United States
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of Agriculture

Forest Service
Pacific
Northwest
Region

1996

CHETCO RIVER WATERSHED ANALYSIS

ITERATION 1.0

I have read this analysis and it meets the Standards and Guidelines for watershed analysis required by an amendment to the Forest Plan (Record of Decision dated April 1994).

SIGNED _____ DATE 4/24/96

District Ranger
Chetco Ranger District
Siskiyou National Forest

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Introduction

The Chetco River Watershed Analysis was initiated to obtain and interpret information on the watershed. This information will be used to guide resource management. It will also be used in future project analysis to ensure that Aquatic Conservation Strategy Objectives and other Standards and Guidelines contained in the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (ROD, 1994) will be met.

The watershed analysis was completed by an interdisciplinary team using the six step process outlined in *Ecosystem Analysis at the Watershed Scale (Version 2.2, August 1995)*. The watershed analysis has the following components: the aquatic ecosystem, the riparian ecosystem, the terrestrial ecosystem, and the social aspects of the watershed. These components are separated in the watershed analysis report; however, in the analysis process they are very much interrelated.

This watershed analysis report contains the summary, the narratives, and the appendices. The narratives cover the same topics as the summary, but with greater detail. The appendices provide supporting detailed information to the analysis report.

Chetco River Watershed

The Chetco River watershed is approximately 225,000 acres or 351 square miles in size. The Chetco River mainstem is 56 miles long with the headwaters and the first 28 miles of the mainstem in the Kalmiopsis Wilderness. The Chetco empties into the Pacific Ocean between the towns of Brookings and Harbor (Figure 1). The elevations of the watershed range from sea level to 5098 feet at Pearsoll Peak. The watershed is located entirely in Curry County in Southwest Oregon. Seventy-eight percent of the watershed is Siskiyou National Forest lands. Four percent is Bureau of Land Management and State of Oregon lands, and eighteen percent is in private ownership. The private ownership is almost completely in the lower portions of the watershed. Private land is used for residential purposes primarily in the vicinity of the coast and the lower mainstem, some grazing and small woodland use, and industrial forestry.

The Siskiyou National Forest portion of the watershed has been allocated to different management areas by the Siskiyou Land and Resource Management Plan as amended by the ROD, 1994 (Figure 3).

Table 1.

Allocations	*Management Areas*	*Acres*
Wilderness	1	99,513
Wild River	2	903
Botanical	4	1,254
Backcountry Recreation	6	5,139
Supplemental Resource	7	1,897
Late-Successional Reserves	8	34,695
Special Wildlife Sites	9	1,971
Riparian Reserves	11	5,095
Retention Visuals	12	6
Partial Retention Visuals	13	5,234
Matrix	14	15,685
	Total National Forest Land	**175,633**
	Total Non-National Forest Land	**49,065**
	Total Acreage	**224,698**

Other Documents Providing Information on the Chetco Watershed

The Siskiyou Land and Resource Management Plan (1989) and the ROD (1994) provide information and overall direction for the portion of the Chetco watershed on Siskiyou National Forest. Portions of the North Chetco and South Chetco Late-Successional Reserves (LSR) comprise the LSR acreage indicated in the table above. The Southwest Oregon LSR Assessment provides information on these LSR's.

The Chetco River has been designated a National Wild and Scenic River and a State Scenic Waterway. The Outstandingly Remarkable Values under the federal designation are recreation, fisheries, and water quality and quantity. The Environmental Assessment and River Management Plan for the Chetco Wild and Scenic River, signed July 23, 1993, provides information on the the resources of the river in the Wild and Scenic corridor of the Siskiyou National Forest.

Additional information on the resources of the river can be obtained from the Chetco River Assessment prepared by the Chetco Watershed Council in March, 1995. In addition to the mainstem, this document provides information on Jack, Joe Hall, Ferry and Emily Creeks and the North Fork Chetco River. The Myrtlewood Resource Area, Coos Bay District, of the Bureau of Land Management is planning to complete a watershed analysis for the North Fork Chetco watershed by October, 1996. In this watershed analysis, there are data gaps in information for the portions of the watershed not managed by the U.S. Forest Service (Subwatersheds 4X, 4N, and portions of 4L).

Watershed Analysis Summary

The following section summarizes the information obtained in the watershed analysis. Following the vicinity, subwatershed, and management area maps, summary tables for the aquatic, riparian, terrestrial ecosystems and the social aspects of the watershed are presented. Key questions concerning the various resources, the existing condition, objectives, priority locations, information needs, and management opportunities are described. The summary concludes with the Key Findings for the Chetco River Watershed Analysis.

Figure 1.

Chetco River Watershed Vicinity Map

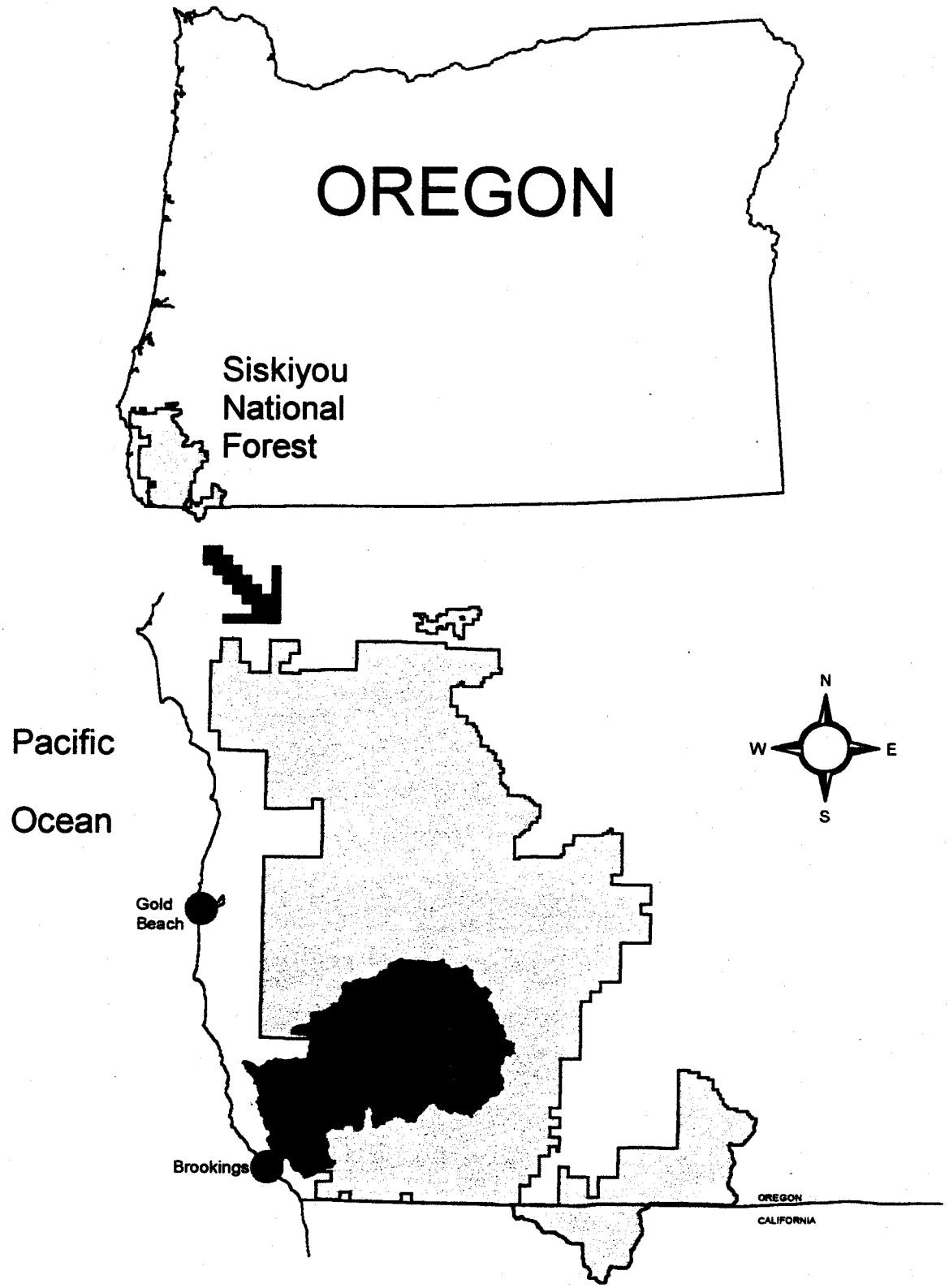


Figure 2.

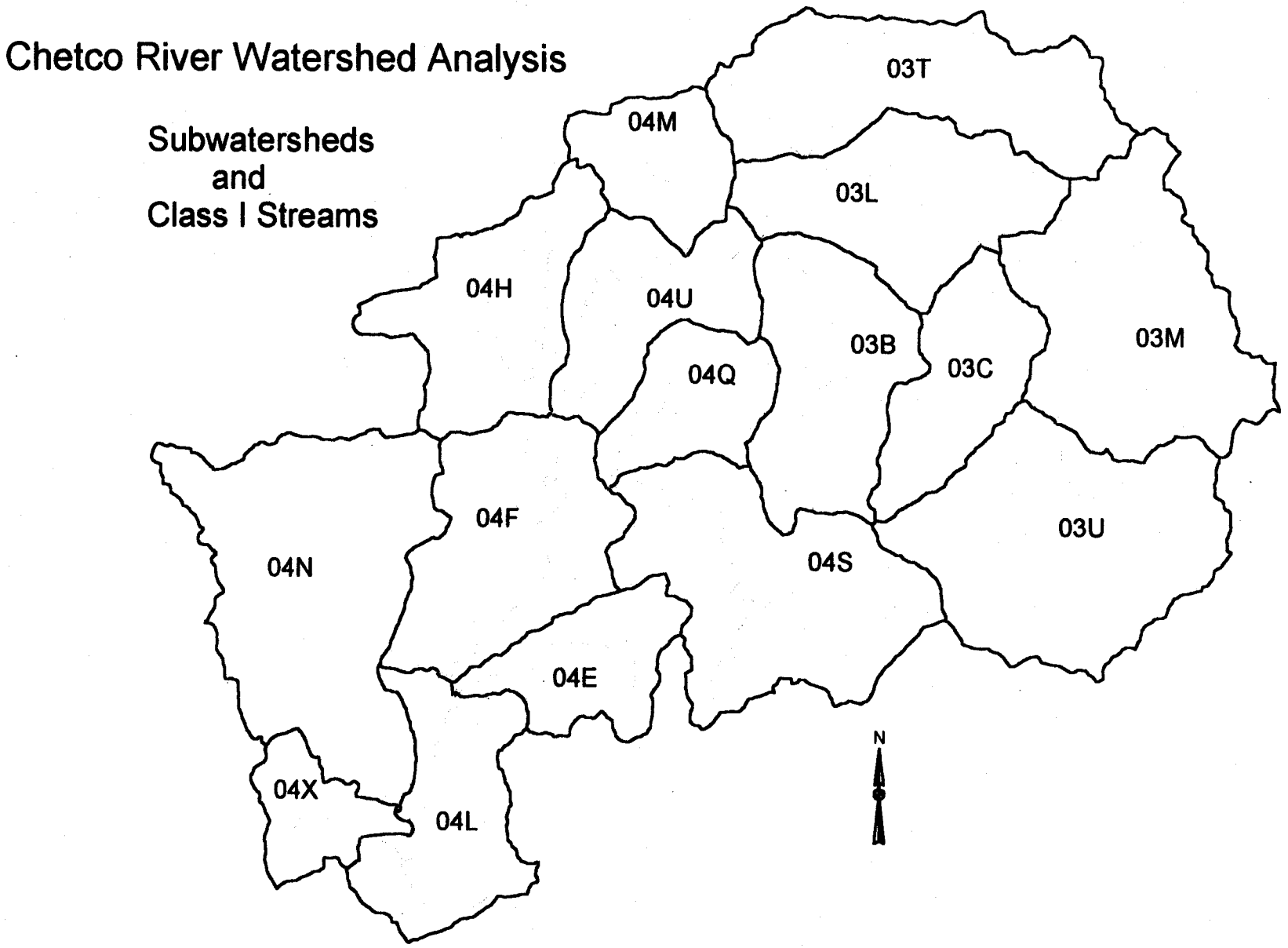
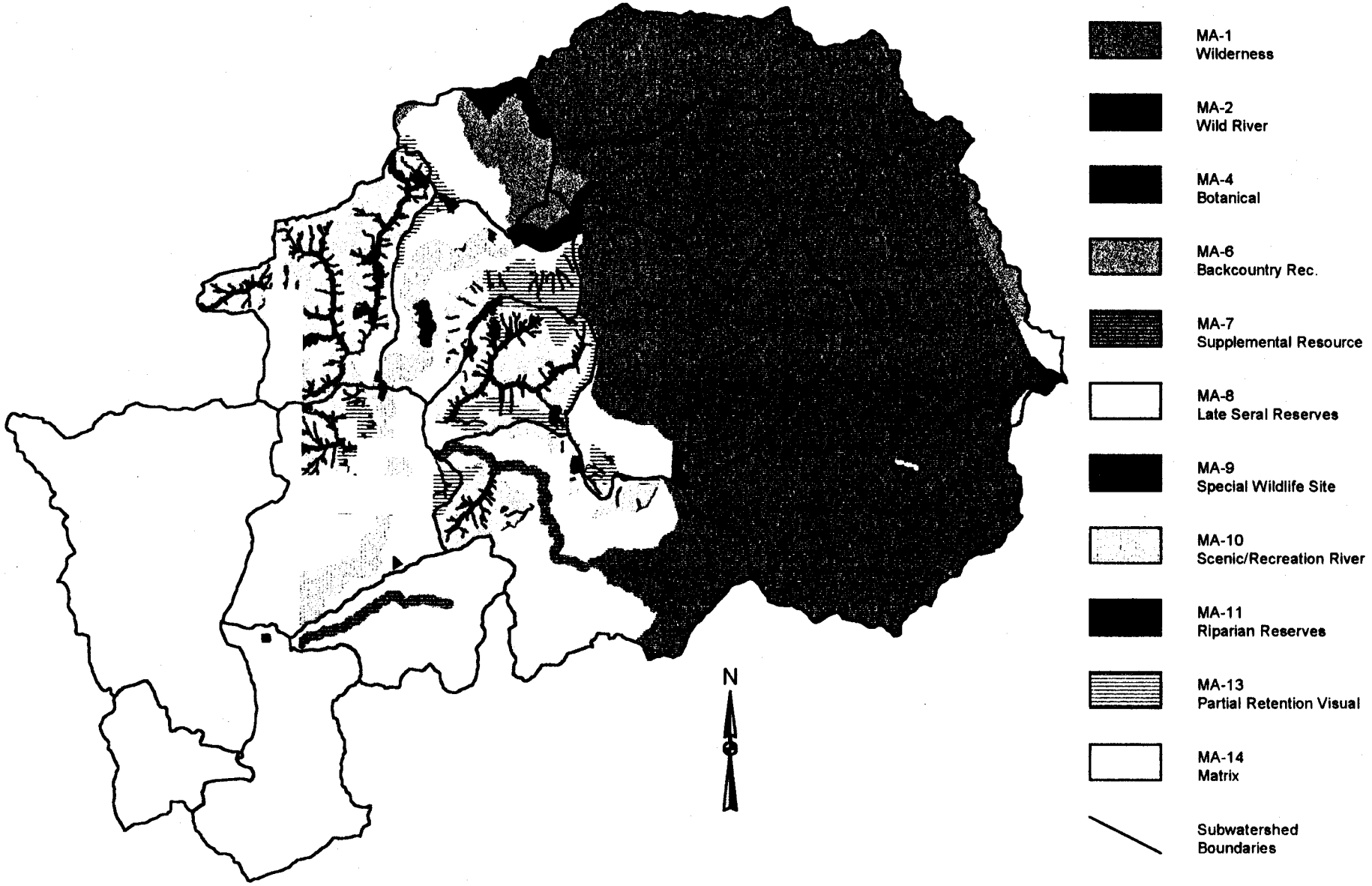

Chetco River Watershed Analysis
Subwatersheds
and
Class I Streams
03T
04M
03L
04H
04U
03B
03C
03M
04Q
04F
04N
04S
03U
04E
04X
04L
N

Figure 3.

Chetco River Watershed Analysis

Management Areas



KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What sediment delivery processes are dominant within the watershed and where do they occur?	**Naturally occurring inner gorge landforms** provide sediment and large wood to streams. Naturally occurring landslides provide risks to roads and trails in these areas. **Older Roads** have triggered debris flows when constructed on steep slopes with relatively large fills. **Roads with switchbacks** are associated with a high incidence of landslides, often caused by uncompacted road fill, drainage diversion, or undercut channels from road drainage erosion. The risk of future debris flows and landslides from these types of roads continues to exist. **Roads in the Wilderness** used to access mining claims lack design features to prevent erosion. **Fuel has been accumulating** due to fire suppression. Higher intensity fires could result in these areas which would be more destructive to vegetation. Root strength would be reduced and in areas of steep slopes with thin soils, debris avalanches are more likely to occur.	Maintain and restore the natural sediment regime and protect water quality.	**Inner gorges areas** are shown in Figure 5. Priority areas include the mainstem Chetco, North Fork and Mineral Hill Fork of Eagle Creek, lower North Fork Chetco, South Fork Chetco gorge and upper South Fork, Red Mountain Creek, and West Coon Creek. Watershed analysis areas where there are **road treatment priorities** are listed in Appendix A. Priority locations for treatment of **mining roads** are where the roads cross streams or headwalls, or concentrate runoff. Priority locations for **fuel accumulation treatment** include areas adjacent to steep slopes in Tincup, Boulder and Box Canyon watersheds.	**Inventory roads** to upgrade existing culverts and ensure drainage. Prioritize roads for stabilization, reconstruction, decommissioning and for FERM patrol. Inventory headwalls, unstable fills, drainage diversion potential, and drainage spacing. Include **mining roads** in these inventories and prescribe maintenance and reconstruction measures to be included in mining plans of operations. Ensure **future roads and trails** are designed to minimize sediment and protect water quality. Treat **fuel accumulations** in priority areas in the wilderness to reduce the risk of debris avalanche.
What large wood delivery processes are dominant within the watershed and where do they occur?	Large conifers are lacking in some riparian areas due to past timber harvest and natural processes.	Supply amounts and distributions of large wood sufficient to sustain physical complexity and stability.	Large conifers are lacking where riparian areas are mapped as pioneer or early seral stages (Figure 7), in ultramafic areas (Figure 4), and on debris avalanche chutes on thin soil slopes (Figure 6).	Where debris flows are likely, redesign crossings to allow wood transport. Plant conifers. Reduce competition from hardwoods. Thin overstocked young conifers. Encourage private landowners to plant and protect riparian vegetation.
How often and for how long is flow in the Chetco River at the City of Brookings intake below the 80 cubic feet per second (cfs) estimated by Oregon Department of Fish and Wildlife (ODFW) to be minimum for fish habitat needs?	Stream flow has dropped below 80 cfs in 11 of the past 25 years, for a duration of two to 77 days per year.	Cooperate with ODFW, City of Brookings, Chetco Watershed Council and private landowners in working on shared beneficial use.	Not Applicable.	Share this information with ODFW and Chetco Watershed Council.
In which subwatersheds have timber harvest and road construction altered hydrologic patterns?	Watersheds with high levels of both harvest and roading are most likely to have been affected.	Restore natural hydrologic patterns where practicable.	Subwatersheds 04F, 04L, and 04X (Chetco River, mouth to Eagle Creek); and Watershed Analysis Areas 03B07W, 04E06W, 04Q01F, 04S02W, 04S05W, and 04S09W (see Appendix A).	Plant and/or thin conifers to improve the condition of Riparian Reserves. Stabilize or decommission roads. Improve stream crossings and/or road drainage.

AQUATIC ECOSYSTEM

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
Have timber harvest and road construction affected stream channel morphology, structure elements (large wood), or sediment transport and deposition processes?	Watersheds with high levels of harvest and roading are most likely to have been affected. Hydrologic effects include increases in peak flows which scour stream channels, destabilize stream banks and transport large wood and sediment out of streams.	Prevent future changes to stream channels and riparian processes from management activities. Complete restoration activities at sites where processes and conditions are currently being degraded.	Panther Creek, West Coon Creek, Quail Prairie Creek, Emily Creek, and face drainages along the south side of the Chetco River below Long Ridge. Primary fish production stream reaches and their tributaries.	Plant and/or thin conifers to improve the condition of Riparian Reserves. Stabilize or decommision roads. Improve stream crossings and/or road drainage.
Have human activities contributed to warm stream temperatures? If so, where and what restoration opportunities are there?	Timber harvest has reduced shade along some streams. Spread of Port-Orford-cedar (POC) root disease may affect the upper Chetco mainstem in the future.	Restore and protect streamside shade.	Subwatersheds 04F, 04L, and 04X (Chetco River, mouth to Eagle Creek), and 04H (Eagle Creek and its tributaries).	Evaluate current condition of riparian vegetation and apply silviculture treatment where planting or thinning, particularly conifers, would be appropriate.
Where have human activities degraded fish habitat and where do they have the potential to degrade fish habitat?	There is high quality habitat along 155 miles of stream which produce coho, chinook, steelhead, rainbow, and cutthroat trout (Figure 9). Some lower river habitat has been degraded by human activity.	Improve degraded habitat. Maintain high quality habitat. Protect spatial and temporal connectivity.	Known sites for improvement exist on Mill Creek, Emily Creek, Dry Creek, South Fork, Quail Prairie Creek, West Coon Creek, and Eagle Creek.	Restore large wood sources, increase instream cover, prevent sediment delivery from human activities. Continue contacts with other agencies, landowners and Chetco Watershed Council regarding habitat protection and land management activities.

RIPARIAN ECOSYSTEM

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What are the riparian processes in the watershed?	**Conifer forest** is the most abundant riparian type in the watershed. Most human impacts have occurred in the conifer type and it is also the most important riparian type for wildlife migration. **Hardwood riparian** stands occur when water is limiting or the fire regime favors them. These stands most frequently surround seasonal streams and are more susceptible to surface erosion. **Meadow riparian** areas are limited to the margins of scattered prairies and are characterized by open canopies. Most have been encroached upon by conifer trees. **Ultramafic riparian** areas support a specialized, sparse flora and Port-Orford-cedar is a critical component. The fragile drainage patterns are sensitive to ground disturbances.	Preserve or restore riparian processes.	Where activities have altered riparian processes. Where management activities are proposed in or adjacent to Riparian Reserves.	Restore altered riparian processes. Implement activities within Riparian Reserves or adjust Interim Riparian Reserve boundaries where appropriate. This can only occur when riparian processes are preserved and Aquatic Conservation Strategy objectives and wildlife dispersal objectives are met. Activities and/or adjustments are more likely to occur in intermittent Riparian Reserves due to the high variability of these stream processes.

TERRESTRIAL ECOSYSTEM

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What are the special and unique habitats in the watershed and what processes are affecting them?	There are 7,629 acres of unique habitats which include meadows, rock bluffs, bogs, springs, ponds, lakes, and a diversity of pines and hardwoods. Open meadows and open ultramafic areas with Jeffrey pine savannahs are being reduced in size by tree encroachment due to lack of fire. Bogs, springs, ponds, and lakes are filling in with silt and vegetation at a slow rate. There are concentrations of Brewer spruce at Big Craggies and Babyfoot Lake. The northernmost stands of coast redwood lie along the lower Chetco River.	Maintain and/or restore open meadows, serpentine areas, pond sites, and redwood stands.	Open meadows occur mainly on ridgetops in the middle of the watershed. Open water areas are rare outside of the Wilderness. Non-Wilderness Special Wildlife Sites (MA-9) include meadows, serpentine/pine areas, springs, ponds, and lakes, and redwood stands at Redwood Nature Trail and Snaketooth Butte.	Girdle, cut, and/or remove encroaching trees in bogs, springs, meadows and serpentine areas. Burn meadows and open serpentine areas. Consider cleaning out silt/overgrown vegetation from open water sites. Thin understory or redwoods at Snaketooth Butte to mimic natural disturbance. Promote development of old-growth redwood in Late-Successional Reserve.
Where have snags and large down wood been depleted in the watershed?	Large hardwoods and conifers are lacking or at reduced levels in stands of early or pioneer seral habitat. Roughly 39 percent (88,322 acres) of the watershed is in these seral stages. Included in this is 14,810 acres of managed stands with few or no snags and 1,625 acres of managed stands with one or two snags per acre. Generally, private lands within the watershed lack snags and down wood. There are low amounts of these components in natural stands due to past fires, soils, and plant series.	Manage for large trees, large down wood, and snag components of stands in the long-term throughout the non-wilderness portion of the watershed. Manage for recruitment of snags and large down wood in natural stands to meet cavity-dependent species requirements.	Areas adjacent to managed and natural stands lacking large trees, large down wood, and snags, especially in the following subwatersheds: Mineral Hill (04H), Mislatnah (04M), Upper Chetco (04U), Quail Prairie (04Q), Middle Chetco (04F), South Fork Chetco (04S) and Lower Chetco (04L). Coordinate with riparian large wood needs in Middle Chetco (04F), Eagle Creek (04H), and Lower Chetco (04L) subwatersheds.	Create snags and down wood in areas adjacent to managed stands for the short term. Recruit snags and down wood within managed stands in the long term by selecting trees with larger, faster growth and/or some defect in thinning operations.
How is road density affecting habitat capability for wildlife species?	The overall road density in the non-wilderness portion of the watershed is 2.6 miles per square mile (mi/sq mi) which is greater than the desired 2.0 mi/sq mi for wildlife habitat capability. Four of 10 subwatersheds are greater than 2.0 mi/sq mi and may reduce habitat capability by increasing harassment levels and possibly poaching.	Reduce harassment or disturbance to wildlife by vehicular traffic.	Subwatersheds and Watershed Analysis Areas (WAAs) with greater than 2.0 mi/sq mi road densities. Priority subwatersheds include Middle Chetco (04F), Lower Chetco (04L), North Fork (04N), and Upper Chetco (04U).	Maintain or reduce open road densities to 2.0 mi/sq mi in subwatersheds and WAA's.

TERRESTRIAL ECOSYSTEM

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What is the status of Proposed, Endangered, Threatened, Sensitive (PETS) or Watch Species, both Flora and Fauna?	Several sensitive species are present throughout the watershed. Limited surveys have been conducted within the Kalmiopsis Wilderness. PETS plant species are limited mainly to Botanical Areas, and serpentine sites in the Wilderness. Some populations of *Kalmiopsis leachiana* are declining, especially in the area between Taggart's Bar and Slide Creek areas. Spotted owls have been recorded at 17 sites. Most activity centers contain less than 40 percent habitat suitability within 1.3 miles. Stands occupied by marbled murrelets have been detected within six subwatersheds. Del Norte salamander sites and habitat are less common in this watershed compared to others. Red-legged frogs and pond turtles have been documented on the mainstem of the Chetco River. Common and California mountain kingsnakes have been documented in the Wilderness. Plecotus (big-earred bats) and wolverines are suspected to occur since habitat is present. Bald eagles have been documented on the Chetco River. Other PETS wildlife species are not expected to occur in the watershed due to lack of habitat.	Maintain or increase populations of sensitive plant and animal species within the watershed. Increase habitat capability for some species (i.e. spotted owl) within the late successional reserves. Complete sensitive species surveys where they have not been conducted or are lacking.	Known sites for sensitive species. Known and potential habitat for spotted owls, marbled murrelets, Del Norte salamanders. Cabin sites and mines which may provide habitat for bats .	Develop potential spotted owl habitat into suitable habitat for activity centers with less than 40% habitat suitability. Protect and maintain known sensitive species sites and habitat. Maintain or improve open water habitat for frogs, turtles, and bats. Install, retain or improve structures for bat roosting habitat. Monitor declining populations of *Kalmiopsis leachiana*.
What stands need treatment to improve interior forest and late-successional habitat?	Several managed and natural stands are overstocked. Competition from hardwoods and conifers is slowing development of younger stands. Older forest and interior forest habitat is fragmented into small patch sizes, causing some patches not to function as interior forest habitat due to edge effect. There are only eight patches of interior forest habitat with a minimum core area size of 200 to 300 acres. The largest patch of interior forest habitat is 1300 acres.	Increase patch sizes of older forest and interior forest habitat by accelerating growth and development of adjacent early-mid seral stands into late seral.	Areas in proximity to older forest and interior forest habitat patches outside of the Wilderness. Managed and overstocked natural stands and Late-Successional Reserves. Spotted owl activity centers with less than 40 percent suitable habitat.	Thin and release younger stands to accelerate development of larger conifers and hardwoods. Prescribe underburning in and adjacent to older stands to reduce competition and fuels in those stands.

KEY QUESTION: How are non-native species affecting native species within the watershed?

TYPES OF NON-NATIVE SPECIES	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
Noxious weeds	Noxious weed species are aggressive and can out-compete and displace native vegetation. Scotch broom, French broom, gorse, bull thistle, and tansy ragwort have been introduced into the watershed along roads. Some weeds are spreading along roads, while others are present but are not spreading. French broom is present on the 1107 and 1107.550 roads and may be spreading. Gorse is present at the low water bridge site on private land. Wheatgrass is present at the Tin Cup Trailhead and may spread up Silver Fire tractor line.	Reduce spread and eliminate risk of further spread on roads.	Meadows: high risk for some weeds such as thistle. French broom on 1107 and 1107.550 roads. Thistle, tansy, and scotch broom along roads. Wheatgrass at Tin Cup Trailhead. Gorse at low water bridge on private land.	Cut, pull, and burn noxious weeds. Close selected roads to motorized vehicles. Clean equipment before entering Forest and after working in infested areas. Contact private landowners about gorse treatment at low water bridge.
Port-Orford-cedar root disease	Port-Orford-cedar occurs in moderate to high concentrations in the upper portion of the watershed, associated largely with wet sites on ultramafic terrain in the wilderness. The Mislatnah, Moores, Red Mountain, Mineral Hill Fork and Eagle Creek drainages also have riparian populations in the mid-watershed. The associated root disease, *Phytophthora lateralis*, has been introduced into the Little Chetco and Mineral Hill Fork subwatersheds in the last five to six years.	Reduce rate and risk of spread, especially to heads of uninfested drainages. Maintain or restore healthy Port-Orford-cedar component in riparian reserves.	Chetco Rim in the Wilderness; Mislatnah Creek/Road 1376; Red Mountain/Vulcan Lake trailhead/1909 road; Chetco Pass/ Sourdough Flat/087 road.	Cut Port-Orford-cedar (POC) from edges of roads. Close selected roads to motorized traffic. Clean equipment before entering Forest and after working in infested areas. Restrict high risk uses to dry season. Use disease-free water in firefighting and other activities. Place rock surfacing on infested road sites. Plant and release POC on lower risk riparian microsites. Educate Forest users about POC issues, especially regarding backcountry sites. Enforce road closures.
Wild turkey releases	The Oregon Department of Fish and Wildlife (ODFW) started releasing wild turkeys in the Lower Chetco subwatershed on private land adjacent to National Forest in 1993. In 1994 and 1995, additional releases occurred on private land within the South Fork Chetco and Quail Prairie subwatersheds. These animals are not native to southwestern Oregon. Populations are spreading onto National Forest lands. Effects on existing endemic species, such as grouse and quail, are unknown at this time.	Protect existing endemic species populations, such as grouse and quail.	Lower Chetco, South Fork Chetco, and Quail Prairie subwatersheds.	Coordinate with ODFW on the monitoring of the spread of turkey populations and the effects on quail and grouse populations and other native species. Possibly remove introduced populations and relocate off National Forest lands.

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What is the fire history and the future role of fire in the watershed?	The past natural range of conditions is poorly understood, although there is evidence which suggests that multiple, low intensity underburns may have been more prevalent than stand replacement fires. Since 1910, 40-50% of the watershed has burned once, 10-15% twice, and 1-3% three times. Wildfire intensities have affected vegetation and habitats either by stand replacement events, such as Silver Fire, by habitat maintenance, such as meadows, or by minor manipulations, such as small lightning fires. The use of prescribed fire has been limited to the treatment of harvest slash, and to a small degree, isolated habitat improvement projects. A greater use of prescribed natural fire may occur in the future in the Wilderness and Late-Successional Reserve (LSR) with the completion of the Kalmiopsis Prescribed Natural Fire Plan and the Southwest Oregon LSR Assessment.	Maintain the natural processes of fire in the ecosystem. Determine where fire exclusion is contributing to the degradation of certain plant species and unique habitats. Determine specific fire intensity levels that would provide these benefits.	Kalmiopsis Wilderness and surrounding LSR, special and unique habitats, fuels hazard reduction as needed, and late-successional habitat.	Identify areas and habitats where fire would provide a benefit. Use prescribed fire as a management tool for habitat maintenance or manipulation. Study results of use of fire in maintenance of habitats. Non-suppression or light suppression versus control of fire in areas that would benefit.
Under what conditions would a prescribed natural fire be allowed to burn outside the Kalmiopsis Wilderness into adjacent Late-Successional Reserve?	The Southwest oregon Late-Successional Reserve (LSR) Assessment concludes the natural processes of fire are missing from the LSP ecosystem. The Assessment indicates that using prescribed fre can benefit natural processes, and can reduce the hazard of stand replacement fires in the LSR. The current Prescribed Natural Fire (PNF) Guidelines for the Kalmiopsis does not allow a PNF to burn from the wilderness into LSR. A PNF which escapes the wilderness boundary will be declared a wildfire and the appropriate suppression response implemented as defined by an Escaped Fire Situation Analysis.	Where appropriate, utilize prescribed fire in the wilderness to protect the surrounding LSR. Allow fires to burn within the wilderness, while maintaining core areas of late-successional habitat within the wilderness. Allow fires to burn in the LSR only after PNF plans for LSR are completed.	Core areas of late-successional habitat within the Wilderness, including Boulder Creek, Coon Creek, and South Fork Chetco drainages. LSR adjacent to the Wilderness.	Identify specific areas and conditions where prescribed fire may be used for the purpose of preventing or reducing the probability of a stand replacement fire in the LSR. This could include having a low intensity, prescribed natural fire burn in the LSR. Prescribed fire from management ignitions shall be allowed in wilderness areas only to reduce the risks and consequence of wildfire within or escaping from wilderness.

