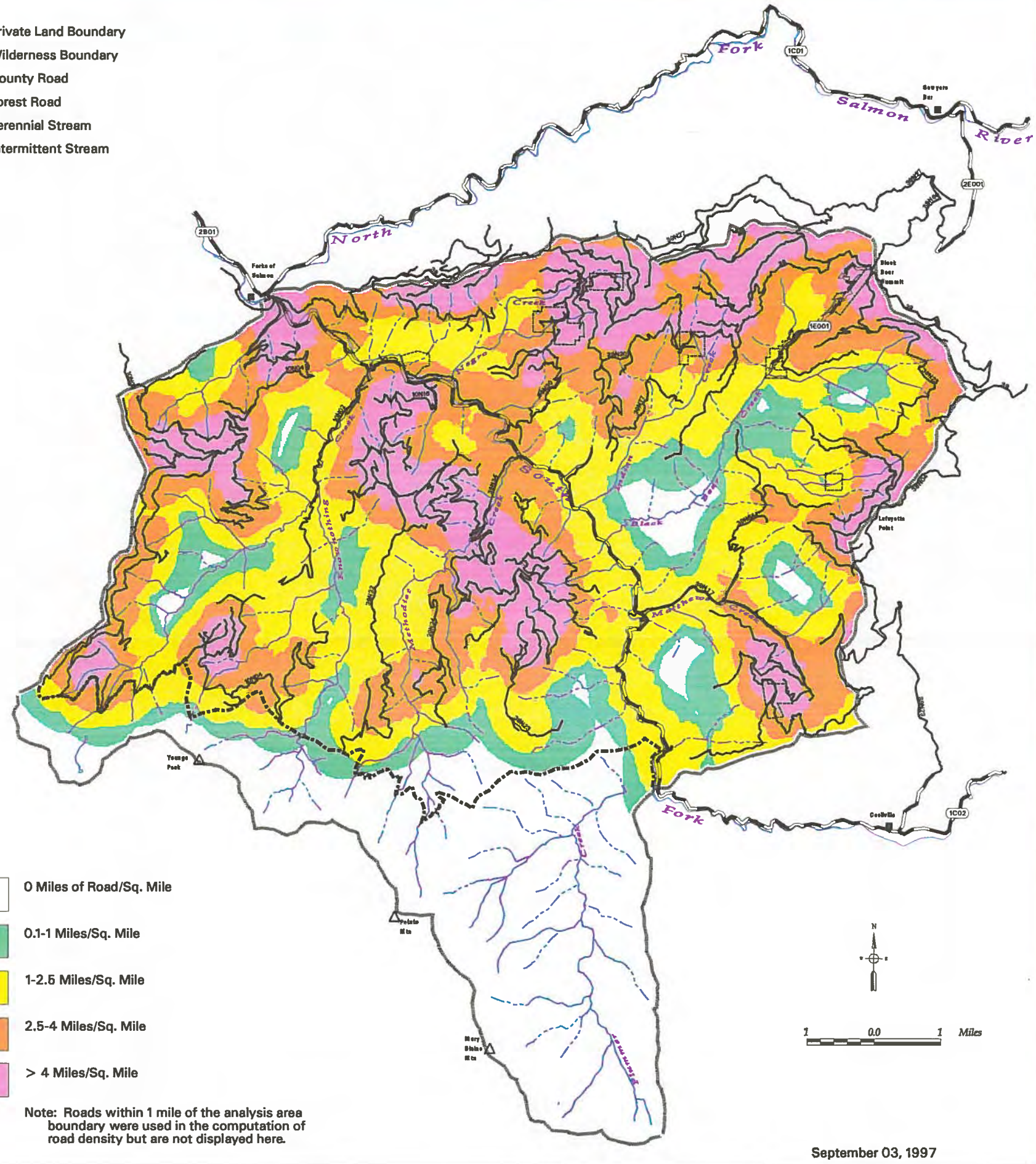
September 03, 1997

Figure 5-6

Lower South Fork Watershed

Road Density

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



0 Miles of Road/Sq. Mile
0.1-1 Miles/Sq. Mile
1-2.5 Miles/Sq. Mile
2.5-4 Miles/Sq. Mile
> 4 Miles/Sq. Mile

Note: Roads within 1 mile of the analysis area boundary were used in the computation of road density but are not displayed here.

1 0.0 1 Miles

September 03, 1997

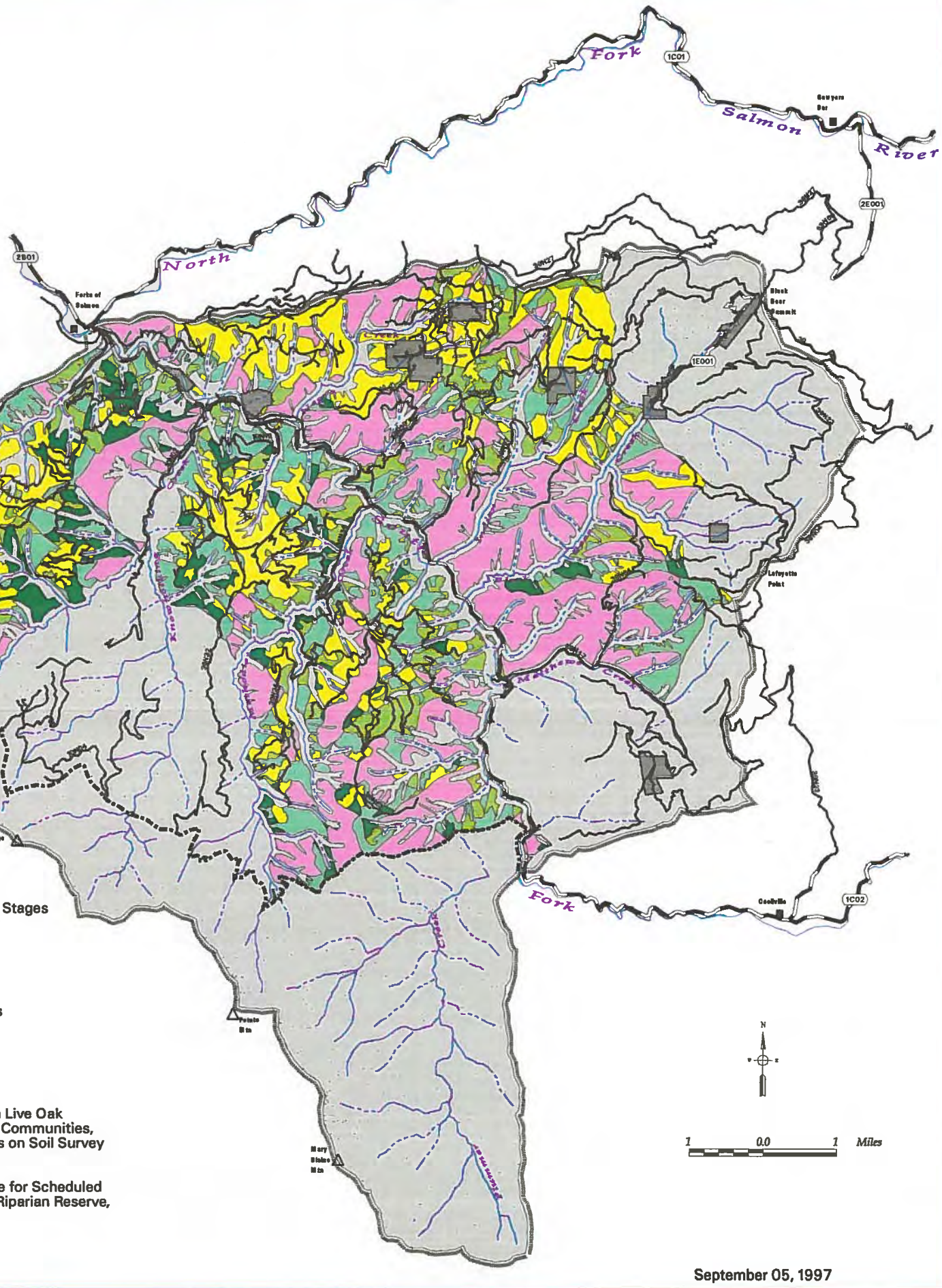
Figure 5-7

Lower South Fork Watershed

Lands Available for Scheduled Timber Harvest

Klamath National Forest

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



Late-Mature and Old-Growth Seral Stages

Mid-Mature Seral Stage

Pole and Early-Mature Seral Stages

Shrub/Forb Seral Stage

Harsh Sites (Gray Pine and Canyon Live Oak with Scattered Conifer Vegetation Communities, and Other Vegetation Communities on Soil Survey Site Class 7)