SOCIAL ASPECTS

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What were the prehistoric human uses of the watershed?	Archeological investigation indicates the permanent use of riverine areas and the seasonal use of the rest of the watershed for hunting and gathering foodstuffs, basket making, woodworking, etc. Trade and travel routes traverse the watershed with associated short term traveling camps. Evidence of stone tool manufacture, vision quest sites and village sites exist in the watershed.	Identify and protect cultural resources.	Meadow areas, major dividing ridge tops, chert outcrops and riverine terraces on all major watercourses.	Conduct cultural resource surveys prior to all ground disturbing projects. Implement a monitoring strategy for project activities that will ensure the integrity and protection of any potential heritage resource sites. Identify, document and evaluate any discovered sites for the Forest inventory and possible inclusion in the National Register of Historic Places. Suitable cultural resource properties may be interpreted for recreational use and the educational benefit of the general public.
What were the historic human uses of the watershed?	Historic elements represent early mining and prospecting endeavors, early settlement, the works of the Civilian Conservation Corps (CCC) and early Forest administration. Travel routes are an important aspect of the cultural fabric. They often follow aboriginal paths or were established during the mining, Forest administration or CCC periods. Many of these routes evolved into administrative and recreational roads and trails. The Siskiyou National Forest's contribution to the area's history is represented by evidence of Forest improvements and facilities, and evidence of commodity production, primarily timber sales.	Identify and protect cultural resources.	Meadow areas, some which contain early settlement structures and remains. Sites containing Forest Service administrative facilities such as lookouts, historic camps and guard stations. All existing trails and trail segments including those former trails located on the historic Siskiyou National Forest maps.	Conduct cultural resource surveys prior to all ground disturbing projects. Implement a monitoring strategy for project activities that will ensure the integrity and protection of any potential heritage resource sites. Identify, document and evaluate any discovered sites for the Forest inventory and possible inclusion in the National Register of Historic Places. These historic sites and features offer an opportunity to raise the public awareness level regarding cultural resources. Suitable cultural resource properties may be interpreted for recreational use and the educational benefit of the general public.
Does the watershed contain any culturally significant traditional use areas?	No evidence suggests that the area within the watershed is presently used for traditional activities by local Indian groups. The three local recognized tribes consulted (Tolowa, Karok, Siletz) did not provide additional information regarding traditional use in the watershed.	Manage traditional use or religious sites in coordination with American Indian tribal groups. Recognized tribes will be contacted during the public involvement phase of project planning.	None known at this time.	If suitable cultural resource properties are found, there is an opportunity for partnership with the three recognized tribes in the development of recreational and educational programs for the public.

SOCIAL ASPECTS

KEY QUESTION: What are the recreational uses in the watershed?

AREAS OF RECREATION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
Wilderness and Wild River	Recreation use in the Kalmiopsis Wilderness and Wild Chetco River is light and is expected to increase slightly while remaining below capacity. Most trails are for hikers with some horse/pack stock use. Completion of the Tincup Trail would provide a loop opportunity and help disperse use from the river area near Slide Creek. Mining roads and operations, mine patent requests, and road access to private land inholdings are management concerns for the Wilderness and Chetco River.	Provide opportunities for solitude and non-motorized, self-reliant recreation in a primitive setting.	All road access to mining claims and private property including gate near Chetco Pass; mining areas along the Little Chetco River and at Taggart's Bar; Tincup Trail; Slide Creek area; and Babyfoot and Vulcan Lakes.	Complete the construction of the Tincup Trail. Settle access disputes to private property within the Wilderness along the Little Chetco River. Evaluate the feasibility of reconstructing abandoned portions of the Upper Chetco Trail which parallels a mining road between Sourdough Flat and Slide Creek confluence.
Dispersed Land-Based Recreation	Land-based recreation includes hunting, dispersed camping, sightseeing, nature study and winter snow sports. Backcountry Recreation areas have low use. Facilities have yet to be fully planned or developed. Trails are limited especially for motorized/mechanized use. Dispersed facilities include: Packer's Cabin, Red Mountain Prairie, Onion Camp, Snaketooth Rifle and Pistol Shooting Areas.	Provide a range of recreation opportunities and facilities which meet the needs of the public and are appropriate with other management goals.	Packer's Cabin, Onion Camp, Red Mountain Prairie, Snaketooth Rifle and Pistol Shooting Areas.	Develop additional trail opportunities which may include motorized/mechanized use.
Scenic and Recreation River Use	The Chetco Wild and Scenic River Management Plan was completed in 1993. The river possesses "outstandingly remarkable values" for recreation related to Chinook salmon and steelhead fishing. The majority of recreation use occurs on or adjacent to the Recreation segment of the river. The River Management Plan implemented a "use allocation system" for boating which included a permit season, a carrying capacity standard, a monitoring procedure and a limitation on commercial use. In Fiscal Year 1995, a concessionaire operated the Little Redwood Campground and Redwood River Bar. The self-guided Redwood Nature Trail is highly used and managed in cooperation with the adjacent Riverview Trail in Loeb State Park. Dispersed camping and river activities occur at the South Fork Chetco, Miller, Nook and Redwood River Bars.	Provide a range of recreation opportunities and facilities which meet the needs of the public and are appropriate with other management goals.	All segments of the Recreation and Scenic Chetco River; Little Redwood Campground; Redwood Nature Trail; and South Fork Chetco, Miller, Nook, Redwood River Bars.	Complete a reconstruction proposal for the Little Redwood Campground. Complete a feasibility plan for development of South Fork Chetco recreation sites. Monitor river use on-site. Monitor use for Redwood Nature Trail.

KEY QUESTION: What commodities can be produced from the Chetco Watershed?

TYPES OF COMMODITY	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
Timber	Over 15,000 acres of managed stands occur on National Forest lands in the watershed. Timber opportunities are currently limited due to the abundance of hardwood stands; remote, unroaded stands in matrix; and the lack of mid-seral, overstocked conifer stands suitable for commercial thinning. Harvest opportunities associated with meadow enhancement exist in both matrix and Late-Successional Reserve (LSR). Salvage harvest is limited to the areas where stand-replacement disturbances have occurred or windthrow adjacent to large openings, or where there is a public hazard. Currently, this is limited to stands that have had windthrow damage.	Produce commercial timber while meeting Forest Plan objectives.	Matrix lands, overstocked stands (matrix or LSR), encroached meadows (matrix or LSR), stands needing treatment near interior forest to enhance late-successional habitat (LSR), roadside hazard trees (matrix or LSR), and areas of stand-replacement disturbance (matrix or LSR salvage).	Current estimates of opportunities for timber harvest include: 250 acres of commercial thinning in matrix, 1,500 acres of regeneration harvest in matrix (much of it hardwoods), and 500 acres of Late-Successional Reserve enhancement. There are some limited opportunities to salvage roadside hazard trees and dead or dying timber where windthrow has occurred.
Special Forest Products	Collection of special forest products has occurred over a wide area with minimal impacts. Some concern exists that beargrass and mushrooms may have been overharvested in selected sites. Trash has accumulated and vegetation and soil has been disturbed in some camps of beargrass pickers and mushroom gatherers. Bough collection has been coordinated with roadside cedar removal.	Produce special forest products while meeting Forest Plan objectives.	Only a few concentrated areas for special forest products have been identified, mainly the Eagle Creek and Long Ridge areas. Priority locations for collection include areas close to roads and markets, primarily in the low and mid-watershed. Roadside hardwood stands in matrix are potential areas for firewood.	Collection of cedar posts and poles; mushrooms; ferns; Christmas trees; burls; brush; huckleberry; boughs; beargrass; alder; and firewood.
Range	The Chetco Range Allotment is the only existing Allotment in the watershed. It includes about 4445 acres of National Forest and 42 acres of private land. Currently, about 160 acres are suitable range open to grazing. Suitable range has decreased 250 acres since 1981. This is due to encroachment of trees in meadows and noxious weeds.	Protect or improve meadow habitat and Riparian Reserves while ensuring a sustainable range resource. Maintain existing grazing allotment.	The Chetco Range allotment including The Pines meadows, High Prairie, Low Prairie, and Riparian Reserves.	Provide a small sustainable range resource that is compatible with resource management objectives. Protect the native species diversity and healthy condition of The Pines meadows. Increase the percentage of native grass species in High Prairie and Low Prairie. Restore these meadows to their 1940 size. Control the spread of noxious weeds within the Allotment area.

SOCIAL ASPECTS

TYPES OF COMMODITY	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
Mining	Gold mining, in the form of placer and lode claims, has occurred since the late 1800's and continues today. Chromite was historically mined in ultramafic areas, although none occurs today. Prospecting has discovered low-grade deposits of iron, copper, nickel, magnetite, manganese, olivine and small quantities of platinum. Most mining activity has occurred in the upper Chetco watershed, within the Kalmiopsis Wilderness and Wild segment of the Chetco River. The Wilderness and the Wild segment of the Chetco River have been withdrawn from mineral entry, however valid existing claims can continue to operate under regulation. Active placer mining occurs on the Chetco River north of Chetco Bar (Gold 11), on the Little Chetco River east of Emily Cabin (Independence Placer) and on a limited basis on the Recreation segment of river near Redwood Bar. A 60 acre claim on the Little Chetco River went to patent in 1988. The Chetco #2 claim at Taggart's Bar has a patent application awaiting decision. A Plan of Operation is expected from the Little Chetco Group of claims. The null and void decision for the Robert E Group of lode claims has been legally contested. The Old Hotel/Hilltop claims have been declared void without dispute.	Allow for mineral exploration and development while protecting resources and environmental quality.	Little Chetco Emily Group and Independence Placer in the Wilderness. Chetco #2 Placer on the Chetco River at Taggart's Bar in the Wilderness. Gold 11 on the Chetco River north of Chetco Bar in the Wilderness.	Conduct mineral exams to determine claim validity after Plans of Operation (POO) are submitted. Clarify mechanized road use issue to Little Chetco River area for access to both patented and unpatented claims.

AQUATIC KEY FINDINGS

The natural character of **fish habitat** in the Chetco River Watershed changes at the mouth of Eagle Creek. Habitat downstream of this point is more favorable for coho and chinook; upstream, for steelhead and cutthroat.

Human activities have affected some low gradient, high value stream reaches below Eagle Creek:

Mill Creek High Value Reach: Timber harvest of 44% of the tributary drainage has removed a large percentage of the conifer component of the riparian vegetation, depleting sources of large wood and shade. A high density of roads, with some on moderately steep slopes, increases the risk of coarse sediment delivery to the stream. The lack of large wood in the channel decreases the channel's ability to provide high quality fish habitat if coarse bedload transport is increased.

Emily Creek High Value Reach: Timber harvest and flooding have removed critical instream cover for overwintering of coho juveniles. Wood masses, large or small, would increase cover.

South Fork High Value Reaches: Timber harvest and roading increased sediment delivery and decreased large wood supply in West Coon Creek and on the south bank of the South Fork between West Coon Creek and Basin Creek. Many roads are showing signs of age and maintenance concerns. The 1107.550 road has been identified as a specific concern.

Levels of roading and past harvest in the **Snaketooth area** may affect high value reaches in Emily Creek and the South Fork Chetco in the future. This area has past road-related landslides, high road densities, and over 60% harvest.

Warm stream temperatures in the Chetco River are a natural condition, originating in the headwaters where ultramafic soils support sparse vegetation for shading. The lower channel is wide, limiting the capability of riparian vegetation to shade the stream.

Late summer and autumn flows in the Chetco River frequently fall below the volume recommended by Oregon Department of Fish and Wildlife for fish habitat needs. Since the gage was installed, nearly half of the years had flows less than 80 cubic feet per second, lasting from two days to over two months per year.

High intensity burns may have greatly increased sediment delivery rates, particularly intense "brushfield conversion" burns. Erosion increases of two to six times unburned rates were found in a Forest Service study in Pistol River in the late 1970's. This would be equivalent to an increase of one to three landslides in a subwatershed with the size and characteristics of Quail Prairie Creek.

The primary mechanisms for **sediment delivery** to channels are landslides in unstable inner gorges, and debris flows. Areas where these are likely to occur are most susceptible to increased rates and volumes of sediment delivery as a result of human activities.

Priority areas within subwatersheds where **road restoration or treatment** should be investigated have been determined. These areas were rated by objectives for road treatment, including sediment delivery potential, altered hydrology, and potential to affect high value fish habitat reaches. A listing of these areas is provided in Appendix A.

RIPARIAN KEY FINDINGS

There are **four distinct riparian types** in the Chetco River watershed. **Conifer forest riparian areas** are stable and provide habitat for interior dependent species. **Hardwood forest riparian areas** are susceptible to vegetative change and offer little microclimate differences than surrounding upland areas. **Meadow riparian areas** are open canopy habitat and have been encroached upon. **Ultramafic riparian areas** are heavily dependent on Port-Orford-cedar and have a fragile water drainage network.

TERRESTRIAL KEY FINDINGS

Unique habitats include meadows, rock bluffs, springs and bogs, ponds and lakes, Brewer spruce, the northernmost stands of coast redwood, and a diversity of pines and hardwoods. Open meadows and open ultramafic areas with Jeffrey pine savannas are being reduced in size by conifer and hardwood encroachment. Ultramafic bogs support unique plant species and are abundant in the upper watershed; ponds, lakes, and bogs are limited in the lower portion of the watershed. Hardwood stands are abundant in the mid-watershed. There are concentrations of Brewer spruce at Big Craggies and Babyfoot Lake.

Snags and large down wood are at low levels in most managed stands and burned areas of the lower and middle watershed. These components are also naturally low in the upper watershed due to fire and ultramafic soil conditions.

High road densities within four subwatersheds may lead to ineffectiveness of habitat, disturbance to wildlife, and possible poaching of wildlife. These subwatersheds contain road densities that are above the desired 2.0 miles of road per square mile area (mi/sq mi), and range from 2.4 up to 4.4 mi/sq mi.

Sensitive species vary in abundance. Limited plant and wildlife surveys have been conducted within the Kalmiopsis Wilderness. Most sensitive plant sightings occur within the Kalmiopsis Wilderness. Some populations of *Kalmiopsis leachiana* are declining. Most spotted owl sightings have been in the middle and lower parts of the watershed while most stands occupied by murrelets are in the lower part of the watershed. Over 50 percent of the spotted owl activity centers contain less than 40 percent suitable habitat. Del Norte salamanders are less prevalent than in the Winchuck or Pistol watersheds due to a lower abundance of talus habitat. Common and California mountain kingsnakes have been documented in the Wilderness. Pond turtles and red-legged frogs have been documented below the South Fork Chetco River. Wintering bald eagles are known to occur on the mainstem Chetco River, from South Fork Chetco down to Loeb State Park.

Late-successional and interior forest habitat conditions are limited in the watershed due to ultramafic soils, plant species compositions, timber management, and fires. Late-successional habitat now, and in the future, may never account for more than 40 percent of the total watershed. Most larger trees and interior forest habitat areas are present along Emily Creek, mainstem Chetco River, and South Fork Chetco River. Interior forest species using mid-late seral habitats for foraging habitat are spotted owl and pileated woodpeckers. Despite conversion attempts in the lower and middle watershed, the amount of hardwood stands is still at the high end of the range of natural variability. Mid-seral, mature hardwood stands are also used by spotted owls for foraging habitat.

Port-Orford-cedar is abundant in large uninfested portions of upper watershed, but disease was recently introduced to the Mineral Hill Fork and Little Chetco (Kalmiopsis Wilderness). The latter introduction flowed ten miles downstream to include the mainstem. Port-Orford-cedar is very limited in lower watershed.

Noxious weed infestations occur in both the upper and lower watershed. Scotch broom exists at Peterson cabin in the middle of the wilderness (Little Chetco River area). Tansy ragwort and thistle have the greatest amount of spread in the lower part of the watershed. Gorse exists near the old low water bridge site. French broom occurs at the junction of the 1107 and 1107550 roads. Thistle occurs along most roads and is spreading onto some open meadows. Wheatgrass is present at the Tincup trailhead.

Wild turkeys released by Oregon Department of Fish and Wildlife on private lands have moved onto National Forest lands. Effects on native populations of wildlife are unknown.

The Wilderness Fire Management Plan for the Kalmiopsis Wilderness could allow a lightning fire to burn outside the wilderness. Fires burning in the wilderness are likely to be of higher intensities than what is desired in other land allocations, such as Late-Successional Reserve (LSR). A fire that may burn into LSR will need to be assessed during the Fire Situation Analysis processes, and an appropriate suppression response developed. The fire plan has provided for management ignited prescribed burning in the wilderness to reduce the risks and consequences of natural prescribed fire escaping the wilderness under conditions not acceptable to LSR values.

Fire occurrence had been widespread during the early part of the 20th century. The largest fires burned in the Kalmiopsis Wilderness, while smaller fires burned along the Chetco River and to the west. Historically, lightning fire starts have been low in frequency, accounting for about 25% of all fires. For the past 50 years, fire suppression has prevented fire from performing its role in forest ecology. The Southwest Oregon LSR Assessment indicated that prescribed fire is an appropriate management tool, and may provide a benefit to certain areas within the watershed.

SOCIAL KEY FINDINGS

The Chetco watershed is rich in **cultural history**. Prehistoric use was year-round in the riverine areas and seasonal use occurred in the rest of the watershed. There is evidence of stone tool manufacture, vision quest sites and village sites. Early historic uses included mining and prospecting, settlement and ranching, the Civilian Conservation Corps and early Forest administration.

Recreation opportunities are diverse and represent a broad range of physical, social and managerial settings. Three main categories are Wilderness and Wild River, dispersed land-based recreation, and Scenic and Recreational River. The Wilderness provides an opportunity for solitude and non-motorized, self-reliant recreation in a primitive setting. The land-based recreational activities include hunting, dispersed camping, sightseeing, nature study, and winter snow sports. Currently, trails for motorized use are limited. The majority of recreation use occurs on or adjacent to the Recreation segment of the river. Fishing, boating, swimming, hiking, and camping, and picnicking all occur in this area.

Timber commodity opportunities are limited by the abundance of hardwood stands and by remote, unroaded stands in matrix. Matrix areas provide opportunities for regeneration harvest of conifers and hardwoods. Commercial thinning of mid-seral, overstocked conifer stands are limited. Harvest opportunities associated with meadow enhancement exist in both matrix and Late-Successional Reserve.

Special Forest Products (beargrass, mushrooms, huckleberry, ferns) are prevalent throughout the lower and middle watershed. Opportunities for firewood (tanoak and madrone), especially in accessible roadside stands, are limited in the matrix areas.

Grazing occurs on one range allotment and has been on the decline in the watershed since the mid-1980's.

Mining for placer gold occurs on existing valid, unpatented claims along the Chetco River within the Wilderness. The potential exists for additional patented claims. Mining road access to claims and potential sediment delivery from portions of these roads are current issues.

Watershed Analysis Narratives

AQUATIC ECOSYSTEM

GEOLOGY AND GEOMORPHOLOGY

Characterization

The geologic setting of the watershed affects terrestrial and social, as well as aquatic ecosystem processes. Rock types, geologic structure, and landforms influence the texture, thickness, and productivity of soils. The distribution of mineral-bearing rocks and suitable tool-making stones influenced the history of human presence in the area, and current mineral operations. Aquatic processes and features, such as sediment and large wood delivery, lakes created by glaciation and landslides, streambank stability, susceptibility to channel erosion, soil thickness and hydrologic response, gradient and valley confinement of channels, and size and durability of substrate are related to the geologic setting.

The Chetco River flows through the Klamath Mountains Geologic Province from its headwaters to approximately Chetco Bar, and through an extension of the California Coast Ranges Province from Chetco Bar to the ocean. The Klamath Mountains include metamorphosed intrusive rocks and the Josephine Peridotite, a large ultramafic body which supports many endemic plants (Figure 4). The ultramafic rocks consist of peridotite and, where altered, serpentinite (also commonly called serpentine). Amphibole gneisses and schists are believed to be the oldest rocks in the area. These are sandwiched between the ultramafic rocks on the east and the underlying Dothan formation. A thin zone of volcanic rocks which have been warped, dragged, and squeezed into the broad zone of the thrust fault is interpreted to originate from the Jurassic Rogue Formation.

The Dothan Formation is the primary rock unit within the Coast Ranges Province, and is equivalent to the Franciscan Formation to the south in California. The Dothan Formation consists of graywacke sandstone, with interbedded siltstone and shale, occasional pillow lavas, volcanic breccia, chert and conglomerate. Evidence of late Jurassic deposition has been interpreted from fossils in the area. The lenticular-shaped chert bodies are generally light gray, massive and fractured, but occasionally is well-banded and multicolored. Chert was used by Native Americans in prehistoric time for stone tool manufacture.

The Dothan Formation has been thrust (a low angle fault) under the Josephine ultramafic sheet. The Valen Lake Thrust is located in the eastern and upper portion of the watershed, and is believed to represent the location of the subduction zone. This major tectonic event occurred after Dothan rocks were deposited, probably during late Cretaceous time. The Dothan varies in its degree of deformation which must have occurred at least partially during the period of thrusting. Fault zones, shearing, and small-scale tight folding are more common in the less competent shaley interbeds than in the graywacke sandstones, and allow weathering to greater depths. High angle faulting in the Dothan is common, and the major faults are associated with severely sheared host rocks, higher grade metamorphism, and slivers of serpentinite (details in Ferrero, 1991). Shearing from thrust faults covers a broad area, for example in the eastern Eagle Creek watershed where Colebrooke schist overthrusts the Dothan Formation.

Gold Basin is about 250 acres of unusually flat terrain (Figure 5), where a relatively thin cover of Tertiary stream gravels overlies an ancient erosional surface on gabbro bedrock (Note that this level of detail does not appear on Figure 4, from the Oregon State Geologic Map, at 1:500,000 scale. More detailed maps are available, but have not yet been digitized).

Geomorphology of the Chetco River

The Chetco River has its headwaters in a landscape carved by glaciers, which is unusual for coastal streams in the area. Evidence of glaciation includes both erosional features (cirque basins) and glacial deposits (moraines). Because the cirques and moraines have not been modified by weathering or stream erosion, they were likely formed during the last glacial stage (Wisconsin). The Vulcan Lakes are glacial cirque lakes (tarns) at the head of Box Canyon Creek. Partially developed cirques are also found on the north and east slopes of the highest ridges, such as Big Craggies. Glacial moraine deposits have been mapped in the watersheds of upper Box Canyon and Fresno Creeks. Less extensive, unmapped deposits occur in the U-shaped canyons of upper Madstone and Broken Cot Creeks and in the unnamed creek between them. Moraines can also be found near Babyfoot Lake (also a tarn). The large moraine in the headwaters of Box Canyon Creek below Vulcan Lakes is composed of ultramafic debris. It is uncertain whether deposits extending to the mouth of Fresno Creek were left from glacial ice or outwash (Ramp, 1975).

Between Tincup Creek and the Forest Boundary, the river generally flows southward along the path of less resistant sheared siltstones. The channel narrows into a gorge as it crosses more resistant sandstones and volcanics along its shorter westerly path toward the ocean. Steep inner gorge streambanks are evident from the contrast between more gently sloping uplands and steeper streambank slopes (Figure 5). Inner gorge landforms characterize recently uplifted (rejuvenated) terrain (see Stability Features Map in process records). North and south flowing streams within the Dothan formation tend to follow shear zones, and therefore have a higher proportion of inner gorge landslides. These stream segments in Dothan include: North Fork Chetco, several segments of the mainstem, Mineral Hill Fork of Eagle, Mislatnah/Craggie/Blueslide creeks, a segment of the South Fork, and the mainstem Chetco from the mouth of Boulder to Tincup, and the first four miles of Tincup Creek. The valley becomes less confined within the shear zone along the lower mainstem perhaps because of more easily weathered hillslopes, and the channel stores sediment in large terraces.

The gradient of the mainstem Chetco also reflects the resistance of the underlying rocks, and the glacial history of the upper watershed. See Appendix C: Subwatershed Descriptions for longitudinal profiles of the mainstem and some major tributaries.

The width of the active channel and its relation to the valley influence hydrologic processes and lead to different social uses. The Valley Width Index (VWI) is a ratio of the valley floor width to the active channel width, and reflects the confinement of the channel by the hillslopes. A smaller number indicates a more confined condition.

Table 2.

Channel Segment	Width (feet)	VWI	Comments
Above Tincup	75	1.0	
Tincup-Tolman Ranch	100	1.0-1.3	
Tolman Ranch-Steel Bridge	100-125	1.0-1.3	
Steel Bridge-Eagle Creek	125-200	1.0-1.5	
Eagle Creek-Low Water Bridge	200-400	1.3-3.0	Intermittent bars, partial vegetation
Low Water Bridge-Elephant Rock	300-900	1.6-4.6	Large terraces, deposition
Elephant Rock-Emily Creek	250-500	1.0-1.4	Few terraces
Emily Creek-Nell Creek	250-350	2.2-3.1	Terraces, well vegetated

Figure 4.

Chetco River Watershed Analysis

Geology

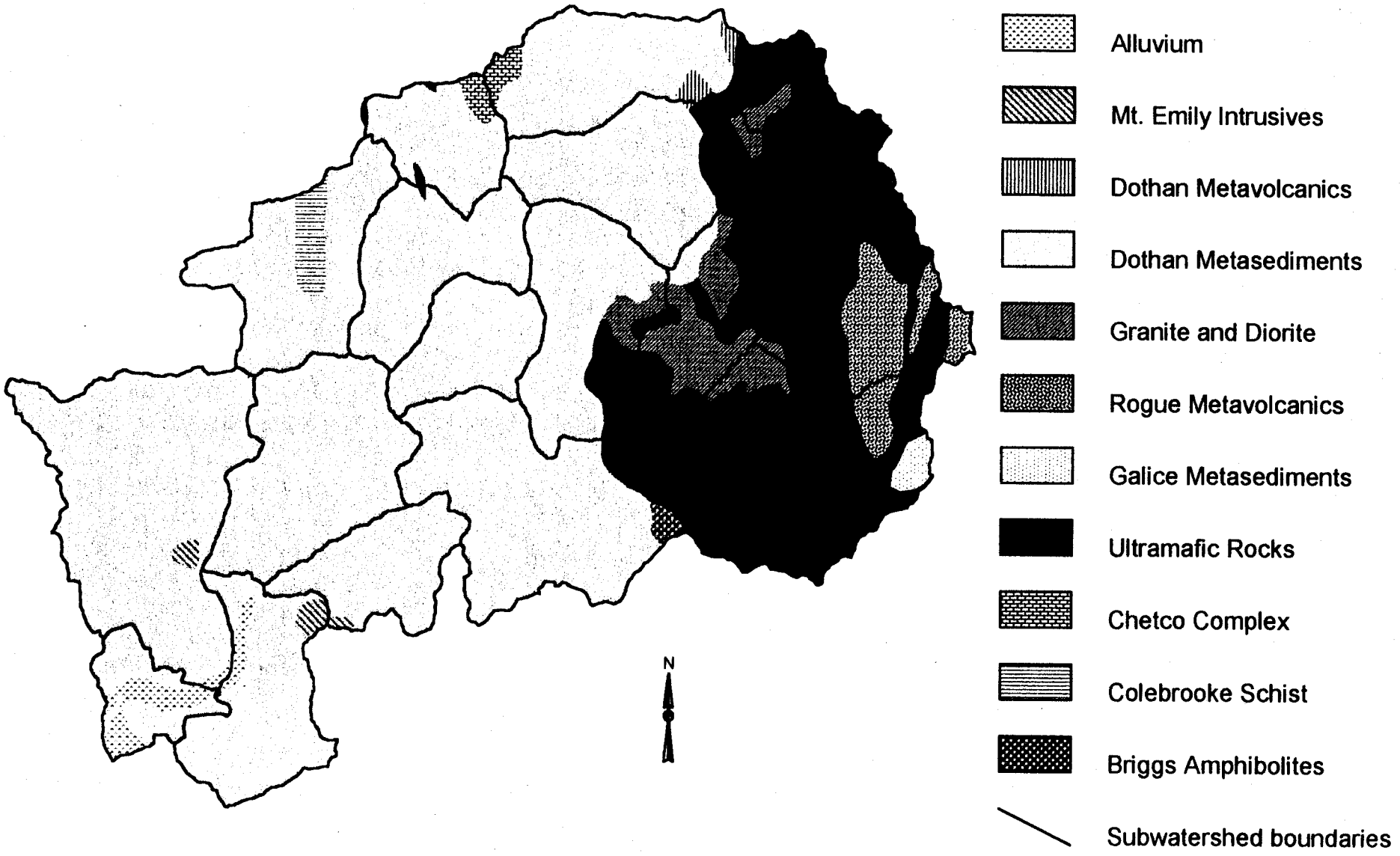


Figure 5.