National Forest Lands Not Available for Scheduled Timber Harvest (Wilderness, LSR, Riparian Reserve, and Special Habitat)

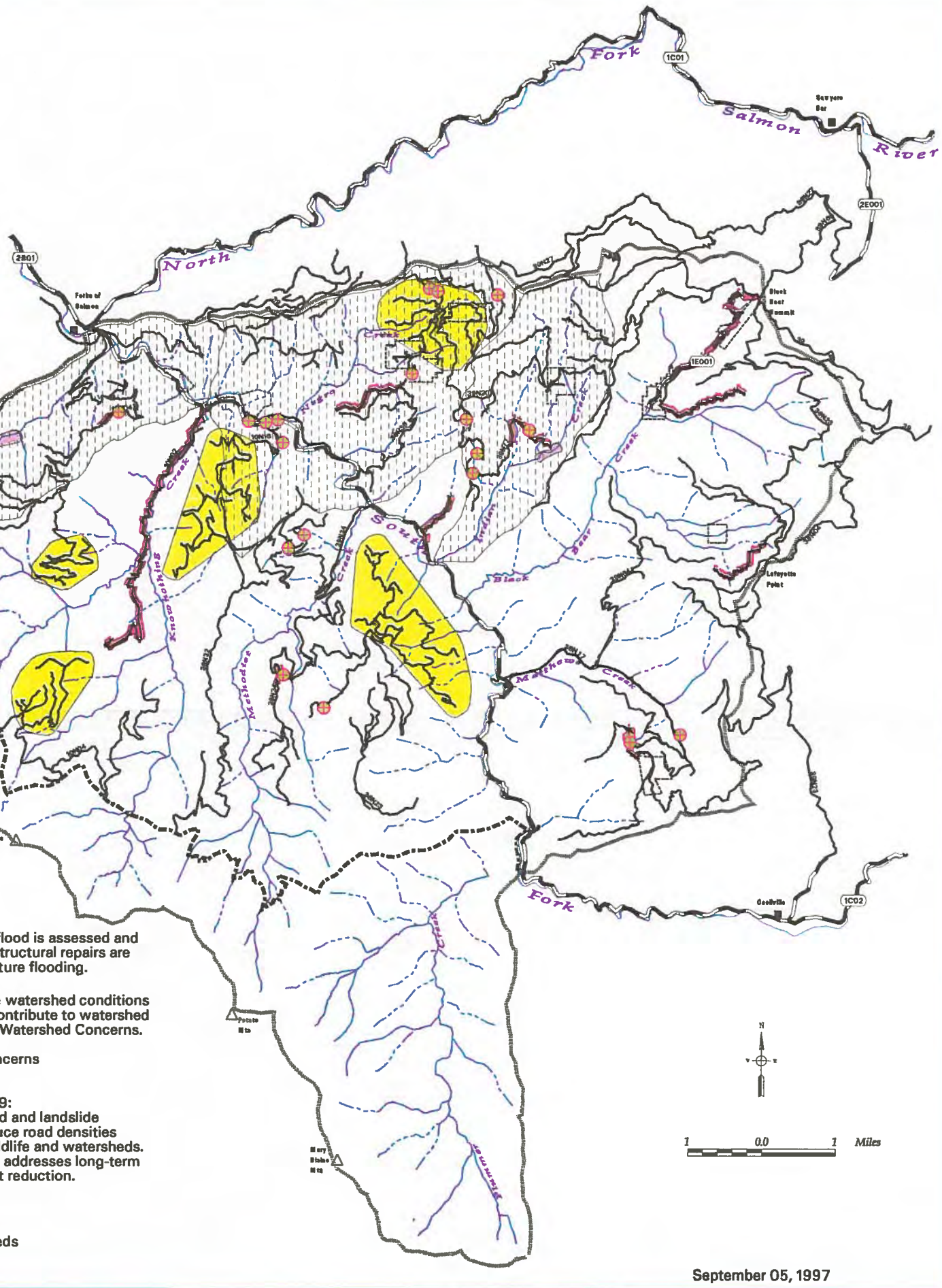
Private Land

September 05, 1997

Figure 6-1

Lower South Fork Watershed

Management Opportunities (1 of 4)



Private Land Boundary

Wilderness Boundary

County Road

Forest Road

Perennial Stream

Intermittent Stream

Opportunity 1:
Road damage from 1997 flood is assessed and repaired as appropriate. Structural repairs are made more resistent to future flooding.