Chetco River Watershed Analysis

Slope Classes

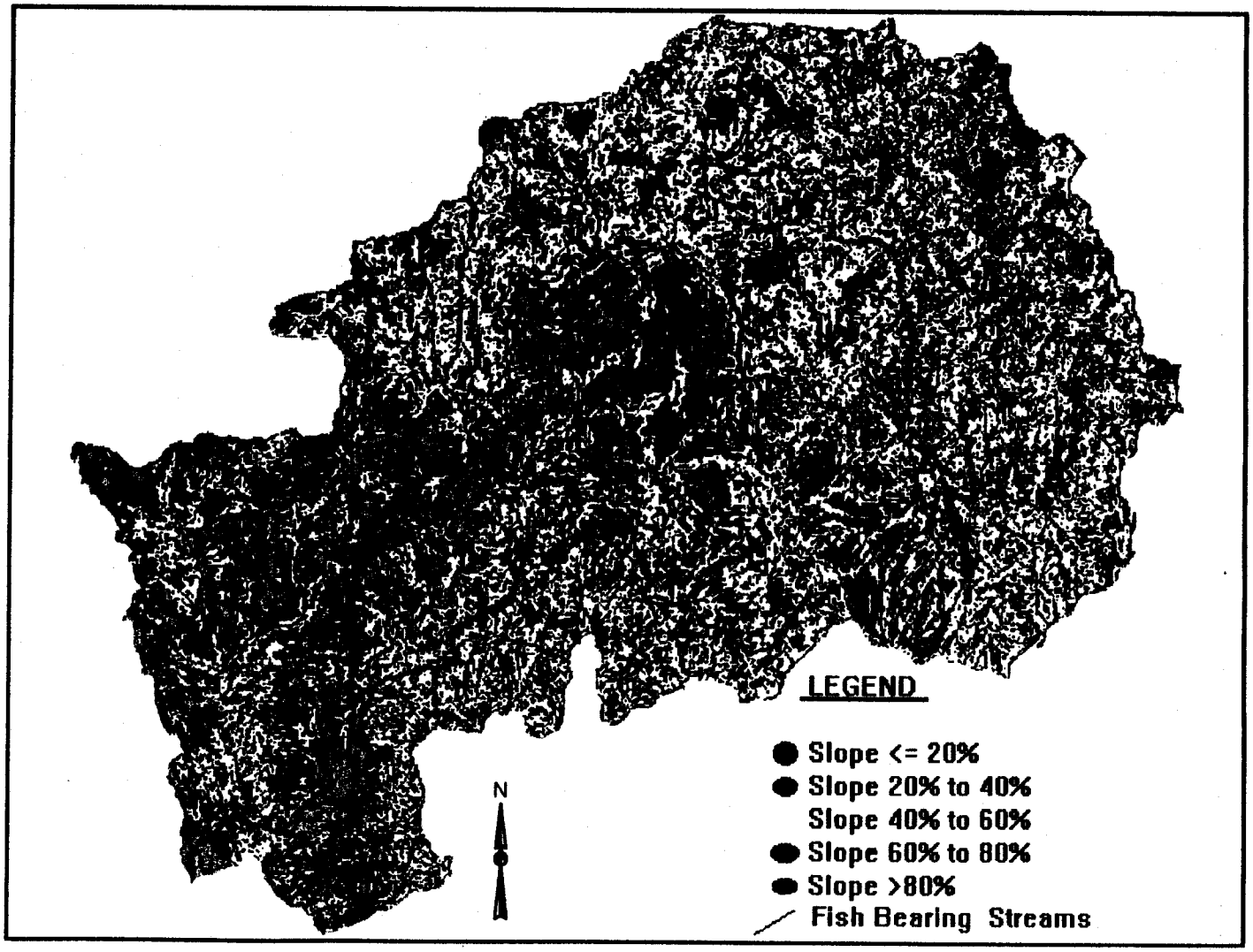
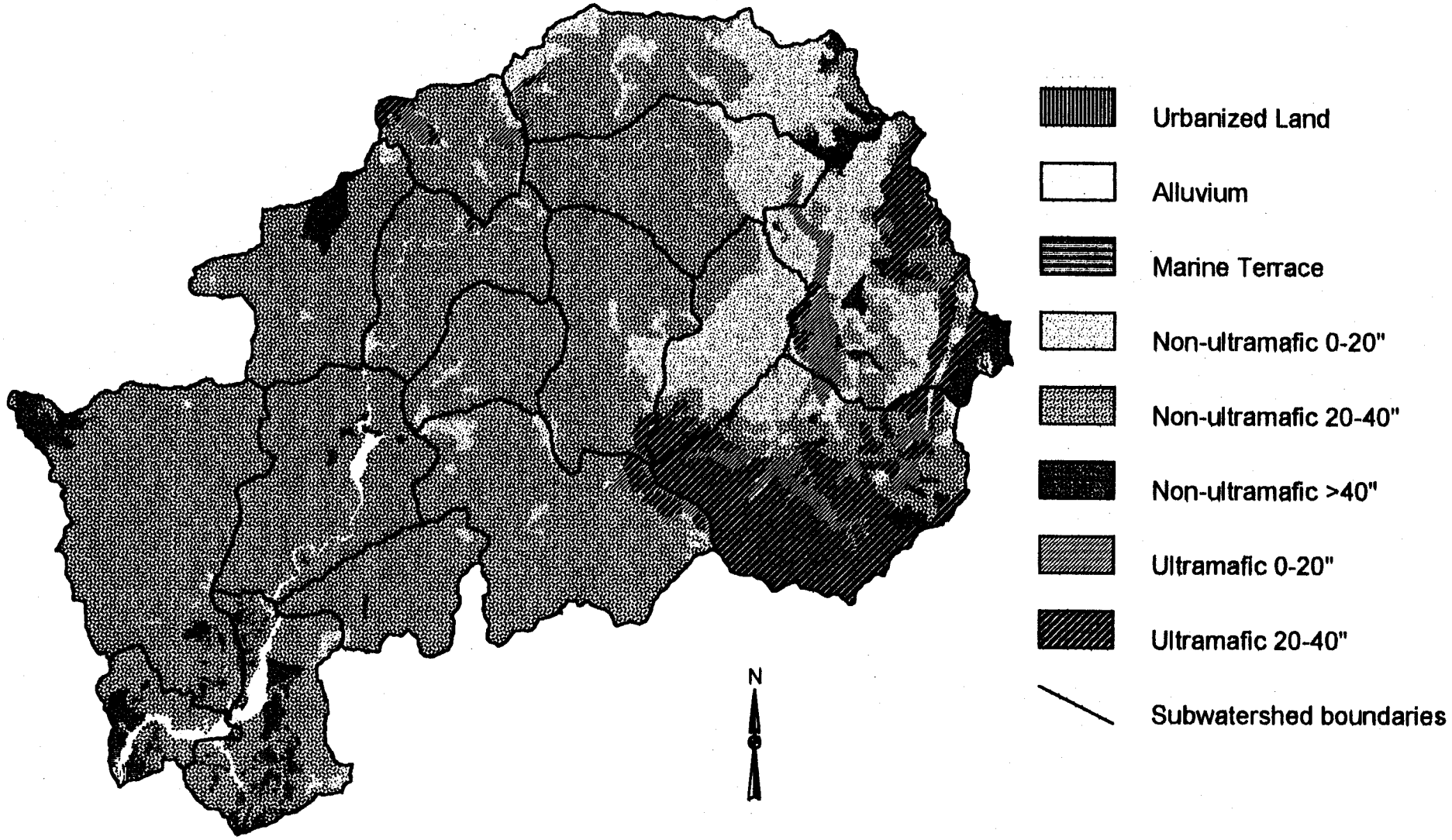


Figure 6.

Chetco River Watershed Analysis

Soil Type and Thickness



Key Questions

What sediment delivery processes are dominant within the watershed? Where do they occur?

Landslides

Landslides of various types dominate sediment delivery, and vary in size of material delivered, rate, and effects on stream channels. The geographic distributions of slopes and soil characteristics influence the types of landslides. Soil thickness (Figure 6) and drainage characteristics are influenced by slope angle (Figure 5) and bedrock (Figure 4). Soils tend to be thinner and rockier on steeper slopes. Soils developed on all rock types tend to be thicker and wetter in shear zones, where springs emerging from intercepted groundwater are abundant. Thicker soils are generally found on moderately steep slopes and benches in Dothan mudstone and Colebrooke schist. Soils on Dothan mudstone tend to be of moderate to thick depth, and poorly drained. On Dothan sandstones, soils are thin on ridges and steep slopes, but moderate on sideslopes, and the higher sand content provides moderately well drained soils. Volcanic rocks within the Dothan and Colebrooke, Mt. Emily rhyolite, granodiorite and gabbros are resistant to weathering and produce thin rocky or gravelly soils, talus, and rock outcrops. Serpentinized peridotite (ultramafic rock) weathers very slowly to thin gravelly soils, but landslides may fail within the weak sheared bedrock. These landslides revegetate slowly and are visible for long periods after the event.

Bedrock that is less resistant to weathering and produces thicker soils will deliver sediment that is finer-grained and contributes a higher natural turbidity, and provide substrate lacking durability. Resistant bedrock with thin, rocky soils will deliver coarser-grained sediment with lower turbidity and more durable substrate.

Rock fall is most common on the steeper slopes within the wilderness part of the watershed. For example, a steep narrow rock slide on the north side of Dry Butte dammed a small tributary of Boulder Creek and formed Valen Lake. Ramp (1975) judged from the size of trees on the deposit, that the rock slide occurred about 300 years ago. Rock fall processes deliver boulders that provide stream structure where runoff rates are high from the rocky slopes, and where large wood is less abundant in channels on ultramafic rocks.

Deep-seated landslides within bedrock are uncommon, but more likely within the sheared ultramafic rocks. An example of a failure within the ultramafic bedrock is the area of Sourdough Flat (north of Slide Creek) which appears to be an ancient, massive slump block (Ramp, 1975).

Streambank landslides are abundant in the inner gorges because of the steep slopes and accumulation of soil and water at the toe of the slope. The more distinct and active inner gorges are located in the less resistant, sheared rocks in North and Mineral Hill Forks of Eagle Creek, and the adjacent mainstem Chetco.

Slump-earthflows are associated with thick, fine-grained, saturated soils, and vary from currently active to older, dormant features. Many of the larger ones have been located (see Stability Features Map in process records), but their relative level of activity and sensitivity to timber harvest and road construction have been investigated only for site-specific areas.

Debris avalanches and flows are more common on steep slopes from headwalls (swales filled with colluvium). These slides are abundant within the wilderness and from the slopes of Mt. Emily, and other steep resistant slopes. These are rapidly moving, scouring events, which transport and deposit large wood as well as sediment.

A few tracks of snow avalanches are evident at high elevations in the wilderness. Snow avalanches remove vegetation from the slopes in their path, and redistribute large wood in a deposit below, but the frequency of these events is unknown.

Within the Chetco watershed, a large percentage of the unstable and potentially unstable lands within inner gorges and toes of earthflows have been mapped as lands unsuitable for timber harvest due to irreversible soil loss. More detailed landslide hazard mapping is available for areas listed in Appendix B under Slope Stability Reports. A landslide hazard map for the entire Chetco Watershed is not available, but would help to locate headwalls subject to debris avalanches and flows.

The frequency and distribution of landslides has been affected by natural disturbances such as flood and fire, as well as land uses such as timber harvest and mining. More details of the history of floods and fires are given in the Hydrology section below and in the Terrestrial section, respectively.

Historic landslides and erosion have not been systematically surveyed or inventoried for the Chetco River watershed. Several large older slides along the Chetco River and major tributaries were reactivated during the 1964 flood (Ramp, 1975). The 1955 flood is known to have triggered landslides in other coastal streams in southern Oregon and northern California.

Road Construction and Timber Harvest

The history of land use and characteristics of climate, slope, soils and geology are similar to those in the Pistol River watershed to the north. The following conclusions from historic landslide inventory (Russell, 1994) and road erosion surveys in Pistol River are expected to be representative of Chetco River.

> Evidence for improved management practices on National Forest lands comes from the incidence of landslides since the 1979 aerial photographs. Between 1979 and 1986, 47 new management-related slides occurred. Of these, all were caused by management disturbance prior to 1979. There was a sufficient acreage of harvest during this period to test the effectiveness of improved management practices, and both the 1982 and 1986 storms occurred during this period. Review of 1986 and 1991 aerial photographs indicated only one new management-related landslide occurred and it was in a unit that was harvested in 1969. This study indicates there were no management-related failures associated with timber sale units that were harvested after 1979.
>
> Gully erosion below road drainage outlets was concluded to be a small percentage of the overall sediment budget compared with landslide volumes. The average erosion volume was 160 cubic yards/mile on the mid-slope roads that were sampled (see Appendix B). The average erosion volume for each road segment varied from 0 to nearly 1000 cubic yards/mile. The largest gullies were associated with stacked roads, mining disturbance, road junctions, long distances between drainages outlets (e.g. 700 to 800 feet), and road-related landslides. Areas that were tractor yarded on relatively steep slopes in past years had poor drainage and a high density of stacked roads, and would be expected to have more severe gully erosion (in the Chetco Watershed, parts of Eagle Creek and Panther Creek would be examples).

Past road-related landslides were tabulated from 1986 aerial photographs in the Snaketooth area which has a relatively high road density within the Dothan Formation (Appendix B). The frequency was 1.2 slides per mile of road. These roads averaged 2.0 stream crossings per mile, and 60 percent of the road-related slides were associated with stream crossings. Cutbank failures accounted for 19 percent of the slides. These failures are less likely to deliver sediment to streams but can cause drainage diversions. Sediment delivery can also result from accelerated channel erosion where hydrologic patterns have been altered by roads and harvest (discussed below in Hydrology section).

Within the Kalmiopsis Wilderness, roads were constructed to access mining claims and were not designed to prevent landslides and erosion (see Appendix C: Subwatershed Descriptions).

In order to project future trends in road-related landslides, the dates of road construction and timing of slides relative to major storms (i.e. historic landslide inventory) would be needed. However, road sediment could be more efficiently reduced by collecting field data on the specific cause(s) of the road-related slides, whether sidecast construction, poorly compacted fills, saturated fills, drainage diversions, or undercutting by channel erosion.

Future trends in road-related slides are also highly dependent on road maintenance funding, which has been substantially reduced since the early 1990's. On steep hillslopes, road drainage onto headwalls may result in rapid, scouring flows for long distances down channels. The 1993 debris flow in Dry Creek is an example of a plugged culvert causing a drainage diversion and failure of a saturated road fill. Roads constructed on steeper slopes are more likely to cause this type of landslide. Watershed analysis areas have been prioritized for road restoration treatment based on the lengths of roads on steep slopes (see Appendix B, Table 15).

Prior to the early 1980's, high intensity burning was used to reduce logging slash and hardwood competition on clearcut harvest units. Burn intensities were most severe in units that were being converted from hardwood stands to conifers (known as "brushfield conversions"). Magnitudes of surface erosion from post-logging burns were estimated by erosion plots in the Pistol River watershed in 1977 to 1978 (Hansen, 1991). Soil loss during three months of exceptionally high rainfall ranged from 2.0 to 3.6, 2.2 to 5.9, and 4.0 to 18.7 tons/acre on 30, 50, and 70% slopes respectively. Unburned plots ranged from 1.3 to 3.1 tons/acre on 70% slopes. If these findings are representative of the effects of brushfield conversion burns in Quail Prairie Creek, 1500 to 5000 tons of sediment would have been delivered to the creek. This would be the equivalent of 0.9 to 3.5 landslides (calculations in Appendix B). The sediment delivered from these units was likely fine-grained, and delivered within the first winter or two following the burn. A 1978 stream survey noted evidence of erosion and deposition in Quail Prairie Creek, which was attributed to burning through class III and IV (perennial and intermittent) streams.

Silver Fire

The 1987 Silver Fire burned 23,500 acres, within the Chetco River watershed, primarily in Tincup Creek. Of the entire fire area, twelve percent was estimated as high burn intensity. This burn intensity kills trees and leads to the loss of root strength, loss of evapotranspiration, and lack of ground cover to inhibit surface erosion. No systematic overflight or aerial photographs have been taken since the 1988 color infrareds. Therefore, the effects of the more recent winter rains on the burned slopes is not known.

Information Needs: Inventory roads in Snaketooth area to determine specific cause(s) of past road-related slides (sidecast construction, poorly compacted fills, saturated fills, drainage into headwalls, drainage diversions, or undercutting by channel erosion.). Use results to prioritize inventory for potential road-related slides, particularly in watershed analysis areas listed in Table 15, Appendix B.

Develop landslide hazard map for the watershed for more accurate identification of sites than the Slope Map (Figure 5).

Inventory historic landslides and dates of road construction for trends. Identify road crossings that failed during large storms, and similar crossings that have not experienced a large storm.

Inventory roads that access mining claims in the wilderness, particularly where road drainage enters streams and where roads cross headwalls.

Digitize detailed Geologic Maps for better locations of fault zones and resistant rock types

Map known earthflows by activity levels and hazards for ground disturbance. Locate and map smaller earthflows, particularly within matrix land allocations.

Interpret new aerial photographs (expected in 1998) for evidence of new landslides or erosion in Silver Fire area.

Management Opportunities: Restore timing, volume, rate, and character of sediment input, storage, and transport within inner gorges shown in Figure 5. Priority areas include the mainstem Chetco, North Fork and Mineral Hill Fork of Eagle Creek, lower North Fork Chetco, South Fork Chetco gorge and upper South Fork, Red Mountain Creek, and West Coon Creek.

Use results of road inventory above to determine where debris flows are likely. Stabilize roads, prioritize reconstruction (Riparian Reserve S&G: RF-3), upgrade existing culverts, and reroute road drainage (Riparian Reserve S&G: RF-4,5). Identify problem areas that should be monitored during flood emergencies (FERM patrol).

Treat fuel accumulations to reduce the chance of spread of high intensity fires onto steep, debris-avalanche-prone slopes in Tincup, Boulder, and Box Canyon watersheds.

Use results of inventory above to prescribe reconstruction or maintenance for mining access roads, to be included in future mining plans of operation.

What large wood delivery processes are dominant within the watershed? Where do they occur?

Riparian forests provide summer and winter thermal regulation, nutrient filtering, and protection from excessive surface erosion, bank erosion, and channel migration as well as delivering large wood to streams for physical complexity and stability. The species composition and structural diversity of plant communities in riparian areas and wetlands are influenced by natural processes and by human-caused disturbances. Conifer wood is larger and more resistant to decay than hardwood.

Riparian stands that have younger vegetation from recent disturbance, or are dominated by shorter vegetation such as hardwoods, are shown as pioneer or early seral stage vegetation on Figure 7. Where streams flow through ultramafic rocks (Figure 4), the riparian stands are generally narrow, and are not shown as late seral stage on remote sensing data. Large fires (see map in process records) have burned through riparian areas in the past. Large wood distribution has also been affected by processes that deliver sediment, such as debris flows, and inner gorge landslides (discussed above). Where streams flow through a valley, large wood is supplied by bank erosion and channel migration during floods.

Human-caused disturbance has also influenced the age pattern of riparian stands. Roads have increased the frequency of debris flows in some areas and may also intercept wood in the runout zone, preventing delivery to the channel. Timber was harvested from riparian areas in the past, and many of these stands have revegetated with hardwoods such as alder. The actual species composition and structure of these stands has not been surveyed and compiled. The proportion of harvest in riparian stands is discussed as it applies to stream shade in the Water Quality section below. Harvest adjacent to riparian stands has locally contributed to a higher rate of disturbance by windthrow.

Parts of the Chetco mainstem valley floor have not revegetated as expected. These areas do not appear to have been scoured by floods within the last forty years. This condition may be a result of grazing on the river terraces. Future recruitment of large wood is being limited in these areas.

Information Needs: Compile existing data on riparian stand condition in harvest units. Survey harvested stands to determine if there is a need for silvicultural treatments such as precommercial thinning or conifer planting or release in hardwood areas.

Management Opportunities: Increase large conifers in areas where riparian seral stages are mapped as pioneer or early seral (Figure 7), except where naturally-occurring from ultramafic rocks, debris avalanche chutes, or inner gorge landslides. Encourage private landowners to plant/protect riparian vegetation.

Where roads are located in debris flow runout zones, redesign crossings to allow wood transport.

Figure 7.

Chetco River Watershed Analysis

Vegetation Structure Within 200 feet of Streams

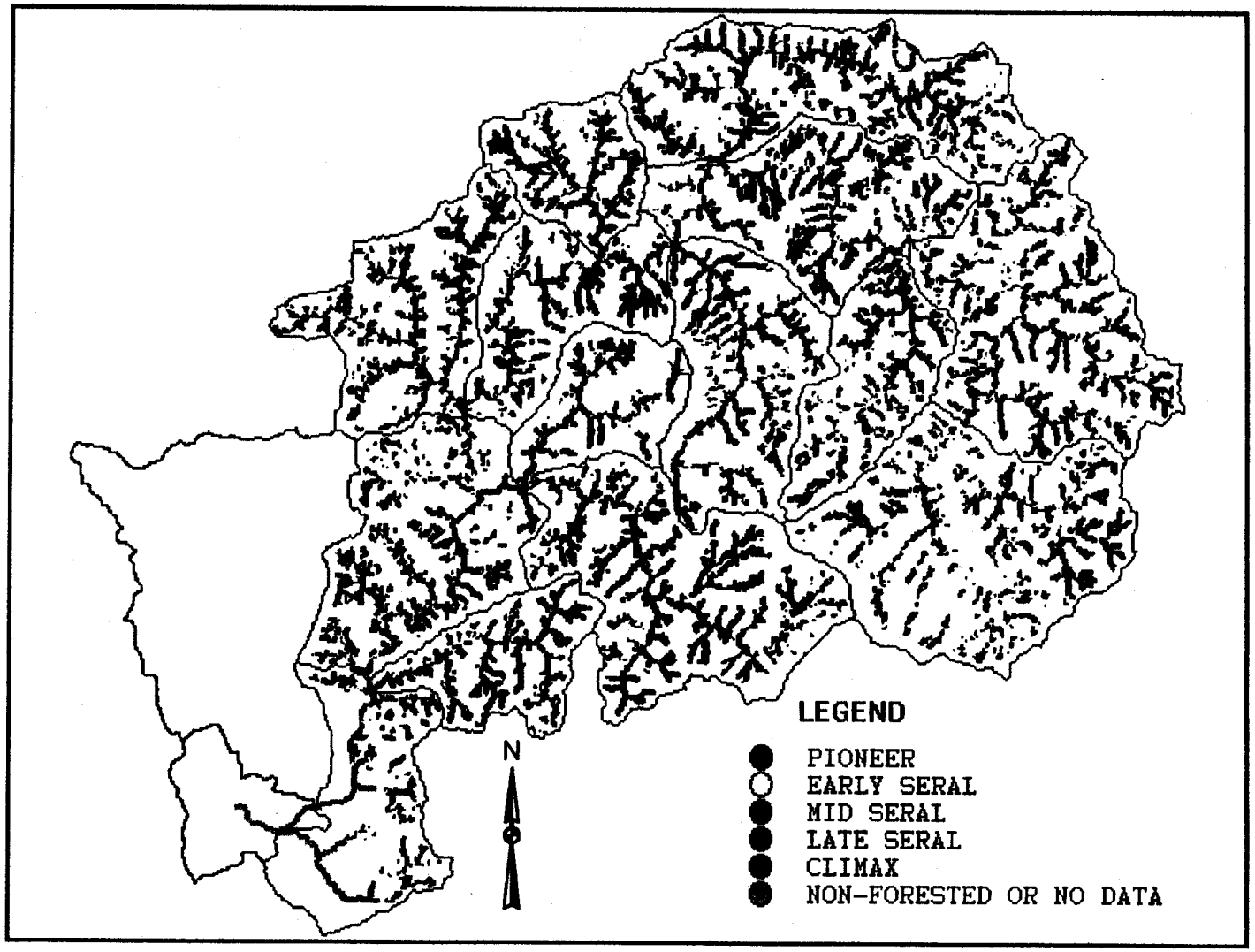
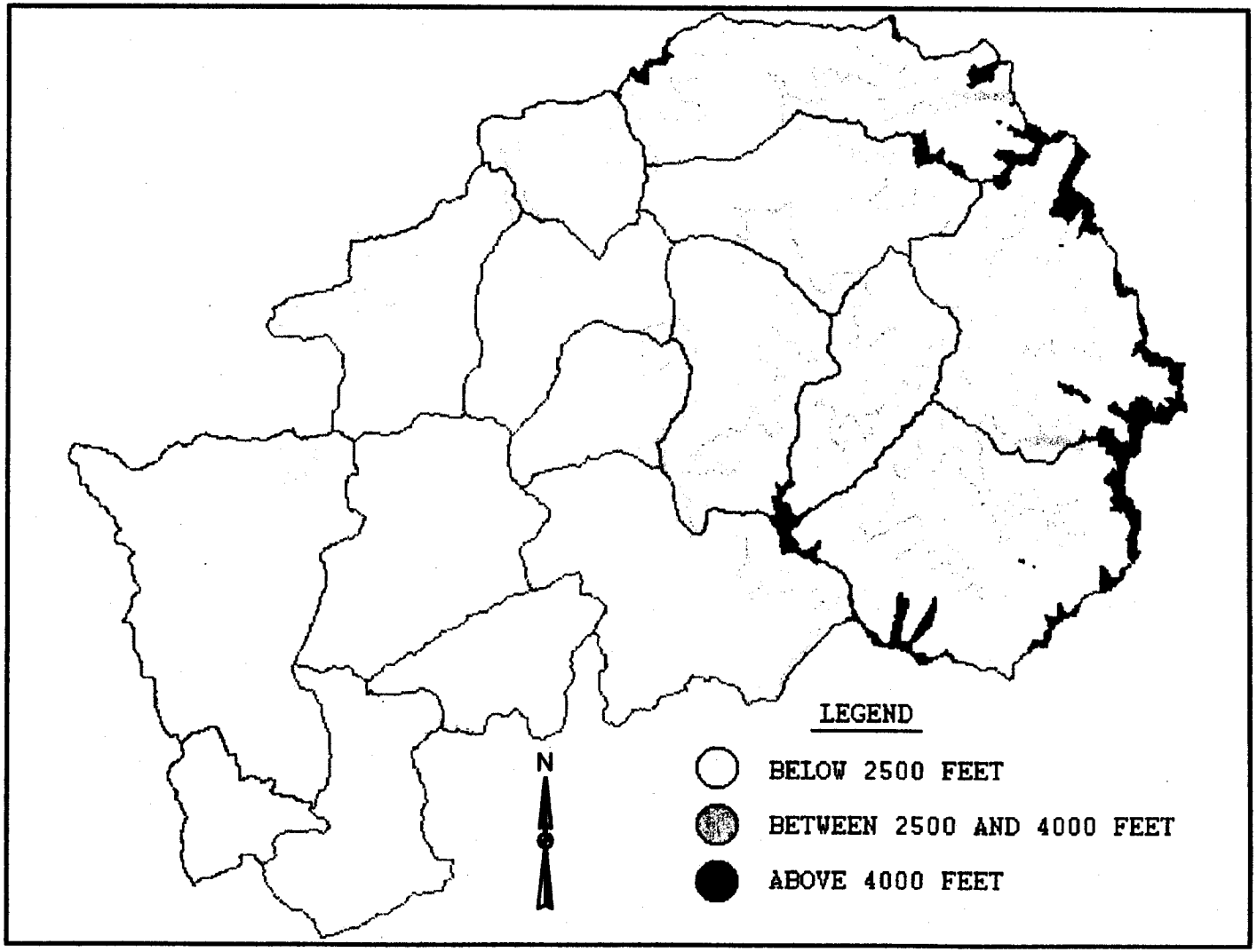


Figure 8.

Chetco River Watershed Analysis

Elevation Zones



HYDROLOGY

Characterization

The hydrology of the Chetco River watershed is complex and varied. Precipitation mainly in the form of rain, ranges from 75 inches per year near the mouth of the Chetco River to 160 inches per year near Granite Butte, in the northeast corner of the watershed (from State Isohyetal maps). Seventy-two percent of the watershed is in the rain-dominated zone below 2500 feet, 26% is in the transient snow zone from 3500 to 4000 feet elevation where rain-on-snow events increase peak flows, and only two percent is in the snowpack zone over 4000 feet where winter precipitation is stored until spring snowmelt (Figure 8).

Both elevation and precipitation increase eastward to the Chetco-Rough and Ready Divide. Roughly 50% of the area with over 100 inches of precipitation lies within the transient snow zone, and most of the snowpack zone receives over 130 inches of precipitation in the form of snow per year. Elevation and precipitation combine to increase the influence of both rain-on-snow and snowpack on the hydrology of the watershed.

A large portion of the watershed has ultramafic rocks and soils (Figure 4 and 6). These have low permeability and low storage capacity, with rapid runoff and a high density of seeps and springs.

Streamflow on the Chetco River has been recorded at United States Geologic Survey (USGS) Gage No. 14400000 since October, 1969. The gaging station is located at the bridge over the river on Road 1376, at approximately river mile 9.25. The following data are for the period of record from 1970 to 1994.

Table 3.

Flow Data	Average	High	Low
Annual Water Yield (acre-feet)	1,602,372	2,831,758 in 1982	397,787 in 1977
Peak Flow (cubic feet per second)	29,016	65,800 in January 1971, (85,000 estimated in 1964)	10,900 in 1977
Low Flow (cubic feet per second)	61	116 in August 1978	42 in October 1987

How often and for how long is flow in the Chetco River at the City of Brookings intake below the 80 cubic feet per second (cfs) estimated by ODFW to be minimum for fish habitat needs?

The Brookings water intake is downstream of the USGS gage, and water from the North Fork Chetco, Emily Creek, and several smaller tributaries increases the flow between these two points. Water withdrawal rights above the gage total less than 1 cfs. Below the gage water rights total over 52 cfs, although only a fraction of this is actually withdrawn. Projections of flow at the City intake based on cfs per square mile (csm) were verified by measuring flow at three points in the river in 1994. Based on csm, a flow of 80 cfs at the intake corresponds to 63 cfs at the USGS gage. Flow dropped below this level in 11 of the 25 years from 1970 to 1994. The number of days per year below this level ranged from two to 77 days (See Figure 11, Flow Duration graph in Appendix B). During eight of the 11 years, flow was below 63 cfs for more than 10 days. The lowest flow recorded was 42 cfs in October, 1987 (corresponding to 56 cfs at the intake).

In which subwatersheds have timber harvest and road construction altered hydrologic patterns?

Subwatersheds (Figure 2) with over 20% of their area harvested may have experienced increases in peak flows and total water yield. Also, within subwatersheds that had less than 20% harvested, some watershed analysis areas (smaller drainages) had concentrations of harvest. Where the overall subwatershed had a high level of harvest, the primary stream is more likely to have been affected. Where small tributaries were affected, they may have contributed increased sediment to the larger stream. (See Table 16, Percent Harvest and Road Density, in Appendix B).

More than 50% of the area in many of the small face drainages along the Chetco River from Eagle Creek to the mouth has been harvested. Streams in these drainages probably did experience increases in annual water yield and peak flows, but they contribute a small portion of the Chetco River flow, and would not have had much of an effect on river flow.

More than 60% of two smaller watersheds within the South Fork Chetco drainage were harvested: Basin Creek and the next tributary east, below Snaketooth. Flows in these smaller tributaries were probably affected, and may have increased sediment contributions to the South Fork Chetco.

During the 1970's, converting hardwood stands to conifer production for the timber market was a common practice in the Chetco Watershed. Techniques included cutting the vegetation, burning, and aerial spraying or manual application of herbicides. The success of these conversions was dependent on intense followup treatment. The change from hardwoods to conifers would have affected the groundwater hydrology and thereby stream flow. The high intensity fires often generated during conversion were observed to create short-term surface erosion with gullying. Burning across intermittent and small perennial streams removed large wood and vegetative structure, creating long-term channel changes.

Watershed analysis areas (WAA) where "brushfield conversion" acres are greater than 10% of the WAA, or where they appreciably increase the harvested acres are most likely to have been affected. These WAA's are on the west side of Eagle Creek, the upper south fork of Quail Prairie Creek, and the face drainages south of the Chetco River below High Ridge (see Table 16, Percent Harvest and Road Density in Appendix B).

Subwatersheds and Watershed Analysis Areas with road densities greater than four miles per square mile may have experienced increases in peak flows because of runoff concentration (see Table 16, Percent Harvest and Road Density in Appendix B). These are along the Chetco River from Eagle Creek to the mouth, and in small tributaries to Boulder Creek, Emily Creek, and South Fork Chetco River.

Watersheds with combined high levels of roading and harvest are most likely to have altered hydrologies.

Table 4.

Location	% Harvested (includes conversion)	Road Density (Mi/Sq Mi)	Description
04F	68	4.4	Chetco River, Elk Creek to Eagle Creek
04L	63	3.5	Chetco River, North Fork to Elk Creek
04X	statistics unknown (see below)		Chetco below North Fork
03B07W	25	3.9	Boulder Creek, near Vulcan Lake
04E06W	47	4.3	Emily Creek, below Snaketooth
04Q01F	40	3.6	Lower Quail Creek
04S02W	60	3.3	Basin Creek
04S05W	65	4.1	South Fork tributaries, below Snaketooth
04S09W	33	3.3	West Coon Creek

Subwatershed 04X includes the City of Brookings urban and residential areas. It is assumed to be largely altered in vegetation. On aerial photos, it appears that most of what has not been cleared and developed has been harvested. Combined with roading, structures, and other developments, it is likely that this subwatershed has experienced changes in hydrology which will continue, and not recover to a previous hydrologic pattern. These changes could include increased water yield, increased peak flows, and decreased low flows. This would have little effect on flows in the Chetco River, but would affect the tributaries within this subwatershed.

The amount of harvest and roads in the transient snow zone is not a factor in the Chetco Watershed because nearly all of this elevation zone lies within wilderness.

Twenty years of vegetation growth following harvest is often considered to be the time required for hydrologic recovery on the westside of the Klamath Mountain Province. Most of the harvest in the Chetco Watershed occurred prior to 1975. No watershed analysis areas (WAA's) have had more than 20% harvested within the past 20 years. However, some WAA's that had more than 20% harvested prior to 1975 have had additional harvest of more than 15% of their acres since then. These are most likely to be experiencing prolonged hydrological effects from harvest, particularly in combination with high road densities. Roads continue to alter hydrology unless they are closed, revegetate, and revert to pre-road drainage patterns.

Table 5.

WAA	% before 1975	% after 1975	Total % harvested	Description
04F04W	30	15	45	Nook Creek
04S02W	43	18	60	Basin Creek
04S05W	49	16	65	South Fork tributaries below Snaketooth

Information Needs: Field visit stream channels to determine current hydrologic condition as necessary.

Management Opportunities: Provide silvicultural treatment where appropriate to return conifer stocking to more natural levels. Maintain, stabilize, or decommission roads, to restore hydrologic function. Improve stream crossings and road drainage.

STREAM CHANNEL

Characterization

The Chetco River is a low-gradient stream within a wide valley for most of its length (see Table 2), meandering between large gravel/cobble bars. Most tributaries are steep-gradient transport streams. Some, like Emily Creek, have long low-gradient depositional reaches. Sediment processes are largely a function of slope and gradient, with the added factor of human activities: roads, harvest, and mining.

The human influence on stream channels is mostly outside of the Wilderness, but some effects from mining including mining roads have been observed within the Wilderness. Channel morphology also has an influence on human activities, both recreational and developmental. The character of the Chetco River morphology changes at Eagle Creek and at Tolman Ranch (see discussion on Chetco River geomorphology above). This is also where Wild & Scenic River classification changes, from Wild to Scenic.

The mainstem of the Chetco River is deficient in structure, especially large wood. This is because of its wide channel and high winter flows. Most tributaries have high amounts of large wood, with two exceptions. Streams flowing through harsh rocky ground with sparse vegetation are naturally low in large wood. Examples of this are tributaries to the Chetco River in subwatershed 03U, in ultramafic rocks. Also Tincup Creek was scoured by a debris flow in 1964 and new wood recruitment is slow from the sandstone sideslopes which have burned repeatedly.

Have timber harvest and road construction affected stream channel morphology, structure elements (large wood), or sediment transport and deposition processes?

Subwatersheds and Watershed Analysis Areas that have the greatest likelihood of hydrologic effects from past harvest and road densities are also most likely to have channel effects. Increases in peak flows can scour stream channels, destabilize stream banks, and transport large woody structure and sediment out of streams. Specific subwatersheds and WAA's are listed in the Hydrology section.