Opportunity 4:
Design projects to improve watershed conditions or, at a minimum, do not contribute to watershed degradation in Areas with Watershed Concerns.

Areas with Watershed Concerns

Opportunities 2, 7, 28 & 29:
Identify & treat known road and landslide erosion problems, and reduce road densities to minimize impacts on wildlife and watersheds. Ensure transportation plan addresses long-term maintenance and sediment reduction.

High Road Density Areas

Landslide Stabilization Needs

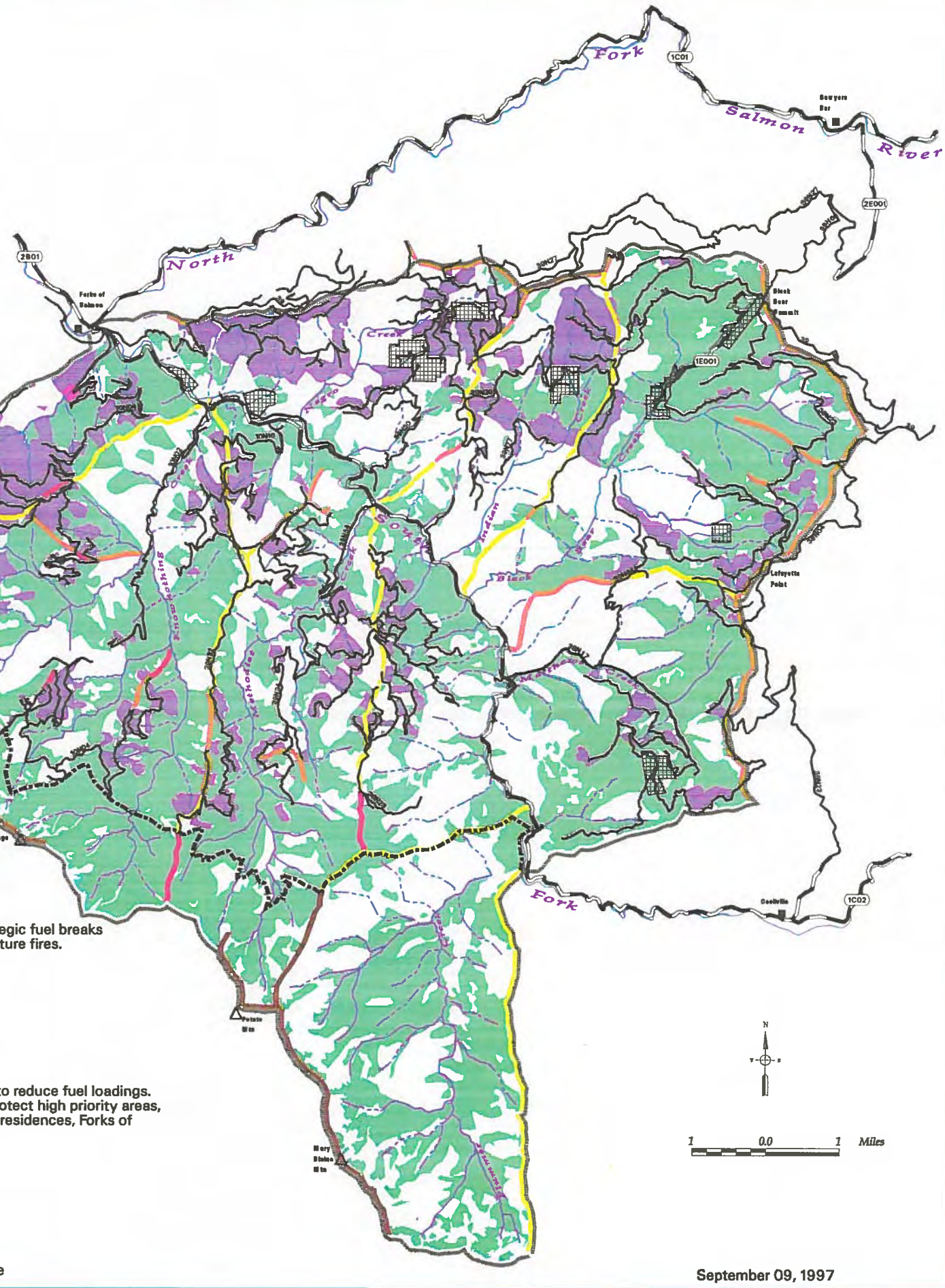
Road Restoration Needs

September 05, 1997

Figure 6-2

Lower South Fork Watershed

Management Opportunities (2 of 4)

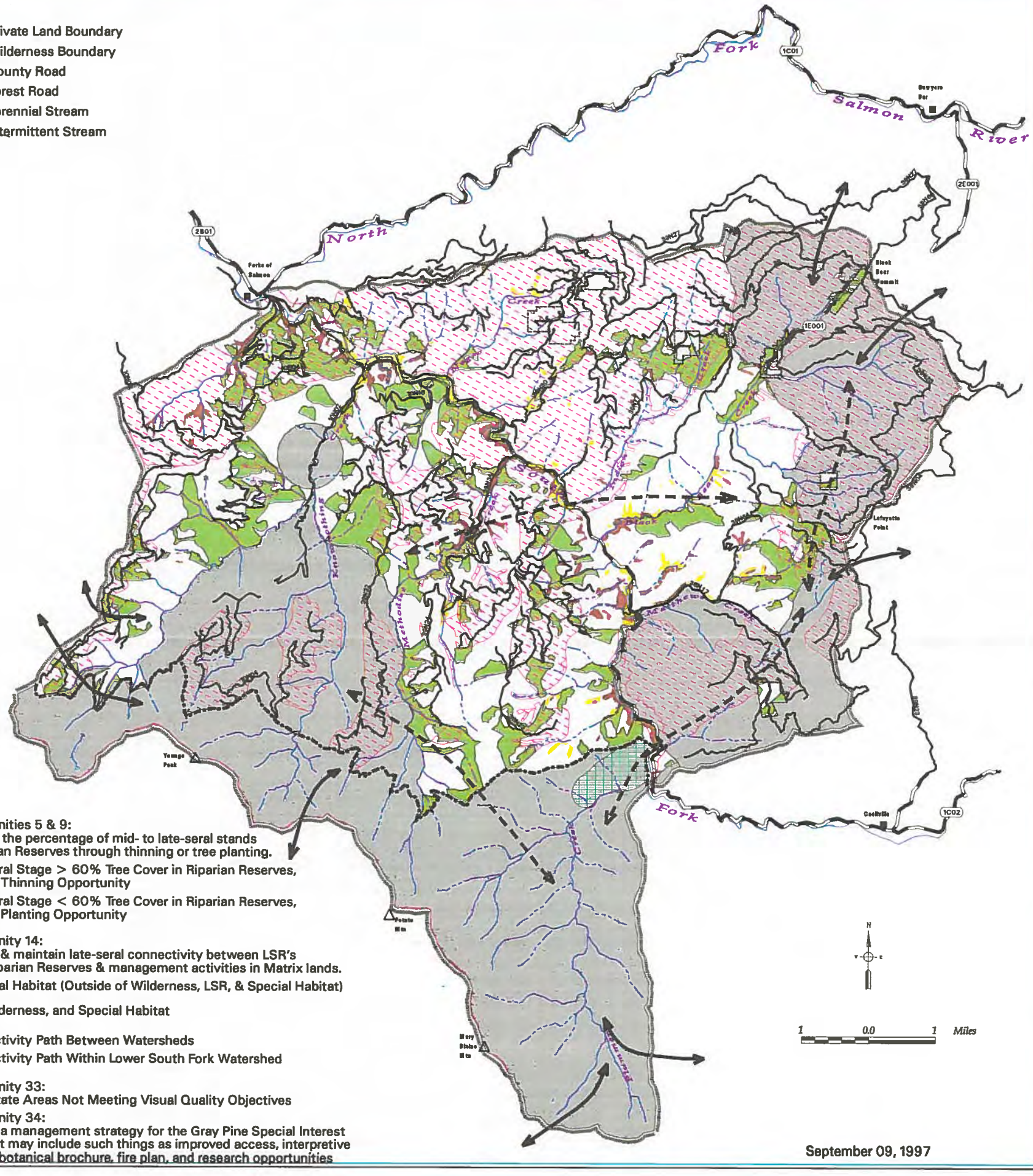


September 09, 1997

Figure 6-3

Lower South Fork Watershed

Management Opportunities (3 of 4)