Human activities removed large wood from tributaries in the 1970's. Stream cleanout removed logging debris following harvest. Any natural wood that could be reached by logging equipment was also removed from streams flowing through harvest units and upstream of road culverts. The purpose of this was to reduce the hazard of accumulations in logjams and dambreak during floods, which would result in damage to both natural resources and road structures. Also during the 1970's, there was an extensive effort to increase the amount of stream length available to anadromous fish by removing barriers formed by logjams, waterfalls, and cascades.

Streams increase in velocity and energy when rock and wood structure is removed. This can affect channel morphology by increasing bank scour and instability, and may increase peak flows and sediment transport through more efficient runoff.

Hardwood conversion during the 1970's also affected stream channels. The high intensity fires often generated during conversion were observed to create short-term surface erosion with gullying; and burning across intermittent and small perennial streams removed large wood and vegetative structure, creating long-term channel changes. WAA's most likely to have been affected are listed in the Hydrology section of this document.

Mining in the Wilderness has affected some channels. Placer mining began in the late 1800's along the Little Chetco and tributaries to the Chetco River. Mining activities moved material in channels and flood plains, and some of the mining access roads delivered sediment to streams.

Subwatershed 04H, Eagle Creek with North Fork and Mineral Hill Fork, has naturally sediment-rich streams. This has been augmented by tractor yarding of large clearcuts and road construction on steep, unstable slopes.

Panther Creek, West Coon Creek, Quail Prairie Creek, Emily Creek, and face drainages along the south side of the Chetco River below Long Ridge have been affected by harvest and road construction, as observed during stream surveys or on aerial photos. These are described in the Subwatershed Summaries in Appendix C. Other stream channels have probably been affected in the past.

Information Needs: Investigate current channel conditions and ongoing sources of alterations to channels. Conduct site-specific surveys to determine restoration needs.

Management Opportunities: Provide silvicultural treatment where appropriate to return conifer stocking to more natural levels. Maintain, stabilize, or decommission roads, to restore hydrologic function. Improve stream crossings and road drainage.

WATER QUALITY

Characterization

Beneficial uses dependent on water quality are fish, especially andromous species dependent on cold water, and human recreation and consumption. Good water quality is critical for consumption, as is clarity for recreation use.

Stream temperatures are warmer than optimum for salmonids. Data on summer stream temperatures on the mainstem have been collected on recording thermometers by Oregon Department of Fish and Wildlife (ODFW) and United States Forest Service (USFS), from tidewater to above Eagle Creek, at approximately river mile 20.3. The average maximum 7-day temperatures were 74 to 76° Fahrenheit (F) throughout the monitored stream length in 1994 and 1995. A Forest Service trail crew and a miner independently recorded a temperature of 78° F in August, 1992 at approximately river mile 35. The Chetco River leaves the Kalmiopsis Wilderness at the mouth of Boulder Creek, about river mile 30.4. If this river temperature in the Wilderness is representative, it indicates that the Chetco River is naturally much warmer than is considered optimum for salmonids.

A lack of shading from vegetation is a natural condition. From the headwaters to Granite Creek at river mile 40, the channel and valley floor are narrow, but there is sparse vegetation because of the ultramafic soils. Beyond Granite Creek, the river flows through an open valley bottom with little topographic shading, and its channel is too wide for summer flows to be shaded by vegetation. These factors all contribute to the warm temperatures in the river.

Tributaries to the mainstem provide cooler temperatures. Recording thermometers in tributaries Emily Creek, Eagle Creek, and South Fork Chetco recorded peaks of 66 to 68°F in 1995.

Have human activities contributed to warm stream temperatures? If so, are there restoration opportunities and where?

Timber harvest and road construction in riparian areas may have reduced shade along some streams, contributing to warmer temperatures. GIS data on the percent harvested within 200 feet of streams gives an indication of which subwatersheds may have been affected, and may have opportunities for silvicultural treatment to accelerate recovery. Subwatersheds with more than 20% of stream length in proximity of harvest are:

Table 6.

04H	Mineral Hill Fork of Eagle Creek
04L, 04F, 04X	Chetco River face drainages, mouth to Eagle Creek

Within this same 200 feet of stream, riparian areas with less than 50% of their vegetation in mid, late, or climax successional stage may provide inadequate shade to protect stream temperatures. Subwatersheds with less than 50% are:

Table 7.

03T	42%	Tincup Creek
03U	45%	Chetco and Little Chetco River, above confluence
04F, 04L	27%	Chetco River face drainages, North Fork to Eagle Creek
04H	45%	Mineral Hill Fork of Eagle Creek
04L	27%	Chetco River
04X	Exact percentage unknown	Chetco River (aerial photo interpretation)

Chetco and Little Chetco above their confluence and Tincup Creek are in the Wilderness with large amounts of exposed, rocky ground adjacent to streams. The lack of vegetation is a natural condition. The other subwatersheds have both a lack of large vegetation and a large amount of streamside harvest indicating that human activities may have contributed to warm stream temperatures.

Port-Orford-cedar (POC) is an important component of riparian vegetation in ultramafics in the Wilderness, where stream temperatures are naturally high. *Phytophthora lateralis* has been found in POC in the Little Chetco River. If this spreads down the Chetco River, loss of shade from disease-killed trees could cause increases in already high stream temperatures.

Information Needs: Field-evaluate the streams within indicated subwatersheds which have reduced streamside shade to determine which riparian areas would benefit from silvicultural treatment to accelerate reestablishment of shade.

Management Opportunities: Treat identified stands in riparian areas to enhance recovery of shade.

FISHERIES

Characterization

The Chetco River watershed produces four highly valued salmonids. The salmon and steelhead are the basis of an important ocean and river fishery, centered out of Brookings, Oregon. The anadromous cutthroat trout, as well as resident cutthroat and rainbow trout provide challenging, back-country angling and wildlife appreciation opportunities. From an ecological perspective, the anadromous fish play a unique role in the energy budget of the watershed ecosystem. Their bodies contribute a significant upstream flow of nutrients in a system which is constantly flushing energy and nutrients downstream. Also, riverine fish are important food items for many birds and mammals - an important link between the aquatic and terrestrial ecosystems.

Southern Oregon/Northern California coho have been proposed as Threatened under the federal Endangered Species Act by the National Marine Fisheries Service (NMFS). Coho exist in very low numbers in the Chetco. The Oregon Department of Fish and Wildlife does not consider it a significant population (ODFW, 1994), and sightings of the fish in the last decade are scarce. Juveniles were seen in Emily Creek in 1993 in numbers low enough to suggest one or two successful redds. Single and small groups of adults were seen spawning in Quail Prairie and West Coon Creeks, South Fork tributaries, four times between 1978 and 1988. Yet, in previous times Chetco coho were considered a fair sized run (OSWRB, 1963.) Adults enter the Chetco from the ocean in the fall. Spawning occurs in the early winter and young fish emerge from the gravels in spring. Juveniles rear in fresh water for one or more years before migrating to the sea where they will spend 2 or 3 years. Their critical in-river habitat need is extensive, slack, backwater areas with abundant woody cover to congregate en masse and escape high flows while rearing.

Klamath Mountains Province steelhead have also been proposed as Threatened federally. The Chetco River adult winter run of these fish has been at about 7,000 individuals over the past decade. The Oregon Department of Fish and Wildlife (ODFW) considers this population to be lower than historic numbers but in a stable state (ODFW, 1992). These fish enter the Chetco river estuary in autumn, migrate upstream to spawning areas when rains fill the rivers, and then spawn in winter and early spring. Up to 30% of the adults may survive to spawn a second or third time. Approximately four months after spawning, juveniles emerge from their gravel nests. The fish will then spend two or three years rearing in the river before moving into the ocean with the year's first high flows. After two to four years in the ocean, the adults will return to the river (Meehan and Bjornn, 1991.) Their critical in-river habitat need is rearing cover in the form of deep pools or wood masses to escape predation while they are dispersed throughout small and medium-sized tributaries in small groups.

Fall chinook adult runs are suspected to be about 15,000 fish. The ODFW data indicate a recent decline in numbers and considers the stock to be sensitive, or likely to become listed as Threatened or Endangered (ODFW, 1993). The National Marine Fisheries Service is currently investigating the status of all chinook to determine if a proposal for listing is warranted. A study of adult chinook was conducted in the Chetco basin during the winter of 1995-1996. Preliminary results indicate that hatchery fish comprise just under half of the adult run, and that the average distance a chinook migrated upriver to spawn was under 8 miles (personal communication with Steve Trask, 1-3-96.) These fish enter the river estuary in autumn and move upriver to spawn by late December. Fish emerge during late spring. Juveniles move downstream almost immediately, congregating in the lower mainstem and tributaries until they return to the ocean with fall rains. Since they spawn in early winter in low gradient, gravel rich channels, their nests are very sensitive to mid- and late-winter storm damage. Redd success is suspected to be very low for mainstem spawners in all but the very mildest winters. Another critical in-river habitat consideration is warm lower-river peak water temperatures, which could negatively affect the juveniles concentrated in the lower river prior to entering the ocean.

Very little is known of the Chetco population of cutthroat trout. Their population appears to be stable, but depressed from historic levels, and the ODFW is considering lowering the allowable sport harvest (ODFW, 1993.) Snorkel surveys indicate that most cutthroat in the basin are anadromous, although a resident population does exist in streams also used by anadromous fish. In general (Meehan and Bjornn, 1991), anadromous cutthroat enter the river as adults in the fall, and will usually overwinter and summer before spawning in spring and may even return back to the ocean without spawning. They commonly spawn in the very smallest of perennial streams. Young fish generally enter the ocean after two to four years in river. Habitat requirements for cutthroat are assumed to be similar to that of steelhead, except that they may depend upon very small perennial streams for spawning.

FISH HABITAT

Characterization

At the watershed level, the 155 miles of fish habitat in the Chetco River basin is split into two basic units at the mouth of Eagle Creek. Downstream of this point, the lushly vegetated, low gradient, uniform streams provide the habitat conditions required for chinook spawning and, to a much lesser degree, coho rearing. Upstream of this point, stream character varies greatly. The low gradient reaches are smaller, far less frequent and separated by steeper, rougher stream segments. These conditions, while not so extreme as to exclude chinook, favor the more hydrodynamic body shape and solitary spawning behavior of the steelhead and cutthroat.

The current distribution of low gradient, high value reaches is shown in Figure 9 and illustrates the disparate conditions above and below Eagle Creek. There are five low gradient, high value reaches below Eagle Creek within 14 river miles of each other. Four of the five are extensive, stretching out 4, 6, 8, and 9 miles long. Above Eagle Creek, there are six low gradient, high value reaches dispersed across 33 river miles, none of which extends more than 3 miles. Also important in understanding fish distribution is that stream gradients above Eagle Creek average four times that of stream gradients below. There are no distinct barriers to chinook such as waterfalls, yet the steady increase in gradient deters their progress.

The history of land use and inherent susceptibility to channel change above and below Eagle Creek is also quite different. Most of the roading, timber harvest, and other development has been concentrated in the lower portion of the watershed, while the upper portion is largely undeveloped. The steeper, more confined channels of the upper river tend to flush coarse sediments and maintain themselves more than the wider, flatter channels of the lower basin. The effects of land use will be concentrated in the highest value fish habitat, and will impact the tenuous coho first, then the chinook, and then, to a much reduced degree, the steelhead and cutthroat.

Where have human activities degraded or threaten to degrade fish habitat?

The quality of fish habitat in the various Chetco River tributaries is generally quite high, especially when compared to other river basins in the region (ODFW, 1993) and is discussed in detail in the subwatershed description, hydrology, and channel morphology sections of this document. Many lower river tributaries experienced an increase in coarse sediment delivery and a decrease in large wood availability following timber harvest and associated roading between 1960 and the late 1970's. However, the basin has had twenty years of recovery and most tributaries now offer excellent habitat.

Important sites where fish habitat condition has been adversely affected by human activity are located where critical habitat (for one or more species) overlaps with channels that have been aggraded or have lost large wood or sources of large wood. These sites are along or influence one of the low gradient, high value reaches identified on Figure 9.

The following list of sites may not be complete. It is expected that others may be present, but are not yet known.

Mill Creek High Value Reach - Timber harvest has removed a large percentage of the conifer component of the riparian vegetation. Sources of large wood have been depleted.

A high density of roads, with some on moderately steep slopes, increases the risk of coarse sediment delivery to the stream. The lack of large wood in the channel decreases the channel's ability to provide high quality fish habitat if coarse bedload transport is increased.

Emily Creek High Value Reach - Adequate instream cover for overwintering of coho juveniles is critical and lacking. Large or small wood masses would increase cover.

South Fork High Value Reaches - Logging activities increased sediment delivery and decreased the large wood supply in West Coon Creek, and the channel still appears to be affected. Decreasing the risk of sediment delivery here should be a high priority.

Timber harvest and roading on the south bank of the South Fork between West Coon Creek and Basin Creek has greatly increased the risk of sediment delivery. Many roads are showing signs of age and maintenance needs. The 1107.550 road has been identified as a specific concern. The stream currently does not appear to be affected, except immediately downstream of West Coon Creek. However, the low-gradient depositional area is sensitive to aggradation.

Information Needs: Inventory areas of critical habitat to determine if other sites exist where fish habitat has been adversely affected by human activity.

Management Opportunities: Protect and restore High Value Reaches. Specifically:

Restore sources of large wood, and reduce the chance of delivery of coarse sediment from roads in Mill Creek priority high value reaches.

Increase critical instream cover for overwintering of coho juveniles in Emily Creek. Wood masses, large or small, would increase cover.

Restore sources of large wood, and reduce the chance of sediment delivery to low gradient reach of West Coon Creek.

Reduce the chance of sediment delivery from older, poorly maintained roads on the south bank of the South Fork (between West Coon and Basin Creek), particularly the 1107.050 road.

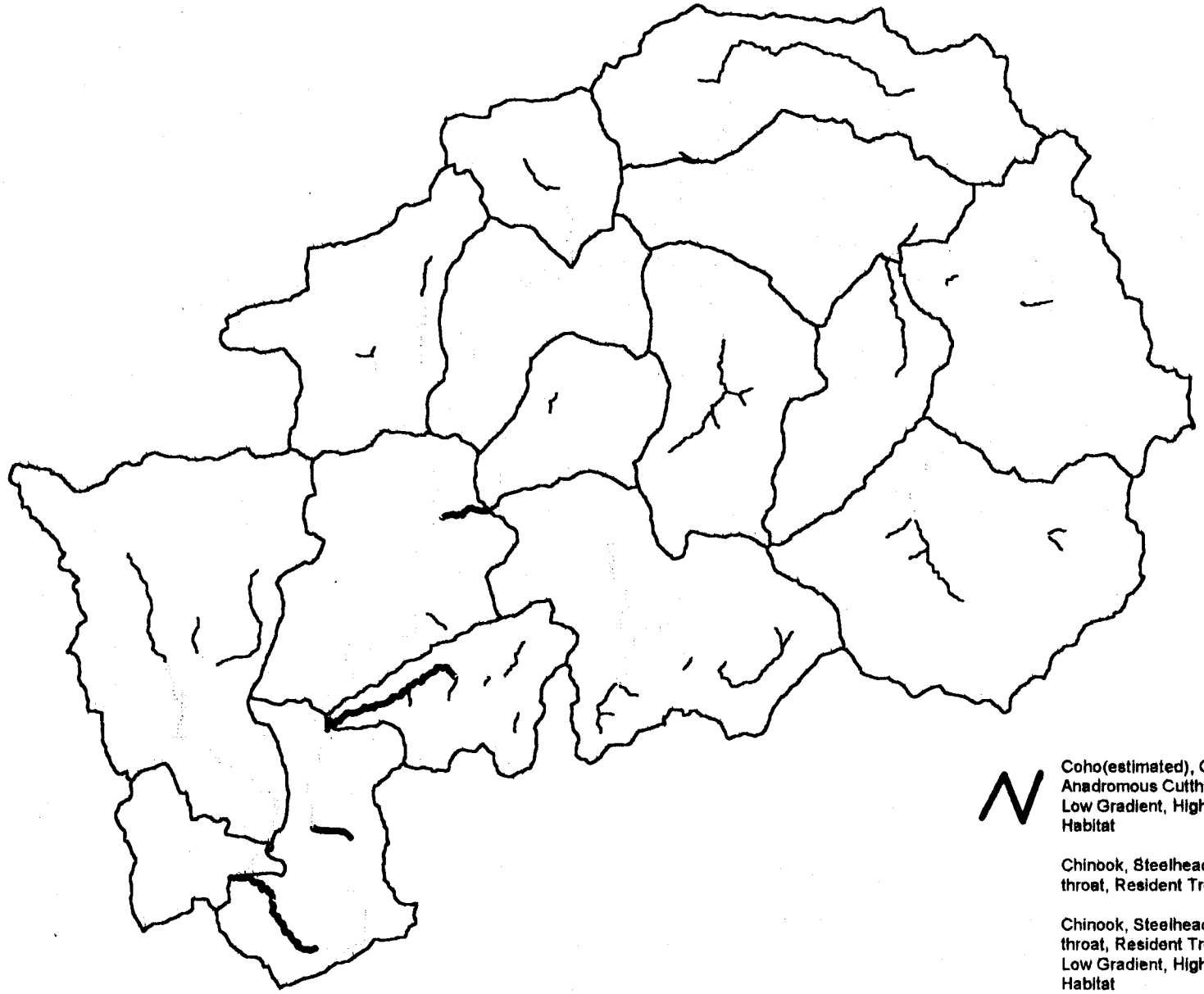
Reduce the chance of sediment delivery from tractor yarding in section 36 (R12W, S28S) in Quail Prairie Creek.

Reduce the chance of sediment delivery from the 1846 road in Eagle Creek.

Figure 9.

Chetco River Watershed Analysis

Fish Distribution



RIPARIAN ECOSYSTEM

What are the riparian processes in the watershed?

Riparian zones in the Chetco River watershed can be stratified into four distinct categories based on vegetative characteristics. These are conifer forest, hardwood forest, meadows, and riparian areas on soils developed in serpentinite and peridotite (ultramafic soils). Each category has its own processes for sediment delivery, channel formation, hydrologic regime, susceptibility and response to change, microclimate qualities, flora, fauna, and migration habitat qualities. Potential riparian restoration sites have been identified in the large wood, sediment delivery, and fish habitat discussions.

Conifer Forest Riparian

The most abundant riparian type in the Chetco watershed is the conifer riparian forest. It is generally located on soils with high to moderately productivity, where water supply is not limiting growth and topography tends to exclude frequent or intense fire (north slopes). Because of its abundance and high value wood production, more land use activities have occurred in this riparian type than in any of the others. Many conifer riparian stands are candidates for restoration.

Abundant, tall conifers dominate these riparian areas. Douglas-fir is by far the most common overstory conifer. Port-Orford-cedar is an associate of Douglas-fir. Pacific yew has very scattered distribution. Western hemlock is a coniferous associate of Douglas-fir in the lower watershed, especially south of the river.

The stand canopy is closed in these areas with most canopies being multi-layered. Hardwood trees are an important mid-layer component. Conifers, with the exception of cedars, create more acidic soils through litterfall than hardwoods. The evapotranspiration associated with the numerous large trees is high. Air temperatures are cool and diurnal fluctuations are moderated throughout the year.

The stands are generally very stable. Tanoak seldom reaches climax condition due to the time-span required for this succession and the longevity of dominant conifers (200 to 300 years). Fire does not start or carry well in most of these stands. Light disturbance from windthrow, land movement, wind or snow damage leads to continual recruitment of conifers. In the event of large scale disturbances these riparian stands are slow to recover to a mature state.

Water-holding capacity of these stands both results from, and helps create, a greater percentage of perennial streams than other vegetation types. Root strength and often dense undergrowth contribute to generally stable stream banks. However, riparian conifer stands can develop on earthflows, and exhibit features of deep-seated instability. Earthflows can be important sources of structure for stream channels by providing boulders and large wood. Areas disturbed by debris flows and inner gorge landslides are often colonized by alder.

In conifer riparian areas, large wood in the form of limbs and boles is continuously delivered to and incorporated into the channels. Stream temperatures tend to be cool throughout the year. Tall trees can shade even moderately wide channels in summer. Roads and streams are important conduits for *Phytophthora lateralis* where Port-Orford-cedar is present in the riparian zone.

Where coniferous riparian areas are surrounded by similar upland stands (generally on north-facing slopes), they are important water sources for interior habitat-dependent wildlife. When they are dissimilar to the surrounding upland habitat (generally on south-facing slopes), they are important uphill-downhill migration corridors for interior species. Stable air temperatures make them valuable thermal refugia in extreme weather for many wildlife species. These riparian stands can be critical habitat for spotted owls and marbled murrelets.

Riparian stands of red alder are generally an early to mid-seral stage of the riparian conifer forest. These stands were usually created by stand replacement events such as timber harvest, debris torrents and inner-gorge landslides. Extensive stands of red alder exist in Mislatnah and Blueslide Creeks and are a result of natural events. Extensive stands in Mill Creek and the eastern fork of Quail Prairie Creek are a result of timber harvest. These stands can be critical habitat for white-footed voles. Dominance of alder can extend upslope to limit recruitment of conifers. Natural conversion to conifers can take 70 to 100+ years. Mountain beavers (*Aplodontia rufa*) also tend to limit conifer seedling establishment in the alder stands.

Hardwood Forest Riparian

Hardwood-forested riparian stands tend to replace conifer-forested riparian stands where either water is limiting or a regime of either frequent low intensity or high intensity fires have disturbed the riparian zone. Because these stands tend to occur on ridge tops, many have been crossed by roads. The economic value of the hardwoods is much lower than conifers, so far less timber harvest has occurred in these riparian areas. Conversion of these sites to conifer for timber stocking objectives has been successful, but required costly, intensive management. As a result, restoration opportunities targeting this riparian type are few.

Hardwood riparian stands are dominated by tan oak trees, with madrone, myrtle, chinquapin, knobcone and sugar pines often present. Often scattered conifers such as Douglas-fir will grow directly out of the stream channel, where there is more water, but they are anomalies. Extensive stands of red alder in riparian areas are generally an early to mid-seral expression of the conifer forest riparian and its processes are more accurately described in that section.

Although the canopy is closed, the single-storied structure does not have the insulating qualities of the conifer forest. Humidity is much lower and air temperatures vary a great deal with the seasons. The microclimate differs little from surrounding upland. Stream temperatures are cool as a result of the closed canopy. Fire will both start and carry well in the riparian stands. These stands have low resistance to change from fire and wind and snow damage. Yet, their closed canopy, single-storied structure is quick to regenerate.

Because of their predominantly south slope, ridgetop slope position and inability to hold water, these stands most frequently surround seasonal streams. Stem density can be very high and subsequent root strength combined with less water leads to generally stable banks. Ground cover is usually low, leading to more surface erosion than conifer riparian stands. Because of the predominantly seasonal nature of streams, these areas have a lower aquatic biodiversity and shorter aquatic food chain than coniferous riparian areas.

Hardwood riparian stands are generally similar to their upland surroundings, making them valuable watering sites for local wildlife. They are less important for thermal cover and migration corridors than coniferous riparian stands. Their acorn crop makes them important foraging areas for mast-dependent wildlife.

Meadow Riparian

Meadow riparian areas are limited to the margins of a few scattered, ridgetop or south-facing prairies. They occur on either dry sites with high fire frequency or on wetland (water-saturated) soils. A reduction in fire frequency over the past century has increased forest encroachment rates on the dry site meadows. Most meadows outside of National Forest have been homesteaded and the riparian areas have generally been the site of water source developments. Within the National Forest many of the meadow riparian areas have been grazed by cattle and a few have water developments for cattle. With the exclusion of fire, most have been encroached upon by conifers and are candidates for restoration.

Historic photos (1940's) of meadows in the Chetco watershed show vegetative coverings of either grass or shrubs along streams. In either situation, meadow riparian areas are open canopy areas. As a result, they receive lots of solar radiation, have high diurnal temperature fluctuations, little microclimate differences, and a narrow range of influence beyond the active channel. Fire will start and carry very rapidly through meadow riparian areas. They are dependent upon frequent fire for maintaining their open canopy characteristics.

Stream channels tend to be along the margins of the meadows and are either seasonal creeks or perennial seeps or boggy areas. Light vegetative covering makes easily destabilized banks prone to downcutting and headwall erosion. Water temperatures show a strong diurnal fluctuation, similar to air temperatures. Aquatic invertebrate and amphibian populations tend to use these streams seasonally. On-site diversity of these groups are low, yet may include highly specialized or unique species. Downstream aquatic diversity is increased because of the different types of production occurring at these sites.

Meadows provide a horizontal migration route. Riparian areas on their margins provide important water sites for the meadow-dependent species, but do not function as important migration corridors themselves. However, their location along the edge of the forest/meadow ecotone increases the on-site diversity of terrestrial species.

Ultramafic Riparian

Ultramafic riparian areas are located in the upper subwatersheds, mainly in the Kalmiopsis Wilderness. At these sites high levels of magnesium relative to calcium, high levels of nickel and chromium, and low levels of available soil water favor growth of tolerant plant species. Plant growth is also limited by these factors. Ultramafic rocks weather to produce landforms with unique topography and hydrology, often prone to mass wasting and erosion in areas with heavy precipitation. Effective and feasible restoration methods for these ultramafic lands are unavailable.

The highly sheared structure and low water permeability of the ultramafic rocks result in frequent springs and bogs, flashy flows, inner gorge landslides, and highly erodible stream channels which are sensitive to ground disturbance. The interaction of stream flow with large boulders and resistant outcrops can result in a diverse channel morphology. Because ultramafic riparian areas have fewer trees than conifer or hardwood riparian, there is less large wood in the stream channel providing structure. However, when large Port-Orford-cedar is delivered to the channel, it decomposes slowly and functions as structure for a longer period of time than a similar piece of Douglas-fir. Because of the open canopy, stream temperatures are usually much warmer than in streams bordered by dense conifer or hardwood forest. The soil chemistry results in higher pH water than in streams which flow through other soil types, yet aquatic life appears as abundant and diverse as that of streams in other areas.

Overstory ultramafic riparian vegetation is often dominated by Port-Orford-cedar. Most stands of Port-Orford-cedar occur within the Kalmiopsis Wilderness. Port-Orford-cedar grows slowly on these sites, generally reaching 30 inches diameter in 400 years on seasonal streams and 30 inches in 200 to 300 years in perennial wet sites. It will remain standing long after it dies. While Port-Orford-cedar has a slow decomposition rate, the sparse vegetative cover on ultramafics creates a low fuel load. This, in turn, results in low intensity fires when fire occurs.

Phytophthora lateralis is an introduced pathogen that kills Port-Orford-cedar reducing shade and future large wood. Mortality rates in well-established disease sites are generally higher in the flat, wet sites and lower on steeper stream sections where spores cannot catch on to roots as easily.

Except for the portions of Tincup Creek that burned in the 1987 Silver Fire, fire has not killed Port-Orford-cedar in the Chetco Watershed with the same intensity as *Phytophthora lateralis*. The rate at which Port-Orford-cedar dies from the introduced root disease could likely exceed the range of natural variability. This has already occurred in Hawks Creek, the Little Chetco, and the mainstem immediately downstream of Little Chetco, and is a result of the disease being introduced into the Wilderness in 1990.

Most stands have an open to moderately closed canopy (20 to 70%). Understory vegetation cover varies from open to dense. Therefore, seasonal and diurnal temperatures fluctuate more than in other riparian stands. Ultramafic riparian stands provide a cooler, contrasting microclimate to the harsh upland ultramafic areas often dominated by open Jeffrey pine stands.

These riparian areas support a high diversity of specialized plants, with many species being endemic or sensitive. Yet terrestrial vertebrate diversity and abundance is low. This is a result of the low thermal cover and low availability of forage. Most use by terrestrial vertebrates is seasonal. Riparian areas are important both as water sources and as travel corridors.

Information Needs: Site-specific analysis and surveys to support management activities within Riparian Reserves, as described in the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (ROD).

Management Opportunities: Implement management activities within Riparian Reserves which preserve the critical riparian processes described for each riparian type and meet the objectives of the Aquatic Conservation Strategy. Where site-specific analysis determines that the critical riparian process described above can be met, adjust Riparian Reserve boundaries in accordance with ROD pp. B-13 and C-31. Restore riparian processes where they are not properly functioning. Specifically:

Plant disease-resistant Port-Orford-cedar on lower risk sites (30 feet and greater from the streamcourse). As these seedlings grow, they will likely provide structural diversity in the stand, and provide a future source of large wood. In some cases, salvage projects can move diseased riparian reserves closer to the range of natural variability by removing excess large wood in the Port-Orford-cedar species class, and by attempting to restore the live Port-Orford-cedar through planting.

Extensive alder stands, especially in the Mill Creek, Quail Prairie Creek, and Mislatnah Creek subwatersheds can be partially converted to conifers by girdling or removal of alders and underplanting of conifers. Standing large wood can be restored to the Middle Chetco, Eagle Creek, and Lower Chetco subwatersheds by thinning and release of existing conifers. These conifers can grow to provide structural diversity, provide a future source of large wood and improve late-successional habitat, and move alder-dominated and harvested riparian reserves closer to the mid-range of natural variability.

Characterization of Vegetation and Wildlife Habitat

Plant communities of ultramafic soils are common in the eastern part of the watershed. Jeffrey pine, western white pine, incense cedar, Douglas-fir, and knobcone pine are common on well-drained soils over much of the Kalmiopsis Wilderness, and parts of the Mislatnah and Boulder Creek drainages. Port-Orford-cedar is found on poorly-drained soils. Huckleberry oak, coffeeberry, small leaf tanoak, labrador tea, western azalea, and tan oak are common shrubs. Concentrations of Brewer spurce and lodgepole pine are scattered in the Wilderness.

There are three botanical areas: Big Craggies, Babyfoot Lake, and Vulcan Peak. All are associated with ultramafic soils or conifer diversity and are located in or adjacent to the Wilderness. The Kalmiopsis Wilderness is legendary for its diversity of plant life. This is largely a result of plants adapting to the serpentinite and peridotite soils, geological, erosional and depositional influences, and periodic fire regime. A large number of the rare and sensitive plant populations are associated with Wilderness. *Kalmiopsis leachiana*, *Erigeron cervinus*, and *Lewisia cotyledon* var *purdyi* are three species located only within the Wilderness portion of the watershed.

Open meadows and prairies are an important unique wildlife habitat associated with the watershed. These areas (1,247 acres, 0.5 percent of the watershed) are predominantly associated with ridges along the mainstem and tributaries of the Chetco River, such as Long Ridge meadows, Low and High Prairie, Mislatnah Prairies, and Red Mountain Prairie. These areas are experiencing encroachment by tree species onto the open grass areas especially in the last 50 years, in part due to fire suppression. Native grass species common in these areas are *Festuca idahoenisis*, *F. californica*, *Danthonia californica*, and *Elymus glaucus*. Meadows and prairies are important forage and rearing habitat for a variety of wildlife species, especially Roosevelt elk, black-tail deer, grouse and quail, and neotropical migratory birds.

Other unique or important wildlife habitats are Dispersed Old-Growth Habitat (3,003 acres); Hardwood Stands (1,336 acres); Lakes and Ponds (50 acres), Rock Bluffs (1,977 acres) and Wet Areas (14 acres). Combined with meadows, unique habitats account for 7,629 acres, or roughly 3 percent of the watershed.

Snag and large down wood habitats are limited throughout the watershed due to erratic fire history, soil types, seral habitat types, and timber management practices. Roughly 39 percent (88,322 acres) of the watershed is in the early/pioneer seral habitat conditions, with little or no snag or large wood habitat. Overall, managed stands in the watershed average 29.2 percent habitat capability, or contain an average of 1.2 snags per acre. This is below the 60% or 2.27 snag per acre standard and guideline requirement for the Siskiyou National Forest.

Late seral habitat (26,550 acres) accounts for roughly 12 percent of the watershed. This habitat is distributed throughout the watershed mainly along riparian zones and as small isolated stands that are less than 500 acres in size. Mid-seral habitat (64,520 acres) accounts for nearly 29 percent of the watershed and is also primarily associated with riparian zones and late-seral habitat areas. Interior forest habitat is limited to a relatively few stands throughout the watershed. There are only eight areas which contain core areas 200 to 300 acres in size. These eight areas account for roughly 16,000 acres. Interior forest habitat areas are important habitat for northern spotted owls and for marbled murrelets. The remaining 69 percent of the watershed is composed of either early seral, pioneer, or non-vegetated habitats. These habitats are scattered across the watershed, primarily on ridges and midslope areas, and consist of conifer plantations, brushfields, hardwood stands, and other non-conifer vegetation.

The amount of hardwood stands in the mid-watershed is at a high point in the natural range of variability. This may be due to high intensity fires set by miners in the 1800's and due to the abundant fires of the early 1900's (1910's and 1930's).

As characteristic of most watersheds in the Klamath Province, fire has undoubtedly influenced the landscape for thousands of years. The area's mediterranean climate favors ignition and spread of summer and fall wildfires. Summertime lightning events have been the source of many fires. Lightning storms are often accompanied by varying amounts of rainfall. The interior summertime temperatures reach well above 90 degrees for long periods of time. East wind events during the late summer and fall are quite common. These east winds often deliver 90+ degree temperatures down the river corridor to the shore line. These weather conditions affect fire intensity and spread rates within the watershed.

Since 1910, approximately 40 to 50% of the Chetco River watershed has been burned once, 10 to 15% of the watershed twice, and a few areas along the western edge (approximately 1 to 3%) have burned three times. While the largest of the fires burned in the Kalmiopsis Wilderness, the most numerous and frequent fires burned along the Chetco River corridor and to the west. With the exception of the Silver Fire in 1987, most fires since the mid-1940's have been relatively small, especially compared to fires prior to this time. This can be attributed to more efficient fire detection and suppression tactics that came about during this era.

In the past 70 years, fires have burned approximately 55% of the Kalmiopsis Wilderness. While lightning, accounts for the majority of the acres burned, human-caused (early settlement/mining/industrial) fires also covered the landscape. Fires in the Kalmiopsis can be large, high intensity, stand replacement fires. There were large fires up until the late 1930's/early 1940's, and then again in 1987 and 1994; with few major fires from 1940 to 1987. The percentage of areas burned during the 20th century is higher than in the North Fork Smith River and Winchuck River watersheds.

What are the processes affecting special and unique habitats in the watershed?

The Siskiyou LRMP identifies special and unique habitats as important areas for wildlife, and established standards and guidelines for management requirements of these sites. Most special wildlife habitats are allocated as Management Area 9 (MA-9). Those areas not allocated as MA-9 are managed according to Forest-wide standards and guidelines 4-14 through 4-18, (LRMP IV-36,37). All special and unique wildlife habitats are identified as Administratively Withdrawn Areas (AWA) under the Record of Decision for the Northwest Forest Plan. The Southwest Oregon Late-Successional Reserve (LSR) Assessment (pages 78-84) addressed the issue of management of unique habitats within LSRs.

Natural processes of forest or aquatic habitat succession may not develop suitable habitat conditions for some species of wildlife which may be dependent either on meadow (early seral) habitat or open water habitat. Management of these unique habitats for certain desired species may conflict with natural processes.

Meadow & Pine-Grass Ultramafic Areas

Open meadow areas, including pine-grass serpentine areas, are being encroached on by conifers and hardwoods. This encroachment has occurred for several decades, as indicated by loss of meadow areas on aerial photography from 1939 to present. For example, in the Long Ridge Meadow, there are areas of older encroachment with all tree sizes 8" diameter breast height (dbh) and up, with evidence of little or no seedlings. Some areas have younger encroachment which consists entirely of seedlings and saplings under 4" dbh. Also, introduced grasses, such as *Cynosurus* (dogtail), have out-competed native grasses and have colonized large areas of the meadow. Native grass species present in meadows within the watershed are: *Festuca idahoensis*, *F. californica*, *Danthonia californica*, and *Elymus glaucus*, with *Stipa* sp. and *Agrostus* sp. present to a lesser extent. Where encroachment is occurring, these native grasses are being shaded out by the encroaching trees, or are being out-competed by exotic or non-native grass and forb species.

Other meadows and serpentine areas in the watershed have conditions similar to those found in Long Ridge Meadow. The 1939 aerial photos of High Prairie, Low Prairie, The Pines (ultramafic), and Mislatnah Meadows show that there was more open meadow area than exists today. Previously, the only conifers present within the subwatershed containing these meadows were along streams and north-facing slopes or a few single isolated trees along edges of meadows/hardwood stands. Historically, fires maintained these meadow and serpentine areas as pioneer and early seral habitats. In the last five to six decades with the suppression of fires, these areas have become overgrown with other species, such as Douglas-fir, where there were only grasses or brush, such as manzanita. Maintenance of these areas, either with the removal of encroaching trees and/or the use of natural and prescribed fire, is needed to return these areas to 1940 (or earlier) conditions and for open/early seral habitat condition.

Riparian areas within meadows, serpentine areas, brushfields, and hardwood stands have developed under different processes than within conifer forest conditions. At Long Ridge meadow, several intermittent streams originate in open grass areas and flow into tributaries to Quail Prairie Creek. Lengths of channels in open meadow vary from a few feet up to 100 feet or more. The presence of canyon live oak in some stream channels indicates prior open meadow conditions. As conifers and hardwoods encroached, the intermittent stream courses grew in with a closed canopy much like forested conditions. Prescriptions for removal of encroached areas within meadows could include riparian reserve areas. Details of treatment would need to be investigated on a site-specific basis.

Open meadow and serpentine areas are important permanent forage areas for wildlife species, such as deer, elk, quail, and neotropical birds. These areas are important elements of habitat diversity across the landscape, even within Late-Successional Reserves. The 8 to 10 open meadows and pine-grass areas account for about 0.5 percent (1,250 acres) of National Forest land in the watershed. Many more pine-grass ultramafic areas lie within the wilderness. There are several private meadow areas (Wilson, Looking Glass, Yank, Northern Prairies) on Gardner Ridge in the North Fork Chetco River drainage that are being planted for conifer production. This loss of meadow habitat off-Forest makes the maintenance of National Forest meadows even more important for those species depending on this special wildlife habitat.

Springs/Bogs/Ponds/Lakes

Several lakes exist throughout the Wilderness portion of the watershed. Most of these are located in the Canyon, Middle, and Upper Chetco subwatersheds. They range in size from 1 acre to 23 acres. A few small ponds occur outside of the Wilderness portion of the watershed, at Pilkas Lake, Packer's Cabin Pond, and in the Snaketooth area. All of the ponds or lakes outside of the Wilderness are manmade and are reducing in size due to siltation/ vegetation. Springs occur in the Red Mountain/Vulcan Peak area, Long Ridge, High Prairie, Robinson Spring, and at several other sites. Some subwatersheds, such as Eagle Creek, Mineral Hill, and Middle Chetco, do not have ponds or lakes.

Hardwood Stands

There are 1,340 acres of hardwood stands allocated as MA-9 which provide habitat for early and mid seral associated species of wildlife, such as deer and neotropical migratory birds. These areas produce mast crops (acorns), have a closed canopy, and are used as foraging areas by spotted owls. These stands are an element of habitat diversity across the landscape, even within the Late-Successional Reserve. Depending on adjacent seed sources, most brush and hardwood stands were created by high intensity fires and maintained by very low intensity fires that occurred throughout most of the Chetco watershed. Fires of moderate intensity tend to maintain established conifer stands by burning back the hardwoods but not the thicker-barked conifers. Fire suppression will likely prevent most hardwood stands from converting to conifers, since tanoak is a climax species. Several partly open hardwood stands, identified as unique habitat areas, could use low intensity underburning or cutting to reduce substantial growth of conifers. Hardwood stands include tanoak, madrone, and chinquapin, and alder in the lower watershed. Most hardwood stands are in the mid-watershed. The amount of hardwood stands is at the high point in the range of variability.

Redwood Stands

The northernmost stands of coast redwood lie on the north (Redwood Nature Trail) and south banks (Snaketooth Butte) of the lower portion of the Chetco River, and in the Emily Creek drainage. The former stand is a relatively stable old-growth stand, while the latter are younger ridgetop stands still developing old-growth structure. While Wheeler Creek Research Natural Area (RNA) in the Winchuck Watershed is set aside to represent the northern extent of coast redwood, the stand at Snaketooth Butte is thought to be the northernmost natural stand of coast redwood. Unlike the largely riparian old-growth stand at the Redwood Nature Trail, the stand at Snaketooth Butte more closely resembles ridgetop stands at Wheeler Creek RNA.

These ridgetop redwood stands are thought to be younger in average age than old-growth redwood at Redwood National Park in Northern California, 300 years old compared to 700 years old. This is due to more frequent fire history and less favorable growing conditions (shallow ridgetop soils and less year-round fog). The Snaketooth Butte stand may benefit from thinning or understory burning to more closely duplicate historic disturbance regimes. This might enhance old-growth structure, including a wider range of ages of redwood through resprouting of redwood in the understory. Frost limits the northern extent of coast redwood, so migration northward depends largely on climate changes over time. Planting of redwood has extended its range unnaturally northward, although it is scattered and limited in size.

Rock Habitats

Rock outcrops are present throughout the watershed. Rock bluffs (1,977 acres) provide habitat such a denning sites, talus, caverns/crevices, and territorial marking sites for a variety of animals. These areas currently do not need any maintenance and occur mainly in the Wilderness. The Mt. Emily rock bluff provides nesting habitat for peregrine falcons, although no falcons have ever been observed. This site is the only MA-9 rock bluff area outside of the Wilderness.

Information Needs: The following areas should be inventoried for site-specific-projects: **meadow and serpentine areas** within the watershed to determine species composition, conifer and hardwood encroachment, and the presence of non-native species; **riparian and wet areas** within meadows to determine appropriate riparian area buffers; **ponds/springs/bogs/lakes** for sensitive species habitat and individuals; potential **pond** maintenance and development sites; **hardwood stands** for maintenance by underburning or cutting; **rock bluffs** for peregrine falcon nesting potential; and **redwood stands** for development of old-growth structure.

Management Opportunities: Maintain or increase acreage of meadows and serpentine/pine areas as early seral habitats through a variety of methods, including timber removal, girdling, burning, etc. Maintain open water sources when possible. Use prescribed underburning and/or cutting to maintain newly encroached hardwood stands and to enhance development of old-growth redwood stands. Develop a native grass seed collection and propagation program to enhance native grass seed populations for meadow and serpentine areas.

Make corrections to current allocations by surveying and mapping of special and unique habitats. For example, Long Ridge meadow is currently allocated as 132 acres in two MA-9 areas. 1939 photos show one long meadow area of greater than 250 acres. This is true of other meadow areas, such as High Prairie, Mislatnah Prairies, and Nook Prairie.

Where have snags and large down wood been depleted in the watershed?

The Siskiyou LRMP standard and guideline 4-13 (LRMP, IV-33-36) states a 60 percent habitat capability for woodpeckers (2.3 trees per acre) should be maintained. The LSR Assessment addresses the development of snags and large down wood on pages 116 and 142.

Large hardwoods, conifers, snags and large down wood are at reduced levels in unmanaged stands and managed stands. Before 1980, timber management practices did not leave snags and large down wood within timber harvest units. Wildlife tree and large down wood standards and guidelines were developed in the early 1980's. Between 1980 and 1985, one snag per acre was left in harvest units. From 1986 to 1989, two snags per acre were left. After 1990, 2.3 snags per acre were left in units to provide the required 60% capability. The table below illustrates acres of harvest and estimated numbers of snags left in units within the watershed:

Table 8.

< 1980 ACRES/SNAGS	1981-1985 ACRES/SNAGS	1986-1989 ACRES/SNAGS	1990 > ACRES/SNAGS
14,810 / 0	505 / 505	1,120 / 2,240	1,021 / 2,348
TOTAL ACRES MANAGED STANDS:		17,456 (excludes hardwood spraying units)	
TOTAL NUMBER OF SNAGS IN UNITS:		5,093	
PERCENT BIOLOGICAL CAPABILITY:		29.2% average for all managed stands	

Some natural stands lack large trees, snags, and down wood, except in riparian areas, due mainly to stand replacement fires that occurred during historical times, serpentine soil types, or plant series association. Roughly 59% of the watershed is in the pioneer, early seral, or non-vegetative habitat conditions, and includes all managed stands in the watershed. This may account for a lower habitat capability within this watershed compared to adjacent watersheds, such as the Winchuck watershed. In the Winchuck, there is higher snag component in stands due to lack of fires and serpentine soils, and it contains more mid to late seral habitat and interior forest.

Management Opportunities: According to the Siskiyou LRMP (IV-33), future timber harvest units may leave higher numbers of wildlife trees to offset low snag numbers in certain subwatersheds. Also, the lack of snags and large down wood can be compensated for by creating these two habitat components from suitable trees in areas surrounding managed stands. Snags and down wood could be created by topping trees in the leave tree areas along the edges of managed stands. The number of snags that need to be created would correspond to those left in adjacent managed stand. For instance, if no snags are present in the managed stand, then 2.5 snags per acre should be created in the adjacent area in order to bring the snag habitat capability of the area up to the 60% biological capability. If 1 snag per acre is present, then 1.5 snags per acre should be created in the adjacent area. Areas lacking snags and large wood within Late-Successional Reserves could also be treated to improve snag and down wood habitat. Additional snags may be created to provide large down wood. Those snags created by the removal of tops either by mechanical or explosive means, would provide immediate large down wood in the form of the tree tops, and future down wood when the snag falls as a result of natural deterioration processes.

Priority subwatersheds for development of snag and large down wood habitat are: Mineral Hill (04H), Mislatnah (04M), Upper Chetco (04U), Quail Prairie (04Q), Middle Chetco (04F), South Fork Chetco (04S), and Lower Chetco (04L). Coordinate with riparian large wood needs in the Middle Chetco (04F), Eagle Creek (04H), and Lower Chetco (04L) subwatersheds.

How is road density affecting habitat capability for wildlife?

The Siskiyou LRMP identifies the use of habitat capability models (IV-32) to be used in project planning to reach management objectives for wildlife. Habitat effectiveness models, like the one developed for elk habitat (Wisdom and others, 1986), discuss the effect of road density on habitat quality. Two miles of road per square mile of habitat has been set as a desired road density for any given area (ODFW, 1994; Draft Siskiyou Elk Management Plan, 1994).

A high road density may reduce habitat effectiveness or capability by having higher levels of vehicular traffic, higher potential for disturbance of wildlife by humans, and higher potential for poaching of wildlife.

Road densities in the non-wilderness portion of the watershed are greater (2.6 mi/sq mi) than the desired 2.0 miles per square mile for wildlife habitat capability. Four of 10 subwatersheds are greater than the 2.0 miles per square mile area: Middle Chetco (04F) = 4.4 miles per square mile area; Lower Chetco (04L) = 3.5 miles per square mile area; North Fork Chetco (04N) = 2.9 miles per square mile area; and Upper Chetco (04U) = 2.4 miles per square mile area. Within certain Watershed Analysis Areas (WAA) within each subwatershed area, road density may be greater than desired amounts. For instance, in the vicinity of High Prairie, road density for a four square mile area is 2.65 miles per square mile area.

Information Needs: Determine which roads can be closed to reduce road densities.

Management Opportunities: Manage open road densities within Watershed Analysis Areas and subwatersheds at 2.0 miles of road per square mile area. Close or restrict access on roads in areas with high road densities and coordinate with other road closure needs (Port-Orford-cedar, watershed restoration, etc.).

What is the status of Proposed, Endangered, Threatened, Sensitive (PETS), or Watch species?

Limited surveys for sensitive species have been conducted within the Kalmiopsis Wilderness, with most being conducted along trails. Sensitive plant sightings have been primarily in the Wilderness. *Kalmiopsis leachiana*, *Erigeron cervinus*, and *Lewisia cotyledon* var *purdyi* are found only within the Chetco watershed portion of the Wilderness, due in part to the distribution of ultramafic soils. Some populations of *Kalmiopsis leachiana* in the area between Slide Creek and Taggart's Bar seem to be declining (personal observation by Rene Casteran, Wilderness Technician, from 7/91 to 7/95).

Sensitive wildlife species are limited to certain portions of the watershed. Spotted owls have been recorded at 15 sites on National Forest land and at two sites on Bureau of Land Management land. None of the National Forest sites contain 60 percent or greater habitat suitability within 1.3 miles of any activity center. Seven sites contain 40 to 45 percent habitat suitability within 1.3 miles of each activity center. The other eight sites contain less than 40 percent habitat suitability within 1.3 miles of each activity center. Sites below 40 percent habitat capability are considered sites of concern by the US Fish and Wildlife Service (FWS). The FWS has recommended managing spotted owl activity centers at 40 to 60 percent habitat suitability as a minimum requirement. Sites below 40 percent should be considered for improvement. Table 18 provides information on owl dispersal habitat using the 50-11-40 rule.

Murrelets occur in the west portion of the watershed, west of the R12W/R11W legal line. There are six areas where "occupancy" or nesting occurs, within the Lower Chetco (04L), Middle Chetco (04F) South Fork Chetco (04S), Emily Creek (04E) and parts of Eagle Creek/Mineral Hill (04M) subwatersheds.

Wolverines are suspected to occur throughout the Wilderness, and in the Mislatnah and Boulder Creek drainages. Common and California mountain kingsnakes have been documented in the Wilderness. Del Norte salamander habitat and sightings are limited due to lack of talus substrate in the lower part of the watershed. Red-legged frogs and western pond turtles have been documented in the Chetco River, below South Fork Chetco. *Plecotus* (big-eared bats) are suspected due to suitable habitat present in the form of mines, caves, abandoned cabins and bridges. Other PETS wildlife species are not expected to occur in the watershed due to lack of suitable habitat.

The watershed contains part of the South Chetco Late-Successional Reserve (LSR) and part of the North Chetco LSR designated for northern spotted owl and late-successional related species. However, due to historical fires, some serpentine soils and habitats, and non-late-successional plant associations within the watershed, late-successional habitat now, and in the future, may never account for more than 40 percent of the total watershed. Currently there are 64,520 acres of mid seral habitat and 26,554 acres of late seral habitat. There are eight patches of interior forest habitat, none of which exceed 1,000 acres per site. Management of spotted owl activity centers is discussed in the LSR Assessment on pages 132 and 143.

Information Needs: Analyze current updated habitat suitabilities for all spotted owl activity centers using PMR/GIS database. Survey for sensitive species outside of project planning areas.

Management Opportunities: Develop stands into suitable habitat within those spotted owl activity centers with less than 40 percent suitable habitat. Develop stands to supply suitable foraging, nesting, and roosting habitat for northern spotted owls. Monitor population trends of PETS and Watch species, especially *Kalmiopsis leachiana.*

What stands need treatment to improve interior forest and late-successional habitat?

Several stands (about 61,000 acres, 28% of the watershed), both managed and natural, are overstocked. Competition from hardwoods and conifers is slowing the development of younger stands. Older forest and interior forest habitat is fragmented into small patch sizes. Some older forest habitat is not functioning as interior forest habitat because of small patch size and edge effect. Pioneer and early seral stage accounts for 39% (88,322 acres) of the watershed which lack some of the habitat components (large down wood, trees greater than 20" dbh, snags greater than 20", multilayered canopy, etc) necessary for development of late-successional seral habitat. Late-successional habitat now, and in the future, may account for a small percentage of the total drainage (less than 15 percent), due to habitat component requirements. The table below describes current seral stage types, acres, and percentage of watershed:

Table 9.

STRUCTURAL STAGE:	ACRES:	PERCENT OF WATERSHED:
NON-FORESTED OR NO DATA	45,561	20 %
PIONEER	27,515	12 %
EARLY SERAL	60,807	27 %
MID SERAL	64,520	29 %
LATE SERAL AND CLIMAX	26,617	12 %
TOTAL	**225,020**	**100 %**

Acres taken from PMR database using U-Tools model. For the most part, data for non-National Forest land is not available for this Watershed Analysis and is indicated by "No Data". See Figure 10 for a map of these seral stages.

Combined, mid and late seral habitats account for 41 percent of the watershed. These habitat types are distributed in small patch sizes throughout the watershed. Using the FRAGSTATS program, the watershed was analyzed for interior forest habitat patches that were greater than 200 acres in size. The program uses plant series over 20" dbh (large size trees) for patch size distribution. There are eight patches of habitat which met mid/late seral habitat criteria. Most of the patches contain 800 to 1500 acres of mid/late seral habitat. All except one of these patches contain core areas ranging from 230 to 300 acres. There is only one patch with a core area greater than 300 acres, this area contains 3,877 acres (South Fork Chetco subwatershed). The following subwatersheds do not contain core areas or patches of interior forest habitat: Canyon Creek (03C), Lower Chetco (04L), and North Fork Chetco (04N).

The amount of hardwood stands within the watershed is at a high point in the natural range of variability. This may be due to high intensity fires set by miners in the 1800's and due to the abundant fires of the early 1900's (1910 to 1930's). Some conversion (about 1,000 to 1,500 acres) of hardwoods to conifers has occurred since the 1960's but the amount of hardwood stands is still high. Fire suppression will likely prevent most stands from converting to conifers, since tanoak is a climax species. Hardwood stands adjacent to existing patches of interior forest habitat, and hardwood stands that have received initial conifer enhancement, offer opportunities to develop coniferous, interior forest habitat while retaining a significant hardwood component.

The management of Late-Successional Reserves has been analyzed in the Southwestern Oregon Late-Successional Reserve Assessment (10/95). Refer to that document for discussion on management of LSRs and recommendations for development of late-seral habitat.

Information Needs: Inventory stands adjacent to late-seral patches which may be developed into larger core areas for interior forest habitat. Inventory stands lacking late-seral habitat components.

Obtain seral stage information for the non-National Forest portions of the watershed.

Management Opportunities: Increase spotted owl habitat to a 40 to 60 percent minimum habitat capability for those spotted owl activity centers with less than 40 percent habitat suitability. Increase core area sizes to greater than 200 acres for smaller patch areas.

Develop stands lacking late-seral habitat components into suitable late seral habitat. Conduct additional conifer treatments of hardwood conversion areas to further develop late-successional/interior forest habitat.

How are non-native species affecting native species within the watershed?

Several types of non-native species have been introduced into the watershed, noxious weeds, Port-Orford-cedar root disease (spores), and wild turkeys. All are non-native species that have been introduced through human causes, either deliberately or accidentally, which may out-compete and possibly cause declines in native species populations.

The Siskiyou LRMP identifies standards and guidelines for the control of noxious weeds and Port-Orford-cedar disease (IV-63). In addition, Regional policies provide direction for the use of native species, whenever possible, in project implementation (FSM 2470).

Noxious weeds

Noxious weeds, mainly scotch broom, bull thistle, and tansy ragwort, have been introduced into the watershed along roads. Some roads have weeds spreading along them (1107, 1376, 1909, 1917), while others have small isolated populations (1376.370, 1376.360, 1407.130). Almost all roads in the watershed are infested with one or all of these species. With few exceptions, most infestations currently are limited to road surface and prism where ground disturbance has occurred. Thistle has spread out into open meadow areas.

The one known site of French broom in the watershed is at the junction of the 1107 road and spur 1107.550 and is spreading along both roads. French broom is not known to occur anywhere else on the District. Gorse is currently limited to one site at low water bridge on private land.

Noxious weeds establish easily and quickly on disturbed soil sites, and over time will crowd out native vegetation. This is especially true with both brooms, which produces heavy amounts of seed and establishes quickly. All of the plants mentioned can spread by windborne seeds, or mechanically by vehicle fenders, bumpers, or tires picking up pieces of plant with seeds and carrying them to other areas. Treatment of infested areas is needed to reduce, control, and/or eliminate the further spread of these plants in the watershed.

Introduced grasses, such as *Cynosurus* (dogtail), have out-competed native grasses and have colonized large areas of meadows (Long Ridge, High Prairie). Wheatgrass is present at eh Tincup trailhead.

Port-Orford-cedar Root Disease

Port-Orford-cedar occurs in moderate to high concentrations in the upper portion of the watershed, associated largely with wet sites and ultramafic terrain in the Wilderness. The Mislatnah, Moores Creek, Red Mountain Creek, Mineral Hill Fork, and Eagle Creek drainages also have populations in riparian areas of the mid-watershed. The associated root disease, *Phytophthora lateralis* has been introduced into the Little Chetco and Mineral Hill Fork subwatersheds in the last five to six years. However, many uninfested creeks and tributaries lie in the Chetco watershed, especially in the Wilderness. Although the rate of spread has slowed since 1950 to 1960's, spread to isolated drainages is still occurring.

Specific areas with disease include Mislatnah Creek/Road 1376; Red Mountain/Vulcan Lake trailhead/Road 1909; Chetco Pass/Sourdough Flat/Road 087 (Chetco Rim in the Wilderness); and Upper Chetco Seed Orchard (POC research outplanting site) in the Mineral Hill Fork.

Wild turkey releases

The Oregon State Department of Fish and Wildlife (ODFW) started releasing wild turkeys in the Lower Chetco subwatershed on private land adjacent to National Forest in 1993. In 1994 and 1995, additional releases were conducted on private land within the South Fork Chetco and Quail Prairie subwatersheds. These animals are not native to southwestern Oregon. Populations have expanded or moved onto National Forest land in the Quail Prairie, Middle Chetco, and Lower Chetco subwatersheds. Effects on existing endemic species, such as grouse and quail, are unknown at this time.

Information Needs: Study and monitor the spread of turkey populations and the effects on quail and grouse populations. Survey roads within the watershed for noxious weeds and plan for control at sites and disposal of plants and seed sources.

Management Opportunities: Cut, pull, and burn noxious weeds. Close selected roads to motorized vehicles. Clean equipment before entering Forest and after working in infested areas. Contact private landowners about gorse treatment at low water bridge. Develop native grass seed collection and propagation for meadow areas with non-native grass species. Control and reduce spread of non-native grass species.

Consider road restrictions and possible sanitation at specific areas to control the spread of Port-Orford-cedar root disease.

Develop monitoring study of wild turkey population movements and effects on native wildlife species.

What is the fire history and the future role of fire in the watershed?

During pre-historic times and up to the early part of this century, fire was allowed to burn un-checked. Weather and natural terrain features were the only things that affected the spread of wildfire. Native Americans used fire to enhance forage for game which they hunted and to stimulate the growth of plant species used both for food and to make baskets. Early Euro-American settlers used fire to clear vegetation for ease of mining, travel and later grazing.

The Regional Ecosystem Assessment Report (1993) on the range of natural conditions, indicates that there is not a clear picture of the natural range of conditions as it pertains to the role of fire. It states, pre-1850 assumptions about the climate, fire regime, and Native American activities are a questionable reference point. It further concludes that post-1850 conditions poorly represent natural conditions, due to the influence of early settlement. Evidence does suggest multiple, low intensity underburns were more prevalent than stand replacement fire events.

In the 1930's and 1940's, fire suppression capabilities became more effective and fire suppression policies mandated that all fires would be controlled. Prescribed fire, except for scattered sites of post-harvest slash and meadow burning, has not been used in recent times. Consequently, the majority of stands throughout the basin have evolved for the past half century without fire playing its natural role. The exception to this was the Silver Fire of 1987.

Historical evidence shows a multitude of large fires burned over nearly 50% of the entire watershed from 1910 to 1940. Forty-seven percent of the acres burned originated from lightning starts, the rest were human-caused. Since 1940, fire has burned only 14% of the area. If the Silver Fire was removed from consideration, since it did not originate within the watershed, this percentage would drop to 0.4%.

The table below demonstrates the increased effectiveness of detection and suppression after 1940. The fewer number of lightning fires (prior to 1940) in conjunction with their larger average size is an indication that detection and suppression was less effective during this period. It is very likely that there were actually many more lightning fires than what the statistics reflect. Multiple small fires were likely to have gained some burning momentum prior to detection, and may have grown into one larger fire.

Table 10.

Time Period	Ignition Source	Total # of fires	Total # of acres	Average # of fires/year	Average acre(s)/fire	% of total fires	% of acre(s) burned
Pre-1940's	Human-caused Lightning	27 4	43,700 39,900	1.28 .19	1618 9976	87 13	53 47
Post-1940 w/o Silver	Human-caused Lightning	29 13	215 1,003	.47 .28	7.5 77	70 30	17 83
Post 1940 w/ Silver	Human-caused Lightning	29 14	215 24,503	.64 .31	7.5 1750	67 33	00.9 99.1

The pre-1940 data was generated from 21 years of records available during this time period.
The post-1940 data was generated from 45 years of records available during this time period.
Table 19 in Appendix B gives the Known Fire History for the Chetco Watershed.

Approximately 55% of the wilderness area within the Chetco drainage has burned at least once in the past 70 years. Approximately 25% of the non-wilderness lands within the Chetco drainage have burned at least once in the past 85 years. Fuel loading on the forest floor has accumulated since the last fire. Areas that were pre-historically and historically burned for human needs have begun to be encroached upon by surrounding vegetation. Unique native plant species, dependent on the return of fire, are receiving competition from non-native and sometimes noxious vegetation. Areas which typically support a more diverse community of fire dependent species are undoubtedly having a negative impact from fire exclusion.

Fire cycles west of the Cascade mountains are estimated to be considerably longer, than those found east of the Cascades, particularly in Northeastern Oregon. The forest health situation and the effects that fire exclusion has had in northeastern Oregon can be used to point to a similar path of events that may be occurring in southwestern Oregon, on a much longer timescale.

The suppression of fire has increased the mean interval between fires in the Douglas-fir series. Continued suppression may cause an "unnatural" build up of fuels, resulting in a greater proportion of high-intensity fires when an area finally burns (Atzet and Martin, 1991). When we temper the time frame in which fire has essentially been excluded from the Chetco River area against the natural cycle of fire, it would appear the watershed is not currently out of balance. However, the stage is being set for potentially greater impacts if fire continues to be excluded.

Management Opportunities: Objectives and plans can be developed for the re-introduction of fire through the use of prescribed fire. Special and Unique Habitats, Late-Successional Habitats and other areas that would benefit from fire should be considered.

Specific treatments include: burning meadows and pine-grass ultramafic areas; burning knobcone and lodgepole pine stands to stimulate regeneration; underburning hardwood stands and conifer stands; underburning to stimulate growth of special forest products such as bear grass and huckleberry; repeated burning of noxious weed sites to kill existing and subsequently seeded plants; burning isolated sites of *Phytophthora lateralis* for eradication; burning Port-Orford-cedar regeneration to reduce roadside disease hosts; burning of harvest units to reduce slash and create planting sites; and underburning adjacent to, or in older stands (including hardwoods and redwoods) to reduce competition and fuel loading hazards.

What are the consequences of fires originating within the Kalmiopsis Wilderness escaping into the surrounding Late-Successional Reserves, and what measures can be taken to reduce potential impacts to LSR values?

The majority of stands throughout the Wilderness, the surrounding Late-Successional Reserve (LSR), and other lands in the watershed have evolved for the past half century without fire and fire effects. The Silver Fire, which burned into the Wilderness, and the Madstone Fire are the only exceptions to this within the watershed. Although rapid wildfire suppression is generally the operative plan today, the Wilderness Fire Management Plan will allow fire to play its natural ecological role in the future under prescribed conditions. The LSR Assessment for Southwestern Oregon also approves the use of prescribed fire under certain conditions to restore processes that have been limited by effective fire exclusion. Prescribed fire can be used as a hazard reduction measure to prevent catastrophic fire events that would degrade LSR values. The LSR assessment sets the objectives and procedures to use natural or management ignited fire (pg. 136-137).

The Kalmiopsis Wilderness Fire Management Plan allows natural prescribed fire to burn under certain conditions. The plan also recognizes that Prescribed Natural Fire has the potential to burn beyond the wilderness boundary into the surrounding LSR. Prescribed fires from management ignitions shall be allowed in the wilderness only to reduce the risks and consequences of wildfires within or escaping from the wilderness, and to permit lightning caused fires to play their natural ecological role safely within the wilderness. The majority of the Wilderness/PNF boundary, within the Chetco River watershed, is located along topographical features that would generally require a fire of moderate to high intensity to predictably escape this boundary. Fires burning under these conditions would generally exceed the fire intensity levels allowed in surrounding LSR. If a fire of lower intensity occurred, it could meet LSR objectives.

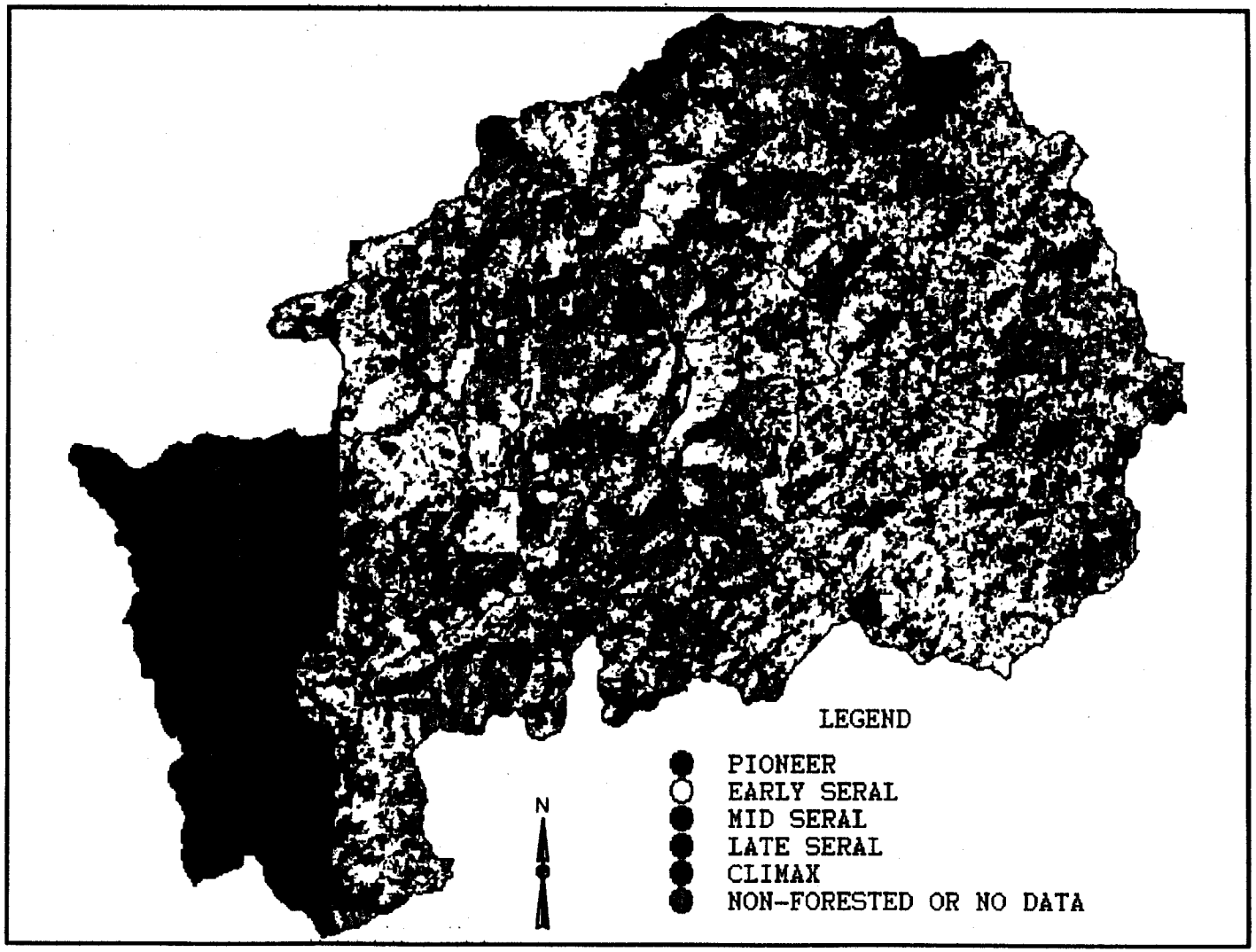
Information Needs: Gather fuel loading data in the wilderness and LSR's. Determine fire situations that would provide fire intensities that would meet LSR objectives.