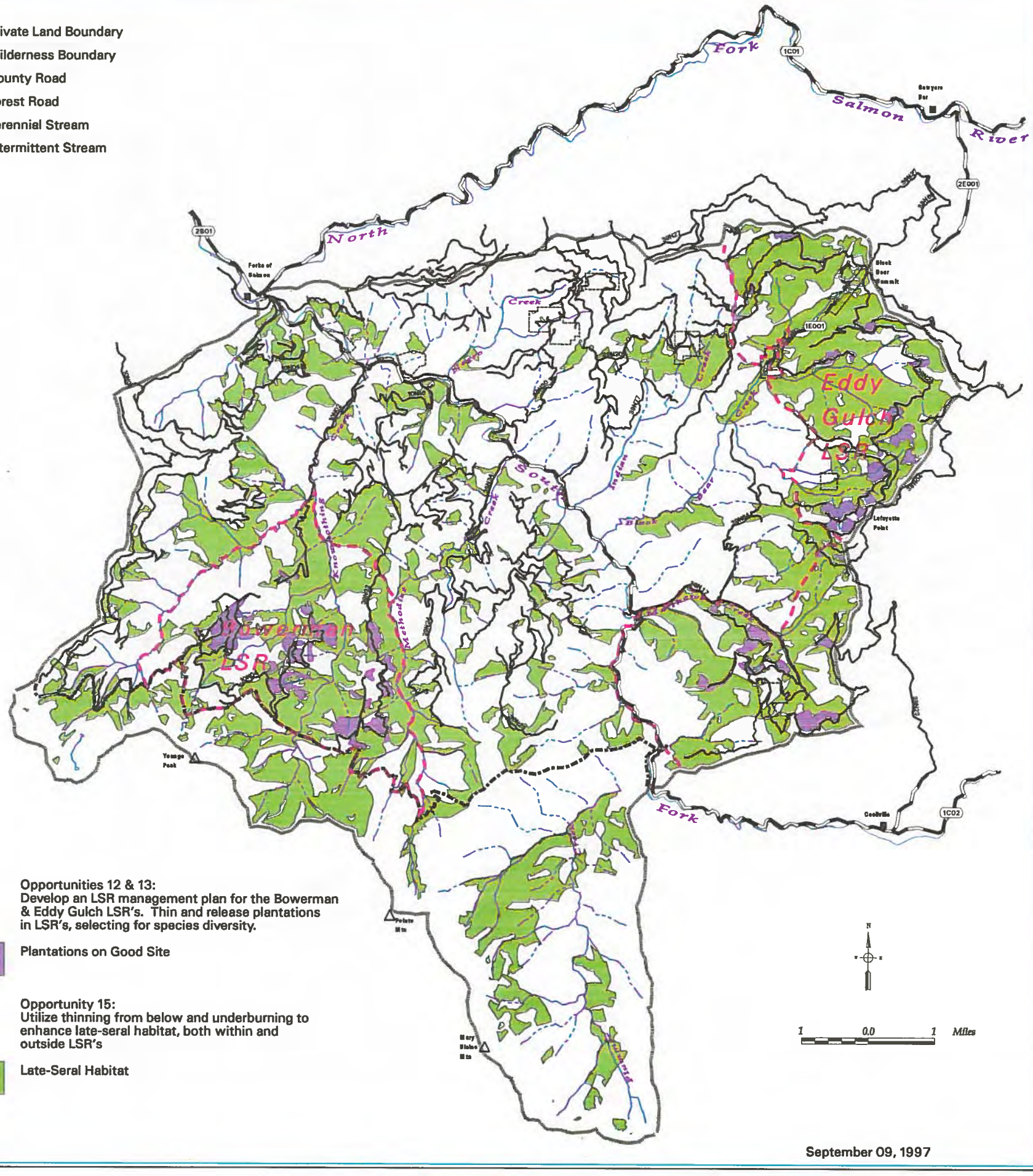
September 09, 1997

Figure 6-4

Lower South Fork Watershed

Management Opportunities (4 of 4)

Private Land Boundary
Wilderness Boundary
County Road
Forest Road
Perennial Stream
Intermittent Stream



Opportunities 12 & 13:
Develop an LSR management plan for the Bowerman & Eddy Gulch LSR's. Thin and release plantations in LSR's, selecting for species diversity.

Plantations on Good Site

Opportunity 15:
Utilize thinning from below and underburning to enhance late-seral habitat, both within and outside LSR's

Late-Seral Habitat

N

1 0.0 1 *Miles*

September 09, 1997