Management Opportunities: The Southwestern Oregon LSR Assessment states that the use of Prescribed Natural or Management Ignited Fire in LSR's is appropriate. Criteria for use of prescribed fire are listed on page 137 of the assessment. The Assessment should be one of the tools used when fire managers complete an FSA (Fire Situation Analysis) or EFSA (Escaped Fire Situation Analysis) in an effort to determine appropriate suppression response for each incident in the LSR or having potential to enter the LSR. A prescribed fire burn plan must be prepared and approved for management ignited fires in LSR. A prescribed natural fire plan must be prepared and approved before a natural ignition can be managed as prescribed fire in LSR.

Figure 10.

Chetco River Watershed Analysis

Vegetation Structural Stages



SOCIAL ASPECTS

The following characterizations and key questions were developed to describe the past, present and potential future human uses of the Chetco River watershed.

Cultural Characterization

The Chetco River watershed is characterized as a dynamic landscape influenced by principle physical and biological processes such as climate, geology, and natural disturbances. Human processes have also had an important influence on the character of the watershed. The interactions between natural and human forces have shaped the human use of the area and have resulted in the configuration of plants, animals and even the topography of the watershed today.

Over time the face of the land has changed. A modern day resident would hardly recognize the watershed as it was 1,500 years ago during the hot and dry altithermal period. The landscape at this time was probably dominated by open park-like savannahs: grasslands with scattered oaks and pines in the uplands and conifers such as Douglas-fir and hardwoods such as maple, myrtle and alder limited to the drainage bottoms. The modern day resident would even be surprised at the face of the land 150 years ago, at the time of Euro-american contact with the native peoples. Many of the ridges would still have been prairies, the remnants of the altithermal, maintained by both natural and human-caused fires. The mouth of the Chetco River, as well as the low lying bottom lands along its course, would have been dominated by salt and fresh water marshes, while the slopes between ridge top and river would have been forested. The intermingling of grasslands, marshes and forest created wildlife habitats of great richness and variety, while life in the ocean and in the rivers was likewise plentiful beyond modern conception.

Flat, open land, preferred for human use, is limited within the watershed. Although much of the watershed appears to be uninhabitable, the resources of the drainage have encouraged men to occupy and exploit this rugged terrain. In general, most human-induced impacts to the watershed have occurred in recent history.

The prehistory and history of the analysis area are treated in Stephen Beckham's Cultural Resource Overview of the Siskiyou National Forest (Beckham, 1978). Additionally, Bancroft and Wallings have compiled general histories of the region and fragmentary local histories exist in the form of oral histories, family journals, manuscripts and photo collections.

What were the prehistoric uses of the Chetco River watershed?

Although the archeological and ethnographic information relating to the Chetco River watershed is limited, it is growing. Most archeological and anthropological research has focused on coastal sites and areas outside of this watershed.

The archeological record attests to a continuous human occupation of Southwest Oregon for at least the last eight thousand years. Excavations carried out near the mouth of the Illinois River at the Tlegetlinten site (35CU59, Tisdale, 1986) and at the Marial site (35CU84, Griffin, 1983) on the Rogue River have established dates of occupation at 8000 to 9000 years before present. Human adaptations in southwest Oregon appear to have changed from a moderately mobile, hunting-gathering lifestyle to more sedentary, specialized economies. These changes are likely to have been influenced by the effects of population displacement and growth as a result of changing climates and environments in southwestern Oregon as well as in other areas.

Archeological research in southwest Oregon has demonstrated that occupation of the region can be broken into three general periods (Connolly 1986, Pettigrew and Lebow 1987) which represent migrations of different peoples with differing survival strategies utilizing different resources. The first stage in this classification (about 6,000 B.C. to A.D. 300) represents an occupation by mobile hunting-gathering bands who are likely to have relied largely on terrestrial plant and animal resources.

A second cultural period (A.D. 900 to historic times) is known as the Siskiyou Pattern. The Siskiyou Pattern is hypothesized to represent a migration of Athapaskan populations (possibly from the Columbia Plateau region) which ultimately displaced or assimilated earlier inhabitants. A riverine adaptation suggesting more reliance on fishing and fresh water resources characterizes the Siskiyou Pattern.

The final phase, the Gunther Pattern, is only slightly later in time than the Siskiyou Pattern, beginning about A.D. 300 and lasting until historic times. The Gunther Pattern represents a second migration of Athapaskan speaking people from northern California. These populations largely occupied the coastal areas and appear to have brought with them a lifeway fully adapted to a marine/estuarine environment. People of this time period are likely to have occupied year-round villages and may have made use of coastal streams for gathering additional resources during parts of the year (Pullen 1982).

Ethnographically, the Tututni are representatives of the final cultural period in southwestern Oregon. These Native American groups either inhabiting or using the general vicinity consisted of several groups each of which spoke a different dialect of the Athapaskan language and each having its own name. Collectively these Athapaskans are referred to as the Tututni or Coast Rogues.

These peoples inhabited much of southwestern Oregon from the beaches to the upland forests. They occupied the region from south of Bandon, Oregon to northern California and extending up the major drainages like the Smith, Chetco, Pistol, and the Rogue Rivers. The bands were numerous and the locations diverse.

According to an 1854 map compiled by J.L. Parrish, Indian Agent for the Port Orford District, the watershed was utilized by a Tututni band called the Che-at-tee or Chetcos, after whom the river was named. The Chetco called themselves the "Chet-zut"; "Chet" being the Indians own name for their tribe, probably roughly meaning people, and "zut" meaning creek or river. Therefore, "Chet-zut" can be translated as "the people of the river" (J.P. Harrington, report to the Bureau of American Ethnology, Smithsonian Institute, 1943).

In 1854, Parrish attempted a census of the native peoples and compiled a map of their approximate territories. According to this map, the Chetco's occupied the area surrounding the Chetco River from a point just north of the Winchuck River to Whaleshead Creek drainage, approximately six miles north of the town of Brookings. They were bordered on either side by other Athapaskan-speaking bands. The upland extent of the band's territories is unknown, although Parrish describes the tribe's holdings as reaching "back from the coast indefinitely".

The Chetco's main villages were located on either side of the mouth of the Chetco River, one on the bluffs above the north side of the river and the other just beyond the mud flats (now the boat basin) on the south side of the river. The combined villages consisted of forty houses known to the neighboring Tututni bands as "Chustii-hoot-meh" and by the Chetco's themselves as "Gah-loo-kwut". This "double" village was reported to contain 241 individuals however, Parrish's population estimates were probably too low as he had counted more men than woman and children; an unlikely and uncommon situation. Parrish also reported a second Chetco village approximately six miles up the Chetco River.

In 1921, T.T. Waterman, an early ethnologist, visited the southern Oregon coast to gather information on village sites, place names and geographical boundaries. He noted the names and locations of thirty-one village sites and places on the Chetco, including village sites which had not been previously recorded at the South Fork of the Chetco River and as far up the river as Mislatnah Creek. This latter village was named "Misletni" and was located at what is now Tolman Ranch.

Village locations were also identified by Dorsey and Drucker; Cheti Deni, Khuniliikhwut, Nukhsuchtun, Setthatun, Siskhaslitun, and Tachukhaslitun, which are on the south side of the Chetco River, and the Chettanne which is on the North side of the river (Dorsey). Dorsey also recorded Thlcarghiliitun which is on the upper course of the South Fork of the Chetco River. Drucker reported the following sites; Natltene'tun, Shri'choslintun, Tcagitli'tun (the mouth of the North Fork of the Chetco River) and Tume'stun.

The general pattern of Tututni settlement indicates that large winter villages, containing 50 to 150 individuals, were established along coastal areas, rivers and major streams. Houses constructed at village settlements were substantial, consisting of semi-subterranean structures with bark or plank walls and roofs about twelve to sixteen feet square. Another structure within the village served as a sweathouse and lodge for men and boys. These villages served as semi-permanent habitation spots, where foods collected throughout the year could be stored for use in the winter.

Generally, the Tututni were hunter-gatherers, subsisting on a diet consisting primarily of salmon and acorns and supplemented by a variety of game and collected food items. A seasonal round of activities was practiced which is characterized by dispersed, small task-specific groups utilizing the upland areas during the spring and summer months. These hunting and gathering groups would traverse the upland areas in search of game, plants, nuts,

berries and other raw materials. Temporary camps in the uplands consisted of grass-covered brush or animal hide shelters. Fall signalled the time for communal fishing and acorn gathering and the occupation of winter villages by multi-family groups. In winter, these people would subsist largely on stored resources collected during the summer and fall.

The adaptive strategies for these people (those things that make up their cultural identity as evidenced in their material found in the archaeological record) indicates considerable use of the river and stream corridors and resources contained in and adjacent to them. Various tools and other artifacts not only document the site locations, but also reveal the types of resources being used and the types of technologies being performed. Adaptive strategies varied from region to region but within southwestern Oregon, the techniques of survival were shared across language and cultural identity.

A number of prehistoric sites and isolated finds have been found within the watershed. Those cultural resources that have been located are representative of the common upland site types found in the Siskiyou National Forest. These include temporary campsites related to hunting and gathering activities such as SK-815, the Long Ridge Lithic Scatter, an extensive site which primarily contains the debitage (waste flakes) from stone tool manufacture, and SK-808, the Mislatnah Village Site, the remnants of the "Misletni" village recorded by Waterman. IF-812, a single stone mortar, is an acorn processing tool and is representative of this extractive technology.

Other types of sites which can be found within the watershed offer insights to the religious/spiritual nature of the Native Americans in the area. SK-020, the Mt. Emily Vision Quest Site, consists of a series of hand-piled rock circles large enough for a person to sit inside and providing a clear view of the surrounding river canyons and the coastline. The vision quest was one of the most fundamental and widespread religious concepts of North American Indians, including the inhabitants of southwest Oregon. Certain rites of passage were key in the life cycle of these aboriginal people, the vision quest being one of the most important. This rite was performed by young men and women at puberty on the bald peaks and headlands of the region. The vision quest was undertaken to seek a guardian spirit and to obtain supernatural power. The vision seeker sought the aid of the spirit world through prayer; dreaming, fasting, dancing, and going without sleep until a guardian spirit came to the candidate in a vision. An individual could undertake more than one vision quest in his or her lifetime in search of spiritual aid and guidance.

Besides being the place where the Chetcos went for vision quests or to become a shaman, Mount Emily is also an important site in the mythology of the native inhabitants. The mountain is called "A'n-mai" (earth undulating) in the Chetco language. The creation and flood myths of the Chetco relate that the mountain was originally so tall that one could touch the sky and stars with an eel gaff hook from its summit. The story goes on to say that the first of three tidal waves which flooded the land washed off the top of the mountain. The summit was said to have been floated away by the creator to Elk Valley, to the south in Tolowa territory, where it is still to be seen today. The people and animal populations were saved from the flood on the top of the peak and flourished after the waters receded. This explained the flat or rounded appearance of the summit of Mt. Emily. When the waves rolled on "A'n-mai", they made the land "wavy", perhaps an explanation of the undulating ridges in the area.

Major ridge tops which surround the watershed were also used by the aboriginal population as trade and travel routes. Historically, trails and later roads followed these aboriginal travel routes. Archeological sites found on these ridge tops usually indicate small temporary campsites. SK-464, the Split Decision Site, is an example of this type of temporary camp.

Differences in culture, lifestyle and economic subsistence between the native peoples and the newly arrived Euro-americans inevitably led to conflicts, a pattern repeated throughout the history of this country. Some of the events of the Rogue Indian War occurred in the Chetco River drainage.

The Rogue Indian Wars

The valley of the Chetco was first settled by Euro-americans in the fall of 1850 when the Cooley, Van Pelt, Miller and McVay families filed their claims for land near the mouth of the Chetco River. The land was considered first rate agricultural lands with the hills ideally suited for grazing (Beckham, 1971). Augustus F. Miller and several others first selected their claims about a quarter of a mile above the mouth of the river. Later, learning that the newly discovered mines would attract a large population, the partners formed an association and chose their claims near the mouth of the river. They disregarded the fact that there was already a Chetco village occupying the spot. Miller built his cabin within the village on the north bank.

For several years travelers along the coast had been paying the Chetco's to ferry them across the river. Upon learning this, Miller informed them that they were no longer to offer this service to the travelers and that he would be the only one to operate the ferry. When the Chetco's refused to meet this demand, Miller sent to Crescent City for a party of known Indian killers known as the "Exterminators" to come to his aid. While most of the Chetco's were up-river salmon fishing, Miller's party planned their attack. At daybreak of February 20, the Exterminators attacked the village on the north bank. Although the onslaught was savage, some of the old men, women and children remaining in the village managed to escape. Others, defending the village, were burned alive when their attackers fired the plank houses. Skirmishes with the natives from the south bank village continued all day. That night the survivors fled back into the mountains while the Exterminators burned the remainder of the north bank village. The following day, the south bank village was reduced to ashes. News of the massacre spread, and other Chetco valley settlers were sickened by the ferocity of the attack.

In retaliation, some of the survivors fleeing the attack came upon Antoine Wort, a settler, and killed him. Two weeks later seventy-five Indians attacked three settlers at the mouth of the Winchuck River. Although their attack was unsuccessful, they proceeded up the valley burning several houses. The situation soon stabilized after the Indians were assured that Miller's deed was condemned by all the other settlers. There was little trouble from the Chetco's until the hostilities increased a few years later.

In February of 1856, the Indians of the coast and lower Rogue River, spurred on by reports of brutality and massacre at the mouth of the Coquille, Euchre Creek, Big Lagoon south of Crescent City and inland in the Rogue valley, swept through the pioneer settlements in an effort to regain control of their homeland. Retaliation by government troops and volunteers was inevitable.

Following the outbreak of hostilities, Captain O.C. Ord was ordered from his camp on the Rogue River to the Chetco to meet Captain Floyd Jones and bring a pack train of supplies north from Crescent City. Reaching the Chetco River, Ord surprised a party of 70 to 80 Indians waiting to attack the approaching supply train. In an inconclusive and fragmented fight, which took place approximately a mile above the river mouth, four Indians were killed, a boy and woman were wounded and four horses, foodstuffs and some ammunition were captured. One soldier was killed and another wounded in the encounter.

The year 1856 marked the sunset of the era of Native American dominance in the area. This year marked the conclusion of the Rogue Indian Wars. By the end of the war, the remaining population of aboriginal people had been removed to the Grand Rhonde (grand round) and/or the Siletz reservations. Some individuals escaped relocation, escaped from the reservations or were allowed to return to their homelands, mainly because of intermarriage with the white settlers. Additionally, some individuals returned to their homelands after the enactment of the Dawes Act, which opened public domain allotments to Indian peoples. In 1938 twenty-three allotments were in existence in Curry County.

Glimpses of these people and their way of life have been made known to us through ethnographic information, the journals and manuscripts of the early white explorers and settlers, records and accounts from the Rogue Indian Wars and the archaeological record as it pertains to the Northwest Coast Culture area. The ethnographic information that exists for these people was acquired from research conducted at Siletz and Grande Rhonde reservations. However, by the time the interviews or ethnographic sketches were compiled in the late 1800's and the early part of this century, most sources of information were already a generation removed from tradition.

What were the historic uses of the watershed?

The historic period in this portion of southwestern Oregon begins as early as the 16th and 17th centuries with the voyages of the various navigators such as Aguilar, De Fuca, Drake, Cabrillo, Sebastian, and later, James Cook, George Vancouver and Robert Grey. The earliest recorded contact between the coastal natives and Europeans is noted in the log of Captain George Vancouver in 1792.

Within the next quarter century trappers and traders, including North West Company fur-trader Peter Corney and an American party of trappers led by Jedidiah Smith in 1826-27, appeared in southwestern Oregon. Smith's second camp in the future state of Oregon was located on the south bank of the Chetco River. Smith's journal entry for this camp reads as follows:

"June 24. West North West 3 miles and encamped at the mouth of a river 50 yards wide rapid at the mouth but as it was high tide I could not cross. The hills about the same distance from the coast as the day before (within 1/2 mile or a mile of the sea) and the low land thick and covered with brakes, scotch caps and grass... Near my camp was a village of 10 or 12 lodges but the Indians had all ran off."

The following day Smith's party of 18 forded the Chetco at low tide and continued their way northwestward near the coast.

Some of the first permanent Euro-american settlers in the area were miners attracted to the region during the gold rush era. In 1849 gold was discovered at Sutter's Mill in California and miners flocked through the inland valleys following the California-Oregon Trail. Very quickly, the richest gold producing areas of California were claimed and late-coming prospectors spread out into the surrounding country in their quest for gold. Early prospectors left little of the local country unexplored and, in 1851, the first discovery of gold in Oregon occurred on Josephine Creek. Other gold strikes were soon to follow. Gold was first discovered on the coast at places like Whiskey Creek and Gold Beach, named for the gold rich, black sand deposits found there. Later, gold deposits were found in the Rogue River. Some exploration and gold prospecting in the Chetco River watershed likely occurred at this time.

Several mining claims were established in the drainage, some more productive than others. The Mt. Emily Mining Company and Nick Barr Mines are located in the lower end of the watershed on and around Mt. Emily. The upper reaches of the drainage, within the boundaries of the Kalmiopsis Wilderness, contain the remains of numerous mining sites including the Gold Basin and Little Chetco claims. Mining activity has had its declines and resurgencies throughout this century. Fluctuations due to changing economic conditions and the demands for various minerals have influenced mining activities within the drainage. Much of the upper end of the drainage was extensively prospected in the 1930's Depression Era with the revaluation of gold, available cheap labor and many persons attempting to make a living "off the land". The need for strategic minerals during both World Wars was also another driving factor for the establishment of mining enterprises. Mining for such as chrome and nickel was the result of these needs. Many of the remains of mining sites that are observable today are from the not too distant past.

Following or accompanying the prospectors were the early settlers. Settlement in southwestern Oregon began in the mid-nineteenth century and continued into the 1950's (Beckham, 1978). The removal of the native inhabitants opened the area to settlement. Early settlers and miners moving into the area often built their houses on the same river or stream terraces that had provided homes for the native inhabitants.

From the 1850's through the 1880's, most of the early settlers followed a subsistence oriented lifestyle making maximum use of available fish and game supplemented with produce grown and animals raised on small farms. Goods and services were traded, borrowed and scavenged. Population densities were low. Cash earning opportunities were limited with small scale mining, the raising and sale of livestock, packing, and the sale of fish providing some income to the local residents. The grassy ridge tops were attractive to early stockmen and are often the sites of early homesteads.

By the 1880's, the population in the Chetco River valley had slowly, but steadily grown with an economy based on agriculture and grazing.

"The Chetco country, as a farming region, may be said to be the garden spot of the county. The Chetco valley in its length and breadth is one expanse of rich, alluvial soil, which produces to perfection any crop adapted to this belt of country. Lands in the valley command a good figure, while hills contiguous are valuable for grazing purposes...." Port Orford Post, April 27, 1882

Many of the farms during this period were devoted to the raising of wheat; for others dairying was the principle source of industry and income. A few ranches were devoted largely to fruits such as apples, pears, peaches and all kinds of berries. In the upland areas, beef cattle, sheep and hogs were raised. Fifty years later in the 1937 Range Management Plan for the Siskiyou National Forest a subheading entitled "Economic Conditions Surrounding the Grazing Industry on the Forest" describes the state of grazing at that time.

"Small ranchers, principally outside the Forest boundary, but embracing also a few residents inside the Forest, have been dependent upon forest range for limited amounts of stock, since the Forest was established. Generally, permits have been for small numbers of cattle and in the past for small bands of sheep and occasional herds of swine...Grazing is of minor importance on this Forest, although it has been rather stable insofar as use is concerned by local settlers, dependent upon the range...The relationship of grazing to other industries is primarily one of association of small ranching projects with utilization of the Forest resources."

The Siskiyou National Forest was established on October 5, 1906. Henry Haefner, an early forester on the Siskiyou states that,

"In 1909 the National Forest area was about as the indians had left it. Nothing of importance had yet been done to improve the property or even find out what it contained in the way of timber or other natural resources." He also mentions the reaction of the local populace to the establishment of the National Forest. "Many people were not in favor of the new order in the management of part of the public domain which the National Forest ushered in. They were not used to regulations of any kind nor did they want any. Many old prospectors believed in burning off the country to aid prospecting. Many ranchers and cattlemen did it to kill the brush and get more grass for their livestock and did not like the idea of being put in jail or paying a fine for that. The timber had little or no value, so they said. It could not be marketed as lumber because it was inaccessible, so they saw no harm in burning some of it, if it was in their way."

Early rangers had to "establish a prestige as a fearless and vigilant forest officer..." to maintain order with these "self reliant people who asked for no odds or expected any." The early foresters duties included mapping, estimating the amount of timber and agricultural land, law enforcement, fire protection, as well as a multitude of other jobs involved with the administration of a large timberland. The rangers often built their own stations and headquarters. Various trails, lookouts and telephone lines were constructed in the general area during the first three decades of this Forests history.

The 1915 Siskiyou National Forest map shows the locations of a number of "ranger stations" within the Chetco River watershed. These early stations usually consisted of a small cabin for the ranger along with outbuildings for the care of the ranger's pack stock. Most were probably used on a temporary basis during the ranger's patrols of his territory. Ranger stations within the watershed were: Long Ridge Ranger Station on Long Ridge, Red Mountain Ranger Station at Red Mountain Prairie, High Prairie Ranger Station at High Prairie, and Dry Bob Ranger Station on Lately Prairie.

Forest Service lookouts are an important component of the historic fabric in the Chetco River basin. They ringed the river basin occupying virtually all of the highest peaks. A partial list includes: Pearsoll Peak, Vulcan Peak, Chetco Peak, Johnson Butte, Long Ridge (later replaced by Quail Prairie), Bosley Butte and Mt. Emily. Forest Service lookouts were the most obvious symbol of the new attitude towards fire detection and prevention. The lookout not only served as the spotter of wild fires, he was often the "first line of defense" in fighting the fire he may have spotted from miles away.

The Mount Emily lookout is a prime example of the life and history of a typical lookout within the Chetco watershed. According to Ray Kresek, in his publication Fire Lookouts of the Northwest, a fire lookout was established by the Forest Service on Mt. Emily in 1922. The original lookout was called a lookout house and was constructed in the cupola cabin style. The lookout cabin was considered standard with the lumber "ready-cut and was packed in and built on Mt. Emily" (Cooper, 1939:32). This structure was severely damaged by lightning and was replaced in 1948. The "new" Mt. Emily lookout was a standardized L-4 structure, a 14 x 14 foot cabin pre-cut kit, bundled for hauling by mule trains, that could be placed atop four poles cut on site. This lookout tower was twenty feet tall and was used until 1973 when it was destroyed.

During World War II, lookout towers with a view of the coast were occupied around the clock for the entire year of 1942 in defense of the nation against attack from the air. Mt. Emily Lookout saw service as an Aircraft Warning Service facility. The Aircraft Warning Service (AWS) was organized many months before Pearl Harbor, and was designed to protect the coastal regions from enemy air attack. It was the first large scale organization offering civilians an opportunity to be of assistance in the event of war. It was Howard Gardner, the lookout on Mt. Emily in 1942, that was responsible for spotting a seaplane which dropped an incendiary device onto the forests of southwest Oregon. This is the only incident of a foreign power bombing the American mainland during World War II.

Hand-in-hand with the development of the fire prevention lookout system was the development of overland communications between the lookouts and the ranger stations. Telephone lines were the only means of long distance communication in the early days of the Forest's history. Prior to 1913 there were only 33 miles of telephone lines in the Siskiyou. In that year, an additional 123 miles of phone wire were strung.

Another component of the historic fabric of the watershed is the trail system. These transportation corridors were the first travel routes within the watershed connecting Forest Service facilities with the populated coastal and river areas. Many of these paths followed older aboriginal routes. An example of a historic trail within the watershed is SK-824, The Mt. Emily Telephone Line Trail. Because this trail follows the telephone wire, it is reasonable to assume that the trail was constructed for that purpose and was installed or completed by the forest personnel. A trail was established by 1927 which facilitated the placement of the telephone line "from Brookings to Mt. Emily and other telephone lines on the district were connected with the Harbor Ranger Station" (Cooper, 1937:46).

Other trail systems effectively linked the coastal area with the interior of the Forest, and the interior with the Rogue Valley and Jacksonville. Many were routes that the miners, and the packers that supplied them, established to get their materials to and from the prospects. During the first three decades of this National Forest's history, the trail systems were improved and expanded.

The vision of John E. Brookings, president of the Brookings Timber and Lumber Company, included platting a town, constructing a lumber mill, railroad, and a shipping wharf which would draw a new population to the area. By 1914, the development of these dreams was well underway and the first log entered the mill in the fall of that year. The mill extended its logging railroad up the Chetco River as far as the North Fork. From there a spur crossed the river on the first railroad bridge to cross the Chetco and continued up the Jack's Creek drainage. The establishment of the Brookings Timber and Lumber Company, which later merged with a California concern to become the California and Oregon Lumber Company (C & O), marked the birth of the commercial timber industry in southern Curry County. The year 1916 saw the first major timber sale from public lands on the Chetco Ranger District. The sale was located in the Jack's Creek drainage and was sold to the C & O Lumber Company of Brookings.

The Depression of the 1930's brought an influx of people to the public forest lands. Numerous out of work individuals sought survival in the mountains undertaking a subsistence economy lifestyle. These people were also engaged in prospecting and small scale mining encouraged by the revaluation of gold. The Depression Era also saw the development of the Civilian Conservation Corps, another important chapter in the history of the Pacific Northwest. Fire prevention and suppression, timber stand improvement, range improvement, soil conservation, road building and forest facilities construction were all undertaken by the CCC volunteers. The Civilian Conservation Corps provided employment for local men and a measure of financial relief for their families. The Chetco River Road, County road 784/F.S. Road 1376 was constructed by the Civilian Conservation Corps during the Great Depression.

In the early decades of the twentieth century, recreational used of the rivers and forests added a new economic emphasis to the area. Guides, packers, lodges and hotels had been developed to provide services to visitors. However, most of these activities are centered on the Chetco River and recreational use of the remainder of the watershed remains light.

Local histories exist in the form of family journals, manuscripts and photo collections. Oral histories, often compiled later in time, are also an invaluable source of information regarding the lifeways of the early pioneers. After settlements became well established, the history of the area is better documented in the form of newspaper articles, tax, land ownership and mining records, religious, birth, death and marriage records.

Even though the historic element is by far more tangible than that of the prehistoric, much of this cultural fabric within the watershed is little known. Many of the sites in the watershed have not been formally documented or evaluated for their historic significance.

What are the Past, Present, and Future Recreation Uses in the Watershed?

Recreation Characterization

Recreation opportunities in the watershed are diverse and represent a broad range of physical, social and managerial settings across the Recreational Opportunity Spectrum (ROS). ROS classes represented include Primitive, Semi-primitive non-motorized, Semi-primitive motorized, and Roaded Natural. In general geographic terms, the upper watershed provides a primitive recreation setting which progressively becomes more developed in the lower watershed. This is in part due to land allocations, road development, and distance from major travel ways and population centers.

Based upon the 1990 census, the population of Oregon has shifted from rural to metropolitan areas, resulting in 71% now living in urban settings. The Oregon Outdoor Recreation Plan (1994 to 999) identified prominent participation activities in dispersed settings (beyond the local community) to be sightseeing/driving for pleasure (69.3%), swimming (58.7%), boat fishing (40.6%), tent camping (39.1%), nature study and wildlife viewing (38.5%) and trail hiking (30%). According to the state's plan, greater planning and emphasis is needed to protect Oregon's scenic and natural resources which can provide recreation opportunities, such as camping, boating, fishing, trail use and wildlife observation. As our population becomes more urbanized, it is natural to assume that the National Forests will become more important in fulfilling the need for recreation opportunities based upon wide areas of land in a natural setting. More specifically, the Regional Economic Profile for Coos and Curry Counties (1993) indicated that recreation played an important role in the south coast economy. Interest in ecotourism has increased, as a way to promote public recreation in natural settings, and in a manner compatible with preservation of the resource. The District is participating with Curry County through the rural community assistance program to help plan and market ecotourism locally.

Congressionally designated Wilderness, located predominantly in the upper drainage, represents 57% of National Forest land in the watershed. The "heart" of the Kalmiopsis Wilderness might well be considered the Wild section of the Chetco River and its surrounding watershed, as it represents about 56% of the entire wilderness area. This is remote and rugged terrain with limited access and few human caused alterations to the landscape. The few existing signs of human use are the result of mining (road construction, cabins, sluicing activity, mine adits, etc), administrative use (fire lookouts, trails, fire suppression activities) and recreation use (trails, campsites). The major recreation use in the upper watershed is day hiking, backpacking, camping, and nature study. Commercial use for recreation is limited at present. The wilderness resource, as defined in the Wilderness Act of 1964, has benefits beyond recreation use, "...and may also contain ecological, geological, or other features of scientific, educational, scenic or historic value." Viewed as a unique resource governed by natural process, wilderness value may exist more in ecological and recreational terms than in commodity use.

The entire Mislatnah Non-Motorized Backcountry Recreation Area and a small portion of the Pearsoll Peak Motorized Backcountry Recreation Areas are within the watershed (MA-6, Siskiyou LMRP). There are a total of 5,139 acres allocated to backcountry recreation.

The majority of recreation use in the lower watershed is in the Scenic and Recreation sections of the Chetco River. The Chetco possesses outstandingly remarkable values (ORV's) for Recreation (Chinook salmon and steelhead fishing opportunities and fishing derbies) as well as for Water Quality and Fish Habitat. ROS settings are varied within the river, ranging from Semi-primitive, non-motorized to Roaded Natural. Drift boating/fishing is the major fall/winter activity with use nearly equal between commercial and private users. River development consists of semi-developed sites, such as Miller, Nook, Redwood River Bars, and Lower and Upper South Fork Camps. Land-based recreation is represented by developed sites, such as Little Redwood Campground and Packer's Cabin and semi-developed sites, such as Red Mountain Prairie in the higher elevations. Trail facilities outside the wilderness are limited. The Redwood and Riverview Nature Trails (managed jointly between the District and Oregon State Parks) provide a self guided interpretive hike through old growth redwood and riparian environments. Scenic driving opportunities exist along the North Bank Chetco River Road 1376.

Wilderness and Wild River

Overview

Geographic features have helped shape the social use within the upper watershed. The area is characterized by deep rough canyons, sharp rock ridges and clear rushing streams. Factors, such as remoteness, difficulty of travel and minimal development led to specific land allocations. These management allocations have been an important factor in shaping the recreation setting and opportunities available in the upper watershed.

The following is a review of significant land allocations and management direction:

Table 11.

1942	The upper Chetco watershed was studied and listed as a "Limited Area"
1946	78,850 acres, including most of the upper watershed, was administratively designated a Wild Area under the U-2 Regulations. The area was recognized for its primitive recreation and unique botanical resources.
1963	Babyfoot Lake Botanical Area was established for Brewer spruce and other species protection.
1964	Big Craggies Botanical Area was established for *Kalmiopsis leachiana*, Brewer spruce and other species protection.
1964	The Kalmiopsis Wilderness was congressionally designated by the Wilderness Act at 76,900 acres and contained most of the previous Wild Area and portions of the two Botanical Areas.
1978	The Kalmiopsis northern and southern boundaries were expanded and the Wilderness grew to 179,850 acres with the passage of the Endangered American Wilderness Act.
1984	All wilderness areas designated in 1964 closed to new mineral entry.
1988	The Chetco River was designated Wild and Scenic by the passage of the Omnibus Oregon Wild and Scenic Rivers Act.
1993	Siskiyou Land and Management Reserve Plan (LMRP) amended with the Chetco Wild and Scenic River Environmental Assessment and River Management Plan.

A few isolated historic human events have influenced the wilderness section of the watershed. In 1918 Madstone Cabin was constructed along the upper Chetco River. This occupation by two World War I draft evaders was the farthest up-river occupation on the Chetco River. In 1930 Lila Leach made the first discovery of the *Kalmiopsis leachiana* plant at Gold Basin. In 1945 a Navy PBY 5a plane crashed killing 8 people along a remote section of the South Fork Chetco River. The deceased were buried on the site. In 1957 a primitive cat road was constructed and a concrete monument with brass plaques erected to honor the dead. All these events offer recreational value and interest to the wilderness user, either as a site to visit or as historical reference.

The Siskiyou LMRP sets the yearly carrying capacity for the Kalmiopsis Wilderness between 29,300 and 32,000 Recreation Visitor Days (RVD's). A RVD is defined as 12 visitor hours and may consist of one person for 12 hours, or 12 persons for one hour, or any equivalent combination. The wilderness setting is divided into three Wilderness Resource Spectrum (WRS) classes. The WRS method of zonation is different from the ROS classes in that the zones are restricted to wilderness areas and generally reflect the desired future condition of the composite wilderness resource. Recreation use is just one part of WRS classification. Currently, the three WRS classes are not defined in much detail and locations and acreages have not been identified in Geographic Information Systems (GIS).

Information Needs: GIS mapping, acreage data and designations for WRS classes.

Management Opportunities: Assessing the adequacy of the Kalmiopsis Wilderness Management Plan, in terms of WRS descriptions and standards, prior to future LMRP revisions.

Wilderness Use

Hiking and camping are the predominant use, although other activities occur, such as botany, geology, wildlife viewing, photography, history, swimming, fishing, whitewater kayaking, floating, hunting, mineral prospecting, and scientific study. The Kalmiopsis has historically experienced "low" recreation use. In 1958, there were 20 Recreation User Days (RVD's) and in 1972 it had grown to 5,000 RVD's. In 1994, use was estimated to be 9,220 RVD's. RVD standards have not been exceeded for encounters or total carrying capacity.

Solitude, if defined by a limited number of encounters with other groups during a trip, is one of the more outstanding opportunities provided by this area. Encounter monitoring by field rangers indicates that there is at least a 50% chance of not seeing other groups while traveling through the interior. Trips of 3 to 4 days of total isolation are common, depending upon the route and season of use.

Day hiking activity accounts for 58% of all wilderness use and is concentrated around Babyfoot and Vulcan Lakes. Between 1991 and 1994, these lakes accounted for 48% of all wilderness RVD's (Babyfoot = 28% and Vulcan = 20%, based upon voluntary registration card data). The wilderness has an established group size limit of 12 persons and 9 stock for overnight use. This standard has only been exceeded in isolated cases. Day use around the lakes has accounted for the largest occurrence of groups over 12 persons, but this group size accounted for only 2% of all groups which visited these lakes. Other user characteristics for data collected between 1989 through 1994 show that 81% of use is from Oregon and that the most common group size is 2 (46%). Use generally occurs during the mid summer, with June = 21%, July = 25% and August = 16%. Winter use is non-existent due to snow blocking trailhead access and trails and early spring use is limited, dependent on winter snow.

Stock use is very low, only about 3% to 5% of total use, due to difficulty of trail conditions and lack of natural food sources. Organized group use of the Kalmiopsis has been limited. Groups known to visit the area on a consistent basis are: University of Oregon Outdoor Activity Program, Lane Community College, Rogue Community College and the Sierra Institute, U.C. Santa Cruz.

Information Needs: Better methods of collecting use data need to be developed. Current methods, mainly opportunistic encounters by field personnel and counting voluntary trail registration cards, are imprecise. Encounter standards may or may not be the appropriate indicator of solitude.

Wilderness Trails and Facilities

Recreation facilities are limited to system trails, roads (built for mining, but used as trails), trail signs, and user created campsites. Trail management objectives for wilderness trails generally are designed for "more" to "most difficult" travel, with minimum construction and maintenance standards that safely offer challenge to the user. Facilities are managed to provide access, disperse use and protect the resource rather than to provide comfort or ease of use. The Sign Management Plan calls for signs only at trail junctions, with messages limited to trail numbers. Use of map and compass skills are encouraged. Within the entire watershed, 85% of all trails are within the Kalmiopsis Wilderness. There are approximately 116 miles of trail for foot and stock use, although many sections do not adequately meet stock use standards. There are 5 on the westside and 5 trailheads on the eastside. In general, these trailheads provide semi-developed facilities for dispersed camping, such as pit toilets, fire pits, tables, and garbage collection. There are approximately 30 miles of existing mining road within the wilderness, with roughly 18.6 miles of this road included as part of the trail system. Approximately 12 miles of road are maintained and used from Onion Camp to Emily Cabin (correct historic spelling) to access mining claims along the Little Chetco River. There are about 8 miles of road occasionally used by a claim holder to access the Taggart's Bar area from the Wilderness Boundary below Chetco Pass. A section of the Upper Chetco Trail, which had been abandoned, has been located below the mining road to Slide Creek. In 1991, the Tincup Trail #1117 was extended 5.2 miles westward toward Tincup Creek from Heather Mountain. This was the only construction of trail in the last 30 years. Completion of the Tincup Trail requires another 3.8 miles of construction and will connect to the western portion of the existing trail.

There are a limited number of standing structures all of which are associated with past or present mining activities. Facilities that are not authorized will be reduced or eliminated in accordance with the Kalmiopsis Wilderness Management Plan. Structures will be evaluated for mining claim validity, cultural resource value, and habitat for sensitive bat species prior to consideration for removal.

Loop hiking opportunities are desired by most backpackers. Historically, dead end trails have received the least amount of use, with some almost becoming abandoned. There are only two reasonable loop routes in the Kalmiopsis. A three to four day trip (21 to 27 miles) that loops from the Babyfoot trailhead or Onion Camp location, and down into the Chetco River. This has caused an increase of use, trash and encounters with other groups in the Slide Creek area. A longer five to six day loop (40 plus miles) circles the entire central portion of the watershed. While it provides the best overview of the wilderness, it is difficult and too time consuming for most users. In 1987, an Environmental Assessment (EA) and subsequent Decision Notice provided for the Tincup Trail construction project. This project would provide a loop trail opportunity to reduce potential overcrowding by dispersing use. At present, there is a 3.8 mile gap between the east and west portions of the Tincup Trail.

Information Needs: The existing EA for the Tincup Trail construction project needs to be updated. Additional analysis that is needed is an update of a Biological Evaluation (BE); and specialist reports from fisheries, geology and hydrology.

Management Opportunities: Completion of the Tincup Trail construction project. Reconstruction of abandoned section of the Upper Chetco Trail to divert travel off the mining road. Complete cultural evaluations on Hill Top Mine and Sourdough Flat cabins for possible removal. Complete Biological Evaluation (BE) of cabins for possible habitat for sensitive species, such as Townsend's big-eared bat.

Wilderness Campsites

Campsite impacts have been monitored as part of implementing the Limits of Acceptable Change (LAC) process. Within the watershed, there are 98 wilderness campsites. Campsite locations are generally found on any available flat terrain close to water. Most campsites are within 100 feet of trails and within 200 feet of lakes, creeks or springs. Campsite impacts from recreation use include loss of vegetation, erosion, tree and snag damage, fire scars, reduction of downed woody material, exposed human waste, abandoned equipment and litter. Each campsite has been evaluated twice within a 5 to 6 year period and assigned a composite ranking based on various impact indicators. The last monitoring indicated that approximately 29% of campsites were considered to be "lightly" impacted; 42% "moderately" impacted; 26% "heavily" impacted; and 3% "extremely" impacted (impact classes based upon a range of composite scores). The monitoring data have not been analyzed to determine if a desired future condition for the area is being achieved, since standards of acceptability have not been established.

An acceptable technique for managing campsites is to concentrate impacts in a few sites to prevent the proliferation of additional sites within a given area. In general, this has been the situation in the Kalmiopsis. Repeated use of the same site has concentrated use and intensified impacts to the most reasonable areas. However, the acceptable range of impact for these concentrated use sites has not been established. Both Babyfoot Lake and Vulcan Lake receive high levels of use due to their ease of access. Users may or may not be looking for a "wilderness" experience. Some specific impacts to our high use areas are multiple user-created trails at Babyfoot Lake and tree damage at Vulcan Lake. User-created trails cause vegetation loss, increase soil erosion and are unsightly. Inappropriate firewood gathering can be visually detrimental (i.e. scars, stumps, sawed off limbs); result in dead trees; and lead to a loss of soil structure and nutrients from excessive depletion of downed wood.

Information Needs: Full implementation of the LAC process requires establishing indicators and standards for monitoring and potential management action. The Siskiyou LMRP and Kalmiopsis Management Plan do not address these issues. In order to utilize the monitoring data, indicators and standards should be chosen, management options defined and this direction included in a revised management plan.

Management Opportunities: **Babyfoot Lake** - explore feasibility of constructing one user trail along the lake and rehabilitating the multiple routes. **Vulcan Lake** - increase user education about proper campfire use.

Commercial Use

Commercial use in the Wilderness is limited but the potential for increased commercial use exists. Currently, only one outfitter guide has a permit in the watershed, and his use has mostly been in the Illinois River drainage. However, requests for outfitter guide permit information have risen and at present, a request is being processed for extensive use in this area. Outfitter guide limits or guidelines for outfitter operations may need to be addressed if requests and use increase.

Information Needs: At some point, if requests for commercial use increase, a needs assessment may be necessary to determine acceptable commercial use limits and practices.

Road Access

There is the potential for user conflicts among hikers, stock users, and legal and non-legal motorized users of the mining roads. Illegal access has occurred between the wilderness boundary and Slide Creek. The gate on the boundary above Sourdough Flat has been seriously vandalized in both 1994 and 1995. ATV's and motorbikes have been reported at the confluence of Slide Creek. Evidence of motorbike use has been found past the gate on the east side of Eagle Mountain into the Bowser Mine area. Improper access has occurred on the road from Onion Camp to Emily Cabin due to disagreements regarding appropriate legal access to mining claims and private property. Additional

confusion and potential conflict may arise along the private property section along the Little Chetco Trail #1121 near Copper Creek. The Forest Service has reserved a travel right through the private property but improper signing by the owner has made this area confusing. Users have been directed by the signs to stay out of the private area, which is not appropriate.

Another access issue involves the seasonal closing of the 4103.087 road to wet weather travel to help prevent the spread of Port-Orford-cedar (POC) root disease (*Phytophthora lateralis*) into the Illinois and Chetco drainages. Some users want to see the road closed on a permanent basis. Present direction calls for closing the road at McCaleb Ranch from November 1st through May 31st. Administrative personnel are required to clean their vehicles year round. The road has been used by the public to access the Pearsoll Peak Lookout. Public users are asked to wash their vehicles in the dry season as a precaution. Unless otherwise prohibited, the road will continue to be used by the general public and for administrative purposes according to the closures and guidelines now in effect. The gate near McCaleb Ranch provides additional deterrence to illegal motorized use into the wilderness. The seasonal closure limits some of the traditional four-wheel-drive recreation use in the Chetco Pass area. Data are not available for how much four-wheel-drive activity has traditionally occurred in the area. Information is not available on how much vehicle use has been prohibited during the wet and snow seasonal closure.

Management Opportunities: Re-installation of the road gate above Sourdough Flat on the wilderness boundary.

Trends

Overall use has shown a steady increase, with some of the additional use coming from "displaced" users from other wilderness areas. Carrying capacity limits are not likely to be exceeded in the near future. Encounter standards may be exceeded on occasion in high use areas at peak use times, but generally will be infrequent occurrences. A short term increase in white water kayaking and summer floating has been observed, but it is unclear whether this is a trend that will continue.

Campsite monitoring has indicated that some campsite conditions have moved to the extremes. Between first and second measurements, "lightly" impacted sites increased by 7%, "highly" impacted sites increased by 3% and "extremely" impacted sites increased by 2%. This move from the "moderately" impacted class probably is the result of some sites being less frequently used and having time to recover and other sites being more frequently used, and showing the additional impact. This trend is likely to continue in the short term.

Commercial use and requests for special use permits is likely to increase but by how much is difficult to predict. The potential exists for some form of commercial use and development by the private property holder along the Little Chetco River.

The potential for user conflicts with motorized use will continue, especially if valid use rights for mining and/or private access continue. Sale of private property or mining claims to the Forest Service appears unlikely. The possible expansion of valid mining operations or development by private property owners, may jeopardize wilderness recreation values and may have a discouraging effect on use. Efforts will be made to prevent the illegal use of motorized and mechanized equipment in the Wilderness.

An approved Prescribed Natural Fire Plan (PNF) has been completed for the Kalmiopsis Wilderness. There will be opportunities to allow lightning caused ignitions to be managed as prescribed natural fire under certain management prescriptions and available resources. There is potential for the displacement of wilderness users in areas of prescribed fire. Some areas will have to be temporarily closed for user safety. Also the associated smoke in the airshed would have an effect upon the short-term recreation experience. Depending upon the intensity of the fire, there will be a range of natural changes to the scenery, vegetation patterns, and facilities (campsites and trails). Response to the re-introduction of natural fire to the wilderness environment by the public may vary. In the event of an intense fire, trail signs might be burnt. In the long-term, dead standing trees will eventually fall, temporarily block/close trails and increase the need for trail maintenance.

Management Opportunities: The implementation of a PNF Plan offers the opportunity for educating the public about fire ecology and the role of natural processes in the Wilderness.

Dispersed Land Based Recreation

Historic Overview

Many of the present day roads were once part of a historic trail system. Earlier travel was by foot, stock, and later motorbike over primitive trails. Little can be found of trails or trail facilities, such as shelters, signs, and spring development. While the majority of roads were for administrative purposes and access to resources and commodity extraction, they also served to provide new recreation experiences to greater numbers of people, such as driving for pleasure and car camping. To some extent, many of our formerly utilitarian pursuits, such as gathering firewood and various forest products, may now provide some measure of recreation enjoyment.

Backcountry Recreation

Recreation opportunities in Backcountry Recreation Management Areas have yet to be fully planned or developed. A recreation management plan, as called for in the Siskiyou LRMP (MA6-1), has not been completed for either the Mislatnah or Pearsoll Peak Backcountry Recreation areas. Non-wilderness trails within the Mislatnah Backcountry Recreation Area are closed to motorized and mechanized use by regulation. Use in these areas is low and development limited.

Information Needs: Field data is needed to explore the feasibility of additional recreation opportunities and management direction in backcountry areas.

Management Opportunities: Develop recreation management plans for each Backcountry Recreation area.

Other Land Based Recreation

Present recreation use includes but is not limited to scenic driving, hunting, hiking, camping, picnicking, sightseeing, undeveloped snow sports and a variety of nature study activities. Little data are available for reference comparisons, although some of the facilities used today may have some historic associations. Packer's Cabin, located on Long Ridge in a meadow environment, provides a year-long, rental for group use. The adjacent area provides for free camping and day use with limited facilities. Also located nearby is a short trail off the 1917 road to the "Big Tree" site, which interprets a large, old-growth canyon live oak. The cabin was built by the Civilian Conservation Corps in the 1930's and served as supply storage and temporary shelter for the packer who supplied the nearby fire lookouts and ranger stations. The structure was renovated in 1990 and facilities upgraded to meet accessibility standards. Fees collected are returned to pay for maintenance needs under the Granger-Thye authority. In 1995 use for this rental was approximately 164 days, an increase of 84% in the past four years. Use is predominantly from Oregon visitors and occurs between June and September. North of Packer's Cabin is the seasonally functional Quail Prairie Fire Lookout. The lookout, situated on top of a large tower, is open for public visitation during the fire season. Onion Camp, located on the eastern edge of the watershed, provides dispersed camping and trailhead facilities. There is one pit toilet, three campsites and a gated access to some of the wilderness mining roads. Onion Camp is seasonally closed during the wet season for POC concerns from October 1st through June 1st. No data are available on current use.

Red Mountain Prairie provides semi-developed recreation, with one pit toilet, picnic table, fire pit, and garbage collection. The meadow environment offers wildlife viewing opportunities. Various trailheads serve as semi-developed recreation sites, such as Vulcan Lake, Chetco Divide, Upper Chetco, Tincup, and Snow Camp. Another semi-developed site is at the High Prairie Corral on the 1376 road.

A group of approximately 12 sites have been selected throughout the watershed as dispersed, undeveloped, non-recreation use sites. These areas have been identified for commercial camping use to avoid conflict and crowding at public recreation sites.

Recreation shooting opportunities are provided off the 1107 road at the Snaketooth Rifle and Pistol Shooting Areas.

The majority of non-wilderness trails and use is limited to the immediate river corridor. One exception is the Mislatnah Trail, which traverses conifer/hardwood forests and mountain meadows as it provides access to the Wilderness, Mislatnah Peak and the Big Craggies Botanical Area. The trail is closed to motorized use by regulation. Use is low and is predominantly by hikers and backpackers. Sections of the trail need reconstruction and route finding is difficult through the meadows. Only the trailhead of the nearby Snow Camp Trail is in the watershed. A wet season closure is in effect on the 1376 road just past the Snow Camp Trailhead from October 1st through June 1st. A gate has been installed and informational signing posted. The closure prevents traditional hunter travel between the Chetco and Pistol River watersheds. Hunters would generally drive one watershed in the morning and cross over to the other watershed in the afternoon. In general, hunter response to the closure has been negative, but compliance has been good. Data indicating the amount of hunting use impacted by this road closure are not available.

Information Needs: Collection of use data at Onion Camp. Search for additional suitable campsites for large group commercial use (mushroom pickers). Look for additional motorized backcountry recreation opportunities.

Management Opportunities: Improvements are planned for Onion Camp, which include installation of a concrete vault toilet and a bulletin board. Evaluate reconstruction needs of the Mislatnah Trail.

Trends

According to the 1994 Oregon Outdoor Recreation Plan, survey respondents indicated a strong preference for semi-primitive and primitive settings for dispersed recreation activities. This response supported the 1988 State Comprehensive Outdoor Recreation Plan findings that shortages of these settings to meet future demand would occur on National Forest Lands. The Chetco watershed has many opportunities for dispersed use which should be able to meet this increasing demand. Opportunities, either lacking or undeveloped, are additional non-wilderness hiker trails and trails designed for mountain bicycle and motorized use.

Continuing Port-Orford-cedar (POC) management activities will evaluate the potential risk of spreading *Phytophthora lateralis* from roads in the watershed. Some additional seasonal road closures are possible that might have an effect on recreation use patterns. One proposal calls for the wet season closure of the 1909 road just beyond the Chetco Divide Trailhead. Wilderness users who hike the Vulcan Lake and Johnson Butte trails in the spring and fall would be required to hike an additional two miles (round trip) on the road to access the trailhead. This has the potential to limit access to the lake by younger, older and less able individuals.

Information Needs: An abandoned portion of the old Vulcan Lake Trail needs to be evaluated for possible reconstruction and inclusion into the trail system. It would mitigate the impact upon hikers (i.e. reducing the hiking distance to access the trailhead) that a possible seasonal road closure would have on hiking to the lake.

Management Opportunities: The public has exhibited a greater interest in learning more about the natural history of the area. Requests to provide information and education to the public via personal contacts, brochures, interpretive programs, presentations, displays and computer (internet) are expected to increase. There is also an opportunity to educate the public about fire ecology, and the role of natural processes in wilderness and adjacent land allocations.

Scenic and Recreation River Use

Historic Overview

The Chetco River was noted for its miles of outstanding fishing and swimming opportunities in the 1969 Multiple Use Plan for the Chetco Ranger District. This plan indicated that the lower-Chetco was used heavily for fishing, swimming, camping and picnicking. It was further noted that while some drifting was done, most of the fishing was at popular holes from along the banks. Between 1953 and 1967, fishing accounted for the majority of recreation use. An early recreation site was the construction of the Little Redwood Campground in 1962, which was listed then at 8 acres and 16 sites. The Chetco River User Study conducted by Oregon State University in 1988, indicates the Chetco River provided a substantial economic impact to the region and supported a large commercial outfitter program. In general two distinct seasons were identified. In the winter, activities were centered around winter steelhead and salmon fishing. In the summer, activities included picnicking, swimming, camping, Off Road Vehicle (ORV) use, and relaxing. There are no specific data available to establish reference points for comparison with current use.

Land Allocation

The Chetco River was designated a National Wild and Scenic River in 1988. In 1993 an Environmental Assessment (EA) and River Management Plan were completed. The River Management Plan is currently being implemented and is addressing the numerous issues raised during the environmental assessment. Issues of concern that have been resolved or are continuing to be resolved include overcrowding; motorized boat use; use of anchors; number of fishing derbies; off-highway vehicles (OHV's); level of recreation facility development; visual quality objectives (VQO's); mineral withdrawals; extensions of scenic and wild segments. The EA decision document, subject to later Congressional approval, set the Recreational River at 9.5 miles from the Forest Boundary up to Eagle Creek. The Scenic River segment was set at 7.5 miles from Eagle Creek up to Mislatnah Creek. And the Wild River segment was set at 27.5 miles from Mislatnah Creek up to the headwaters, with only the section from Mislatnah Creek to Boulder Creek outside the Kalmiopsis Wilderness. Until approval by Congress is obtained, these changes from the original river designations will be managed as recommended in the EA. The Scenic and Recreation (MA-10) land allocation for the Chetco River is 4,241 acres. Within the Scenic segment, VQO's in adjacent land were changed from modification to partial retention. ROS descriptions for the Scenic segment contain both Semi-primitive non-motorized and Roaded Natural classes. Within the Recreation segment the ROS class is Roaded Natural.

Fishing and Rafting

The EA decision also affected recreation use in more direct ways. Overcrowding was resolved with the phased implementation of a permit, allocation and rationing system based upon a determined carrying capacity. Permits are required to float the Chetco for all users between October 1st and April 1st. A limit for commercial outfitters was established at 40 guides. Non-commercial use is not limited but must be permitted. A monitoring system has been implemented which establishes indicators, standards and actions to be taken to deal with potential overcrowding. The ratio between commercial and private use has also been monitored.

Motorized use on the river is not allowed except for the purpose of emergency search and rescue and administrative use by managing agencies. OHV use to cross the river is not allowed unless it is historic use by private property owners. Vehicle use is permitted down to and along the recreation river bars. River fishing derbies are limited to no more than two per year. Facility development is set to low in the Scenic segment and to moderately high in the Recreation segment.

According to the Chetco River Management Plan, yearly use in the river corridor was estimated to be 29,700 RVD's in 1987, and projected to be around 31,500 RVD's by the year 2000. Prior to the 1993-94 fishing season, only commercial river guides were required to obtain a use permit. Data for non-commercial use prior to the 1993-94 season are not available. The following table shows a comparison of commercial and non-commercial use based upon actual counts of trip cards deposited.

Table 12. Number of Chetco River Float Trips

	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
Commercial	538	612	448	694	780	620	605
Non-commercial						657	943

Commercial fishing use has grown steadily since the 1988-89 season, except for the drought season of 1990-91. The 1993-94 season established a limitation upon the number of special use permits allocated for commercial fishing (40). Therefore it is not surprising to see commercial use drop from the 780 trips made during the 1992-93 season. A significant change was the rise in non-commercial use since the 1993-94 season. According to the Chetco River Management Plan "Use Allocation System", the carrying capacity threshold (no more than 34 total boats/day for 80% of a sampled season) must be exceeded before additional standards apply (see the Chetco River Management Plan for other use standards). The primary indicator used to measure carrying capacity is on-site sampling of boats observed. In practice, consistent and adequate field monitoring has been difficult to achieve. Field observation data are not complete enough to determine if thresholds for total use have been exceeded, but trip card data does provide enough information to indicate that overcrowding is not occurring. For the 1993-94 season, trip cards indicated that the 34 boat/day limit was never exceeded. During the 1994-95, season there were 35 or more boats on the river for 9 days of the season, but this represented only about 8% of the sampled season (below the 20% threshold). The amount of the season that is used by either group will vary with seasonal conditions. Overall, in the 1994-95 season, non-commercial use utilized 65% of the available season (180 days) compared to 60% for the commercial guides. It is believed that commercial guides would be more willing to relocate to better fishing opportunities on other rivers as conditions change. Data are not available for bank fishing use.

The 1995 CAL-ORE Enhancement Derby (fishing derby) was the 13th annual edition of this event. Fishing derbies are limited to two per season in an attempt to limit the potential for conflicts and overcrowding. The derbies generally occur in February and March which are traditionally high use months of the season. The events are regulated by special use permit. Approximately 20 to 25 boats are involved in each event and float down from the Low Water Bridge site to the Forest Boundary. These derbies are popular and established events which attract fishing enthusiasts from a wide area and provide additional tourism dollars to the local community.

Whitewater rafting use of the lower Chetco has been restricted by limited access, high use during the fishing season, and availability of other boating opportunities in the area. There is one special use permit for whitewater rafting, fishing, and sightseeing.

Information Needs: If analysis of drift boat trip cards reveals the potential for exceeding standards, adequate on-site monitoring should be implemented. Periodic monitoring of bank fishing use should be completed.

River Recreation Access and Sites

The North Bank Chetco River Road and Forest Service Road 1376 provide the access to the majority of Chetco River recreation. There are limited opportunities for river viewing along the 1376 road due to a lack of adequate turn outs for parking and obstructions to the view from dense vegetation.

The primary Forest Service boat launch locations for floating the river are Miller Bar, Nook Bar, Redwood Bar, South Fork Chetco, and Low Water Bridge. Miller and Nook Bars provide paved road access to the Recreation section of the river and offer other semi-developed recreation opportunities. Services provided are portable toilets, law enforcement patrol and garbage collection. Redwood Bar, which is adjacent to the Little Redwood Campground is a fee site providing additional river access and camping.

Other popular areas for semi-developed river recreation are the Upper and Lower South Fork Chetco sites. These sites which were acquired from South Coast Lumber have the potential for further development. The Low Water Bridge site has limited camping and no facilities but does provide a boat launch and trailhead for the Chetco Gorge Trail. Previous plans for development here have received a lower priority since the acquisition of the South Fork Chetco sites. A semi-developed day use picnic site is located near the Redwood Campground.

The Little Redwood Campground is a developed fee-based site located on a river terrace. A permit for concessionaire management of the campground and adjacent river bar was implemented in FY 95. The campground has 12 sites, drinking water, two toilets, campground host, garbage collection, and can accommodate trailers up to 20 feet in length. Most of the campground facilities are old and in need of reconstruction. The site was originally designed for tent camping. The campground could use expansion and upgrading to provide barrier free access and to accommodate modern recreation vehicles.

The following table provides two season trend information for the Little Redwood Campground and Redwood Bar that is based upon fees collected rather than RVD's. Since fee rates are different at each site, comparisons between sites are not valid.

Table 13. Developed Recreation Use (Fees in Dollars)

Fee-Based Recreation Sites	1994	1995
Redwood Campground	3359	3286
Redwood Bar	1110	1329

Use for both sites is mostly from Oregon visitors and occurs during July and August. Both sites have approximately a 180 day season.

Down river from the Forest Boundary is Loeb State Park which provides the majority of developed river-based recreation on the river with 53 sites. A private Bed and Breakfast facility, the Chetco Inn, is located in the upper Recreation river segment. It has been established for about 8 years and provides river access. Other private use and occupation within the river corridor is in a section of privately owned land called "Wilderness Retreat". Use is mostly for primary residence but some seasonal use occurs. It is located on the south bank of the river near the confluence of First Creek. The historic Tolman Ranch is privately owned and is located in the Scenic section of the river below Mislatnah Creek. Access to the ranch is by a vehicle ford of the river from the south bank along Forest Service road 1917.067. During the winter, access is limited to a cable car, trail or boat.

Management Opportunities: Prepare a proposal for reconstruction of the Little Redwood Campground. Explore the feasibility of improving the Upper and Lower South Fork recreation sites, for a possible campground and construction of permanent rest rooms and boat ramp. Develop Chetco River vista points along the 1376 road.

Trails

The Tincup Trail provides a more difficult, semi-primitive non-motorized opportunity along the Scenic and Wild sections of the Chetco River. The route provides access to large Douglas-fir, tan oaks and small meadows. The trail is closed to mountain bicycles and motorized use by regulation. A popular site across from the confluence of Boulder Creek is within a reasonable day hike trip. Access to this site has been limited in recent years due to small slides and extensive tree fall downs which have impacted the trail. The Chetco Gorge Trail used to be one of the District's most popular year round low elevation trails. The route is easy, scenic and provides access to swimming and fishing along the river. When the Low Water Bridge collapsed in the early 1980's, easy access to the trail on the north bank ended. Having to ford the river has limited use to the summer and early fall months.

The Redwood Nature Trail receives the heaviest use on the District. It provides a self-guided interpretive hike through large old growth redwoods near the limit of their northern coastal range. While the trail is only 1.2 miles long it does have some short steep grades. Short bridges on the trail pose the most significant maintenance concern. The Redwood Nature Trail is also connected with the Riverview Trail managed by Loeb State Park. The Riverview trail follows the north bank of the Chetco through a variety of riparian vegetation. Trailhead access at the Loeb Campground has reduced congestion on the road at the Redwood Nature Trailhead and has provided additional interpretive opportunities. The Forest Service produces the interpretive brochures and makes them available on site and at the office. Use for these trails is thought to be heavy but data are not available.

Information Needs: Use data on the Redwood Nature Trail are needed. Install a trail counter device to record use.

Trends

Commercial river use will remain steady due to limitations on special use permits. Non-commercial use has increased since commercial use has been limited and that trend is likely to continue. Overcrowding, as defined in the River Management Plan, is possible but not likely in the near future. At some point it may be necessary to adjust the ratio of use between commercial and non-commercial use. When the commercial use limit was initiated there were about 55 requests for permits. Compliance by river guides has been good, but the 40 guide limit has excluded some guides. Requests for river permits will continue to exceed the allowable limit.

Some of the recreation management problems include vandalism to facilities and resources; non-compliance with fees; campfire violations; reckless driving; discharge of firearms; illegal river guiding; vehicle use on/across the river; violations of 14 day camping restriction; trash dumping; and aging facilities. Most of the law enforcement violations are likely to continue and will require a greater law enforcement presence to control. Some improvement has been observed at the Redwood Bar site since it was changed to a fee area. Reduced funding for recreation has motivated the search for partnerships. Local Boy Scouts have contributed to various recreation maintenance projects and assisted in annual river clean-up events.

There appears to be a need to offer more trail opportunities outside of wilderness which are easier to use, access, and offer use to additional types of groups (i.e. mountain bicycles and motorbikes).

Management Opportunities: Explore the opportunities for developing additional trails within the Chetco River corridor. Possible trails to access bank fishing sites, and travel routes extending beyond the Chetco Gorge Trail. Also look at the Steel Bridge area for possible site development.

What commodities can be produced from the watershed?

Timber

Over 15,000 acres of managed stands occur on National Forest lands in the watershed. The following broad opportunities for timber harvest are available in the non-wilderness portion of the Chetco River watershed: 250 acres of commercial thinning in matrix, 1,500 acres of regeneration harvest in matrix (much of it hardwoods), and 500 acres of habitat enhancement in Late-Successional Reserve (LSR). Site-specific information would have to be obtained before recommendations could be made for harvest in these stands.

Timber opportunities are currently limited due to the abundance of hardwood stands and remote, unroaded stands in matrix. The matrix areas provide some opportunities for regeneration harvest of conifers and hardwoods. Mid-seral, overstocked conifer stands suitable for commercial thinning are not abundant. Harvest opportunities associated with meadow enhancement exist in both matrix and LSR.

Late-successional habitat improvement opportunities in LSR are limited by the lack of overstocked, mid-seral conifer stands and the use of hardwood stands by spotted owls for foraging habitat. Commercial thinning in LSR would only occur if it would improve the stand's ability to have late-successional habitat characteristics at an earlier date. Treatment of dense stands or single-structure mid-seral stands next to interior forest habitat would be the priority over the next 10 to 30 years.

In the matrix allocation, the same type of dense or single-structure stands would be priority stands to commercial thin. Regeneration harvest could occur in mid to late-seral stands. Timber harvest from meadow enhancement is an opportunity in mid-watershed in both the LSR and Matrix allocations. Partial removal of hardwood stands could occur in dense hardwood stands in mid-watershed, in matrix or LSR, that do not conflict with objectives for stand diversity. Opportunities for firewood (tanoak and madrone), especially in accessible roadside stands, are limited in the matrix areas. Partial harvest of roadside hardwood stands for LSR enhancement may provide additional fuelwood opportunity.

There are limited opportunities to salvage Port-Orford-cedar and other species. This is due to lack of Port-Orford-cedar in matrix and lack of large-scale disturbance in LSR to warrant salvage. An environmental assessment and timber sale has already been prepared to remove roadside timber along Forest Road 1376 to protect downstream Port-Orford-cedar from its associated root disease. Scattered roadside hazard trees and hardwood blowdown periodically exist and may need to be harvested for public access/safety. Site-specific information would have to be obtained before specific recommendations could be made for harvest in these areas.

Special Forest Products

Special forest products collection has occurred over a broad area of the watershed with mostly minimal impacts to the resource. Products include: cedar posts and poles; a variety of mushrooms; ferns; Christmas trees; burls; brush; huckleberry; boughs; beargrass; alder; and firewood. The Eagle Creek and Long Ridge areas are the only specific areas identified for concentrated harvest. There has been some concern that beargrass and mushrooms may have been overharvested in selected sites. Trash and soil disturbance has occurred in some camps of beargrass pickers and mushroom gatherers. Bough collection has recently been coordinated with roadside cedar removal. Special forest products can be collected in Late-Successional Reserve under the Forest LSR assessment. Priority locations for collection include areas close to roads and markets mostly in the low and mid-watershed.

Information Needs: Determine which stands in which subwatersheds are suitable for habitat enhancement, regeneration harvest, thinning, firewood and special forest product collection, etc.

Grazing

In the past there were two range allotments, the Chetco and the Long Ridge Allotments, in the watershed. Currently, the Chetco Allotment is still active, while the Long Ridge Allotment was revoked due to non-use in 1991.

Long Ridge Allotment

Historical Range Condition and Use

The Long Ridge Allotment was located in T38S, R12W, Sections 22, 23, 26, 27, and 34.

The 1973 revision of the Range Management Plan stated the allotment consisted of 2624 acres of National Forest land and 570 acres of private land for a total of 3194 acres. Unsuitable range within the allotment was 2,284 acres of National Forest land and 330 acres of private land for a total of 2,584 acres. Suitable range open to grazing was 340 acres of National Forest Land and 240 acres of private land for a total of 580 acres.

Earliest records show Long Ridge was settled in the late 1850's. Records from 1911 indicate that sheep were grazed on Long Ridge before the Siskiyou National Forest was established in 1907. A 1923 Range Appraisal Report indicated that 250 head of sheep grazed year long. At that time there appeared to be no pressure by cattle owners to use this range. No records have been found between 1923 and 1930. District records show a permit was issued in 1930 to A.P. Waldien to graze 10 head of cattle. A.P. Waldien held a permit until 1938 when it was transferred to his son Frank Waldien. From 1930 to 1985, the permit allowed for 10 to 15 head of cattle.

The Long Ridge Allotment was put into non-use status in 1985 and revoked in 1991.

Current Range Condition and Use

The Long Ridge Allotment is no longer considered suitable for range use. The Forest Plan has designated this area as MA-9 - Special Wildlife Site and it is also an elk emphasis area. Range livestock use would be in conflict with the objectives set for this management area. The allotment contains an important elk calving area. An elk herd of about 65 animals rely on this area for spring and early summer grazing. It is also used by the local deer population. Current estimates are that wildlife consume between 40 and 50% of available forage.

Mr. Waldien's ranching operation no longer exists, and he no longer owns cattle. Since the revocation of his permit in 1991, no one has shown an interest in obtaining a grazing permit for the allotment.

Other Issues with this Allotment

Vehicles driven off-road in the meadows have and continue to damage soil and vegetation.

Packer's Cabin is a popular developed recreation site within the allotment area.

Chetco Allotment

Historical Range Condition and Use

The Chetco Allotment is located in T38S, R12W, Sections 2,3,4,9,10,and 11. The allotment originally included approximately 4445 acres of National Forest Land and 42 acres of the privately owned Tolman Ranch. Records indicate that the allotment was recognized and used at about the time the Forest was set aside. The permitted livestock number was dropped to 75 in 1938 from 125 in 1923. The allotment traditionally served the old Tolman Ranch homestead (patented in 1911).

The Range Allotment Management Plan of 1965 mentioned evidence of the decline in range quality and quantity. It specifically mentioned that encroachment of timber had altered the natural meadows. Poor livestock handling and possible overstocking caused the loss of vegetative cover resulted in soil erosion on High Prairie. Total suitable range open to grazing was estimated at 320 acres. In 1965 it was estimated that there were 110 pounds per acre of available forage on the primary range in the allotment. It is not clear in the records when the allotment went into non-use under Leo Lucas,but it was sometime between 1965 and 1981.

The Range Allotment Plan of 1981 states that the allotment was re-opened and Archie McVay, owner of the Tolman Ranch, was the permittee. The usual number of permitted livestock since 1981 has been 11 cow/calf pairs (there were 10 cow/calf pairs in 1989 and 9 pairs in 1992).

The Environmental Assessment that is associated with the Range Allotment Plan of 1981 indicated that the primary range was recovering from apparent past overuse. It also stated that primary range had been expanded by timber harvest, brushfield conversion, and wildlife improvement projects. Considerably more transitory range had been created by harvest activity since the 1965 Range Allotment Plan. Total suitable range open to grazing was estimated to be 410 acres in 1981 (an increase of 90 acres since 1965). Forage was estimated at an average of 300 pounds per acre on the primary range in 1980.

The Environmental Assessment reported that there was an elk herd of about 20 to 25 animals that were heavily dependent on the allotment for their sustenance.

Current Range Condition and Use

The Forest Plan has designated this area as MA-9 - Special Wildlife Site. It appears that there is not a conflict with wildlife objectives, but a new Allotment Management Plan is needed to analyze the current situation. Until the new allotment plan is completed, a temporary grazing permit has been issued to Archie McVay on the same terms and conditions of the expired permit as required by the Rescission Bill H.R 1944 (Public Law 103-332).

The amount of suitable range open to grazing has decreased since 1981. Total suitable range open to grazing is estimated to be 160 acres (a decrease of 250 acres since 1981). Transitory range has been greatly reduced as trees in harvest units and along roads have grown in size. The last timber harvest within the allotment was in 1988. Open meadow type range has also been reduced by tree encroachment. It is estimated that High Prairie has decreased in size by 1.8 acres per year and that other meadows in the allotment have decreased by 1.0 acre per year since 1940.

The type and scale of range on the allotment are not such that reasonable expenditures for betterment would make this area profitable for the cattle industry or diversified ranching. Instead, it is a carry-over of old practices fostered by homesteaded properties. The local economy is not affected by the existence or absence of this range. It has a small effect on the income of one family.

A Meadow Prescription for the High Prairie, Low Prairie, and The Pines meadows was completed in 1993 (refer to Meadow Prescription for the Upper Chetco Planning Area, 6/93). These meadows are all within the allotment. High Prairie vegetative cover and desired species composition did not meet the desired conditions established by the prescription. Sheep sorrel (*Rumex acetosella*), areas of low vegetative cover, and areas of bare soil, were potential indicators of heavy grazing on High Prairie in the past. The Meadow Prescription stated the meadows receive frequent wildlife use, including deer and elk, bear and cougar. The local elk herd is estimated to contain 25 to 30 animals.

An informal walk through survey in 1995 indicated that conditions on High Prairie had not improved since 1993. The Pines meadows were also included in the informal survey. There was a good composition of native species and little encroachment of undesirable species was found in the Pines. There was concern that almost every clump of grass along the survey route had been grazed and that the few occurrences of undesirable species, dogtail grass (*Cynosurus*), were found growing in cattle dung. Dogtail grass was also found along the roadsides in The Pines. Wheatgrass (*Agropyron*) was found at the end of the 1376365 road adjacent to The Pines.

High Prairie has four springs that form intermittent streams. The Humboldt Spring feeds the livestock and wildlife watering trough at the Humboldt Corral. Humboldt Corral is also a dispersed recreation site. A pumper chance near the junction of the 1376360 and 1376362 roads also provides water for livestock and wildlife.

Management Opportunities: **Long Ridge** - Livestock use conflicts with MA-9 Special Wildlife Site objectives. No appropriate range opportunities have been identified. **Chetco Allotment** - There is an opportunity to develop a new Allotment Management Plan to define range objectives that would ensure a small, sustainable range resource that is compatible with wildlife and other resource objectives.

Mining

Characterization

The following metallic mineral resource characterization is summarized from the Geology and Mineral Resources of the Upper Chetco Drainage (Ramp, 1975). Historically, the Upper Chetco area was mined for gold, both lode and placer, and for chromite. Most of the gold mining took place in the late 1800's, with renewed activity during the 1930's depression years. A limited amount of chromite was produced under government subsidy between 1952 and 1958. Occurrences of copper, associated with volcanogenic massive sulfide deposits, were found during the search for lode gold. More recently, low-grade deposits of iron, copper, and nickel have been prospected.

The Tertiary gravels at Gold Basin were found to contain little gold. Placer gold values have been reported within the Little Chetco (particularly at Emily Cabin), the mouth of Hawk Creek, and a half mile above Hawk Creek on Peterson's claims. Large deposits were found in bench gravels and active bar gravels along the Chetco River near the mouths of Babyfoot Creek and Slide Creek, and at Taggert's Bar and Chetco Bar. Platinum-group metals occur in minor amounts with gold, and further investigation of platinum occurrences maybe warranted.

Lode gold mineralization occurs mainly in altered volcanic and sedimentary rocks of the Rogue Formation, near sheared contacts with serpentinite, or contacts with diorite or gabbro dikes (see Geologic Map, Figure 4).

Chromite occurs exclusively in the ultramafic rocks associated with the Josephine peridotite sheet, predominantly in the olivine-rich varieties on the western and northern margins. Sourdough Flat was the largest chromite producer. It is situated within a large ancient landslide (slump block) that was deeply weathered to form a nickel-bearing lateritic soil. None of the known chromite occurrences in the area appear to have significant reserves of metallurgical-grade ore. Weathering processes tend to concentrate nickel in lateritic soils over peridotites, particularly on flat-topped ridges and benches, including landslide areas.

Magnetite is a common iron-bearing mineral in the gabbros. A large low-grade deposit is reported in the Tincup Iron Group claims located between Tincup Peak and Gold Basin. Further investigation of the iron potential may be warranted.

Small deposits of manganese occur in cherts of the Dothan and Rogue Formations where the manganese oxides have been enriched by surface weathering. The amphibole gneiss near Chetco Lake also bears a small discovery pit of rhodonite and manganese oxide.

Large potential reserves of fresh olivine suitable for the manufacture of refractory brick, foundry sand, etc. are present in the vicinity of Pearsoll Peak and Sourdough Flat.

General Historic Overview

Gold

Emily Cabin was built in the late 1800's as placer gold was mined on the Little Chetco River. Chinese laborers were hired to construct a ditch and dam to transport water from upper Ditch Creek to the hydraulic "giant" used along the river. Neatly stacked, moss covered rock walls still stand near the cabin location. Some hardrock gold mining operations took place on the Bacon (Peck) and Robert E. (Miller) lode claims between Miller and Babyfoot Creeks between the 1920's and 1950's. Limited placer mining of Tertiary gravels occurred in Gold Basin on a 160 acre patented claim established in 1897.

Chromite

Mining for chromite, a "strategic material" which occurs in serpentinite and peridotite areas, was historically limited to the war years, as its production was only viable with the assistance of government subsidies. Roads were pioneered and quickly constructed to access potential sites. The road from McCaleb Ranch up to the Chetco Pass area was constructed to access claims near Pearsoll Peak, Sourdough Flat (southwest of Chetco Pass), and Bowser Mine (west of Eagle Mountain). The Gardner Mine (near Vulcan Lake) was another chromite producing site which included road and cabin construction. Physical impacts from these and other chrome mining operations are still visible in the form of roads, cabin and mill debris and small pits from ore extraction.

Current Use

Effective January 1, 1984, the Wilderness Act withdrew minerals from designated Wilderness Areas from appropriation under the mining and mineral leasing laws, subject to valid existing rights. This limitation also applies to the Wild segment of the Chetco River. The Recreation and Scenic segments of the Chetco, which are not within designated Wilderness, have been allowed to remain open to mineral claim and discovery. Holders of valid mining claims within Wilderness are allowed to conduct operations, subject to regulation, which are necessary for the development, production, and processing of the mineral resource.

Little Chetco and Emlly Claims

Claims in this area were originally located in 1958. Perry and Ruth Davis lived in the Emlly Cabin and mined along the Little Chetco River from 1961 until 1979. Mineral exams were made in 1963-64 on the Emlly claims confirming valid existing rights and led to the approval of motorized access. The Little Chetco 1-3 Group and the Emlly 1-5 unpatented claims came into the ownership of Carl W. Alleman in 1982 . A patent application was filed for Little Chetco 1-3 in 1984. A 60-acre patent with exceptions was granted in December 1988. The exceptions included title to the surface of a portion of land embracing 14.9 acres outside of the boundaries of the mineral survey and a reservation for portions of trails #1121 and #1131. Mining operations on Mr. Alleman's unpatented claims have been limited to hand sampling, sluicing, panning, road maintenance, and suction dredging each field season since 1983. Motorized access in the Wilderness has been allowed to perform these activities under Notices of Intent (NOI) and Plans of Operation (POO). Mr. Alleman has contested the need to obtain a special use permit for access to the private property. Mr. Alleman is entitled to "reasonable access" under a special use permit, but his reluctance to request this permit has precluded its issuance. In 1994 Mr. Alleman offered his private property to the Forest Service for sale or trade for property of equal value outside the Wilderness. Another dispute has concerned Mr. Alleman providing motorized access via the locked gate at Onion Camp to a prospective purchaser of his private property in the absence of a special use permit.

Information Needs: Clearly determine when access to the Little Chetco area by Mr. Alleman is for mining purposes or for access to his patented claims. Specific information is needed from the miner as to the nature of his mining plans for the unpatented claims.

Management Opportunities: Determine if a POO is necessary on Mr. Alleman's unpatented claims. If so, conduct a mineral examination, and include conditions for access. Should Mr. Alleman request a SUP for access to his patented claims, issue him a permit which meets the definition of "reasonable access" while being sensitive to wilderness concerns.

Independence Claim

The Independence placer claim is located on the Little Chetco River approximately 1.5 miles southeast of Emlly Cabin. The claim was discovered in 1933 and relocated in 1941. A mineral exam was conducted in 1964. A main cabin and a smaller sleeping cabin were constructed sometime in the mid 1960's. In 1974 a mineral exam found that a valid discovery had been made. Another mineral exam was performed in 1985 and in 1991, an EA and POO was approved for Lynn Peterson. The claim has been minimally worked under an approved POO since 1991.

The access road through the Wilderness to the Little Chetco River does not have a specific maintenance plan. Under the authority of a NOI and POO, Carl Alleman and Lynn Peterson have been allowed to perform routine road maintenance, such as clearing of windfalls, correcting drainage problems and removing slough from cut banks. The use of bulldozers or other motorized road maintenance equipment would require additional authorization.

Taggart's Bar Area

Chetco Placer Claims

The Chetco Placer Claims, comprising 17 claims and 2,115 acres, are located on the Chetco River within the Kalmiopsis Wilderness. The claims were located on January 27, 1961 when the land was classified as a Wild Area prior to wilderness designation. Mining first began in 1961 at the mouth of Slide Creek by Darrel E. Brown (M & B Logging). Hydraulic mining was done with a giant and diesel powered pump. Aerial observations made in 1962 indicated that the river was muddy for over a mile downstream from this operation at Slide Creek. Mr. Brown constructed a mining road to the Chetco Bar area in 1961. There appeared to have been some confusion as to whether Mr. Brown had received

the proper approval to build the road at the time. A mineral exam was performed in 1961 at the mouth of Box Canyon Creek to determine if a special use permit (SUP) should be issued to Mr. Brown for the road. A discovery was determined and a SUP was issued in 1962 for 12 miles of road use and required Mr. Brown to perform road maintenance. Until about 1980, most of the work on these claims had consisted of prospecting and annual assessment work. A POO was approved for 1980-82 and some work was performed in the Taggart's Bar area. Heavy equipment was removed from the claim area in 1984. POO were approved in 1989 and 1990 for sampling on portions of his 160 acre Chetco #2 claim. In 1992 Mr. Brown applied for a patent on his Chetco #2 claim but the current status in not known. In 1993 the Forest Service conducted a mineral exam (Supplement Report to Mineral Report for 1991) on the Chetco #2 and it concluded that a valuable mineral deposit had been demonstrated within the claim. In accordance with his SUP for the use of the road and to accomplish his yearly assessment work Mr. Brown has been doing yearly road maintenance. The use of a D-9 cat in 1990 was the last time road equipment was used for road maintenance. Access to the Chetco #2 claim requires the fording of the Chetco River above the confluence of Slide Creek and at Taggart's Bar. The log stringer bridge across Sluice Creek, which provides access to Brown's cabin and truck camper located near the confluence of Box Canyon Creek, has completely fallen in. The section of road prior to the Taggart's Bar crossing has some deep rutting occurring from the cross flow of a side drainage.

Information Needs: Inventory road conditions, determine what maintenance is necessary to prevent resource damage and include in POO and SUP.

Management Opportunities: Review and adjust the Brown road SUP at issuance of patent to bring it into compliance with current direction.

Robert E. Group

The Robert E #1-6 were located in 1960 and again in 1973. This group of lode claims has pre-dated wilderness designation and are owned by Ralph Kaiser and LeRoy Clouser. The claims have been the subject of validity and access disagreements with the claim holders and has resulted in a series of legal actions. The Forest Service contends that the claims are null and void and has not approved motorized assess to the claim area by Mr. Clouser. Mr. Clouser is pursuing all his legal options of appeal to contest these decisions. No work has been done on these claims since a joint sampling mineral exam was performed in 1989. A cabin in disrepair, a small tractor, ore cart, and miscellaneous materials and tools remain on-site. On a nearby skid road toward Miller Creek, there is an old style cat approximately the size of a D6 which is rusting in place. A cultural resource site report on the cabin has been completed and submitted to the State Historic Preservation Office (SHPO).

Management Opportunities: If the decision to void the claims is upheld through all legal appeals, and the cabin is not eligible for the National Register, consider options for removing the cabin from the Wilderness. Completion of a Biological Evaluation (BE) will be necessary to assess the cabin as potential habitat for the Townsend's big-eared bat.

Old Hotel/Hilltop

The Old Hotel, Old Hotel #2, #3 and the Hilltop #1-3 mining claims of Richard Rounds were declared null and void in 1994. These claims are located on a ridge about 1 mile west of Babyfoot Lake in T38S, R10W, Sec. 36 & 31. The mine site contains a rustic cabin, shed, miscellaneous materials and litter.

Information Needs: Standing structures at Old Hotel/Hilltop mine need a cultural resource evaluation.

Management Opportunities: If the structures are not eligible for the National Register, make plans for removal and clean up of the sites. Complete BE to assess the structures as possible habitat for Townsend's big-eared bat.

Gold 11

Gold 11 is one of a series of 11 (Gold 1-11, ORMC #66638-66648) contiguous placer gold mining claims on the Chetco River owned by Floyd Higgins. The claims, which begin at the National Forest boundary, include segments of Recreation, Scenic, and Wild river. The only active claim has been Gold 11, located within the Kalmiopsis Wilderness, starting at T38S, R37 1/2S, Sec 34 and ending at T38S, R11W, Sec 11. The claim is accessed on foot via a mining

road constructed by Darell Brown in 1962. No recreation trails are in the area. The claim was located in August 1983, prior to wilderness mineral withdrawal. A POO was submitted in 1984 and an EA was completed for suction dredge mining. In 1986 a mineral exam was completed which determined that the Gold 11 claim was valid. Mining operation occurs for approximately one month each year during a period from July through early September. Each year since 1986 the miner has submitted a NOI to operate. Operations have been allowed to continue based upon Notices of Intent which have adhered to the previously accepted POO. The operating plan restricts operation to the "wet area" of the stream channel and allows helicopter use for equipment logistics. A total of 8 to 10 helicopter trips occur during the mining season. A maximum of 500 cubic yards of gravel is disturbed each season. The largest suction dredge used has an 8 inch intake. Camps are located on the river bars at least 100 feet from the river. Approximately 2 to 5 people work the claim on any given year. A small pole and shake equipment shed has been constructed on a small river terrace to hold tools, equipment, safety gear and additional food. The shed is not visible from the river. Attempts are made to monitor the claim area on a yearly basis whenever possible.

Orewash 1-3

Clarence Mohr (Northwest Mineral Prospectors, Inc) owns a group of claims on the Recreation segment of the Chetco River. The Orewash 1-3 are a group of gold placer claims located approximately between Miller and Redwood Bar (T39S, R12W, Sec 29,30). A initial NOI was submitted in 1994 and another submitted in 1995. In both cases, evaluation of the operating plans determined that their operation was primarily recreational in nature and did not pose any significant surface disturbance. This is a "club" activity with mining accomplished with small (4 inch or smaller) dredges and hand tools within the "wet area" of the river channel. The season of operation has been adjusted for fishery and wildlife considerations. Mechanized equipment use is limited to a period of time between July 15 and September 15 and limited to "handwork only" prior to July 15 and between September 15 and October 1st.

Trends

The Kalmiopsis Wilderness and the Wild segment of the Chetco Wild and Scenic River are closed to mineral entry. Additional active claims in these areas are possible but are not expected. While there are a number of claims "on file" many may not be valid and will be dealt with on a case by case basis as NOI's or POO are received.

Carl Alleman (Little Chetco Group) has limited his previous mining operations to doing assessment work. Mr. Alleman is expected to submit an POO in the future to operate on his unpatented claims. Depending upon the scale of a proposed operation under a new POO, it is likely that a mineral exam and appropriate environmental assessment work will be completed. Lynn Peterson (Independence Placer Claim) is expected to continue his operation via a NOI based upon the operating plan approved in his original POO and completed EA. Road maintenance from Onion Camp down to the claims on the Little Chetco is likely to be an issue with the claim holders and will be addressed through POO's. Road access to patented claims will be addressed through a SUP with the land owner.

If and when Darell Brown's (Chetco #2 Placer) patent application is approved, the older SUP for road access will be revised. A patented claim will have the potential to be sold, but there are no known negotiations by the claimant with prospective buyers at this time.

The null and void decision on the Robert E. Group owned by Ralph Kaiser and LeRoy Clouser is currently in litigation. If the government position is upheld and the cabin is neither eligible for the National Register of Historic Places nor found to be habitat for sensitive bat species, it may be removed along with the clean-up of litter and debris.

The Hilltop/Old Hotel claim will be cleaned up. The cabin may or may not have cultural significance. Disposition of the cabin will depend upon cultural resource and wildlife evaluations.

Floyd Higgins is expected to continue mining the Gold 11 claim, adhering to the provisions of his approved POO and completed EA. Mr. Higgins has mentioned an interest is doing some exploratory work on the adjacent Gold 10 claim.

No change is expected from the limited "club" mining performed by the Northwest Minerals Prospectors, Inc. on the Orewash 1-3 claims. A yearly NOI is expected.

Watershed Analysis Appendices

APPENDIX A
Road Treatment Priorities

Priorities for road treatments vary by objective. Locations are given by Watershed Analysis Area (WAA). Ratings for treatments to minimize sediment delivery are based on the miles of steep (>60%) and moderately steep (40 to 60%) roads in the WAA. Ratings for treatments to restore hydrologic function are based on road density, harvest percentage and timing, and brushfield conversions. Ratings under fish habitat are based on the values of the fish using the habitat in that WAA.

Table 14.

Subwatershed	WAA	Sediment	Hydrology	Fish Habitat	Comments
Upper Mainstem	03U01W (Ditch Creek)	Medium	Low	Low	mining access roads
Middle Mainstem	03M05W (Upper Babyfoot) 03M07W (Slide/Miller)	Medium High	Low Low	Low Low	Mining access roads Mining access roads
Boulder Creek	03B07W 03B08W	Low Medium	Medium Low	Low Low	LSR; tribs to Wilderness
Upper Chetco	04U01F 04U04W	High Low	Low Low/Med	Low Low	Harvest/Road interaction
Mislatnah	04M01F	Low	Low/Med	High	
Eagle Creek	04H07W 04H08W (North Fork)	High Medium	Low Low	High Med	
Middle Chetco	 04F02F 04F04W (Nook Creek) 04F06F	High High Low Medium	Med High *	 Med Med Med	Part private Part private
South Fork Chetco	04S02W (Basin Creek) 04S05W 04S06F 04S09W (West Coon) 04F07F	Medium Low Medium Low High	High * High * Low High High *	High High High High High	 1107550 road "World class" slide
Quail Prairie Creek	04Q01F 04Q04W (South Fork)	Medium Low	Medium Low	High High	Sec. 36, tractor logged
Emily Creek	04E05W 04E06W	Medium High	Low High *	High High	Snaketooth roads
Lower Chetco	04L01F (Jacks Creek) 04L04F 04L05W (Mill Creek) 04L06W (Dry Creek)	Medium Medium Medium Low [1]	Medium Low Medium Medium	High Med High Med	Private Part private Part private
North Fork	04N	High/Med		High	Road mileage unknown

* highest priority for hydrologic effects, with high road density, and high % harvest within last 20 years.

[1] Rated Low because Dry Creek has less than one mile of steep or moderately steep road. A headwall failed in 1993 along a shorter road, indicating that a more sensitive method for locating landslide hazard is needed.

APPENDIX B
Data used to Support the Chetco Watershed Analysis

GIS Maps

Stream Classes
Roads
MA-9 (Special Wildlife Sites)
National Forest land
Small fires (fire starts)
Large fires (fire history)
Subwatersheds and Class I Streams
Management Areas
Elevation zones
Slope classes
Seral Stages (structural stages)
Canopy cover
Geology
Soil types and thickness
Slope of stream segments
Vegetation (seral stages) in stream buffers
Vegetation within 200 feet of streams
Roads on steep slopes
Harvest clear cuts
Brush field conversions
Vicinity map
Watershed analysis areas for each subwatershed

GIS Reports

Area of subwatersheds
Area of proposed projects for 1996 and 1997
Road densities by subwatershed
Stream Miles by class by subwatershed
MA-9 by subwatershed
MA-9 by category by subwatershed
Management Areas by subwatershed
Management Areas for Chetco River Watershed
Land ownership by subwatershed
Small fires by subwatershed
Area burned by large fires by subwatershed
Structural stages (Seral Stages) for Chetco River Watershed
Structural stages by subwatershed
Canopy cover by subwatershed
Elevation zones (<2500 feet, 2500 to 4000 feet, >4000 feet)
Watershed analysis areas (WAA, sub-sub watersheds) for 04E, 04Q, 04M and 04S
Road densities by WAA for 04E, 04S, 04M, and 04Q
Road densities by WAA for 03B
Seral stages within stream buffers
Seral stages within 200 feet of streams
Slope class of streams by subwatershed
% of stream length that has been harvested (by class and subwatershed)
Fish use in Chetco River Watershed
Fish use by subwatershed
Roads and slope steepness by subwatershed
Clear cuts before 1976 by WAA
Clear cuts since 1975 by WAA
Brush field conversions by WAA
Area of WAA's

Road-Related Landslides on Dothan Formation

Methods: Past road-related landslides were tabulated from 1986 aerial photographs within the area centered on Snaketooth Butte. The area includes watershed analysis areas 04E06W, 04S01F (part), 04S02W, 04S05W, 04S06F (part), 04S08F (part), 04S09W, 04F02F (part), 04F05W, and 04F07F. Road miles were measured by map wheel, and stream-crossings were identified by contour crenulations on 15' topographic maps. Landslides were listed as cutbank or fill failures, and were noted where located in stream-crossings.

Results: On 46.4 miles of road, 92 stream crossings, 57 debris slides, and 35 debris slides in stream-crossings were measured. Debris slide frequency was 1.2 slides per mile of road. These roads averaged 2.0 stream crossings per mile, and 60 percent of the road-related slides were associated with stream crossings. Cutbank failures have a low volume of sediment delivery to streams, and accounted for 19 percent of the debris slides.

Pistol River Sediment Study

In 1991, a study was initiated in the Pistol River Watershed to identify sediment sources, estimate magnitudes of sediment delivered to stream channels, and identify high priority sites for rehabilitation. Results on landslide and erosion frequencies, average volumes, delivery and timing, are expected to be representative of those in the Chetco River watershed, because of similarities in climate, geology, soils, and land use history.

Historic Landslide Inventory

Methods: Conducted by Periann Russell through a Cooperative Agreement between Oregon State University and the USDA Pacific Northwest Research Station. Landslides were identified and measured on historical photos for 1940-1986. The photo measurements were field verified .or a sample of the slides during summer 1991.

Results: Landslide, frequencies, volumes, and trends

Road Gully Erosion Survey

Methods: Gully erosion was sampled in winter 1992. Nine road segments totalling 12.6 miles were selected for the study to represent differences in geology, elevation, soil type, aspect, and age of road. Each road segment has at least some midslope portions, and is within soil mapping units of 30 to 60% or 60 to 90% slopes (it is expected that more gently sloping, ridgetop road locations will be sampled at a later date). Each drainage outlet was identified and checked for erosion features within 100' of the road. Where erosion was present, the feature was measured with tape and clinometer methods, using representative cross-sectional areas. Slope, stability of alignment, potential for downcutting, presence of bedrock, skeletal or non-skeletal nature of soils, and nature of the lower end ot the feature were noted. At each drainage outlet, the length of road which drains to the feature, road gradient, culvert size, culvert outlet protection, and other sources of water were noted. Natural drainages were not measured, due to the difficulty in differentiating between natural and road-related erosion.

Results: Volumes eroded from drainage outlets varied from 0 to 378 cubic yards per outlet. Erosion was evident below 24% of the drainage outlets. In addition, 18% of the drainage outlets occurred in natural drainages, and may have had road drainage erosion which was not measured. The average erosion volume over the 12.6 miles was 160 cubic yards/mile. The average erosion volume for each segment varied from 0 to nearly 1000 cubic yards/mile.

The largest gullies were associated with stacked roads, mining disturbance, road junctions, long distances between drainages outlets (e.g. 700 to 800 feet), and road-related landslides. From preliminary analysis, it appears that it will be difficult to correlate drainage distance and other flow-related factors such as elevation and road grade with gully erosion volumes. This is due to a lack of data on the maintenance history of the roads. For example, it is common practice to add drainage outlets to a road near the site of an eroded gully, to prevent additional erosion. The existing road drainage may not be associated with the drainage that caused the erosion.

Discussion: Evidence from the literature indicates that most erosion from road drainage outlets occurs within the first few years after road construction or other disturbance. Later erosion may also result from inadequate maintenance of road ditches and culvert inlets, or during storms when road cutbanks fail and divert drainages. Thus, the age of the road may have little effect on the volume of erosion, and erosion is not given as a rate, in cubic yards per mile per year.

While these results are roughly applicable to the Chetco Watershed, it would be inappropriate to extrapolate these results to other watersheds which differ in climate or rock type from Pistol River. In addition to the variability in yield from different road segments, it should be recognized that the measurements may not reflect the true sediment yield. Gully erosion below the midslope roads in the study may be greater than below ridgetop roads (at the same elevation) because of the interception of subsurface flow by the cutbank and ditch, and potential for diversion of drainage. Sediment delivery to natural drainages may be less than was measured, because some of the gullies dissipated before reaching streams. Sediment delivery may also be greater than was measured, because of our inability to differentiate between natural and road-related erosion in natural drainages.

Example Calculation for Surface Erosion from Burning

Maximum soil loss on burned minus unburned 70% plots: 18.7-3.1 = 15.6 tons/acre
Moderate soil loss on burned 50% plots: 4.0 tons/acre
Assume: all of the soil loss was delivered
soil density of 110 lb/cf,
average sediment delivery per landslide = 1000 cubic yards
330 acres of brushfield conversion in Quail Prairie Creek
15 tons/acre x 330 acres x 2000 lb/ton /110 lb/cf /27 cf/cy /1000 cy/landslide = 3.5 landslides

Slope Stability Reports and Data

North Fork Eagle and Mineral Hill Fork
Ferrero Geologic, 1991, Geology, Soil, and Slope Stability: Eagle Project Area, Contract for Siskiyou NF
Geologic map with faults and shear zones
Soil thickness map
Stability Features map (springs, talus, landslides, rock, benches)
Landslide field data forms
Rock outcrop classifications (URC)
Captioned photographs
Mislatnah Project Area
1990 Geologic Services Report - Ron Sonnevil
1990 Position Statement, inc. 1:24,000 geology and photo-interp landslides
Watershed Sensitivity Map at 4"/mile
West Coon Project Area
Watershed Sensitivity Mapping on 1986 air photos
1989 Traverse field notes
Upper Quail Project Area
1986 Geologic Services Report
Risk Zone discussion, but no map located in files
Watershed Improvement Needs form and map of skid road drainage diversions and resulting debris flows
Red Mountain Project Area
1989 Map with new unsuitable lands (TML)
1983 Position Statement (Boulder Heaven) with geology and photo-interp landslides
Partridge TBV proposed Unit 3 (adjacent to mainstem Chetco inner gorge)
1988 Geologic Services Report, inc. landslide map (16"/mile)
Jasper Copter Timber Sale Unit 13
1990 report on field layout near unsuitable lands (TML)
Snaketooth Area - Dothan Road Coefficients file
Road-Related Landslide map and data
Dry Creek Slide, 1993 Report
"World Class Slide" - west of Basin Butte
1993 Draft Report on historic photo inventory of road landing failure

Stability Features Map
Historic Fires Map
Temperature Data
- United States Forest Service (USFS) Data
- Oregon Department of Fish and Wildlife (ODFW) Data
- Water Temperature Monitoring, Kalmiopsis, 1992
- Temperature Recordings, 1992, Floyd Higgins, miner

Fragstats (U-Tools Report for Interior Habitat)
Wildlife and Plant Observations Database

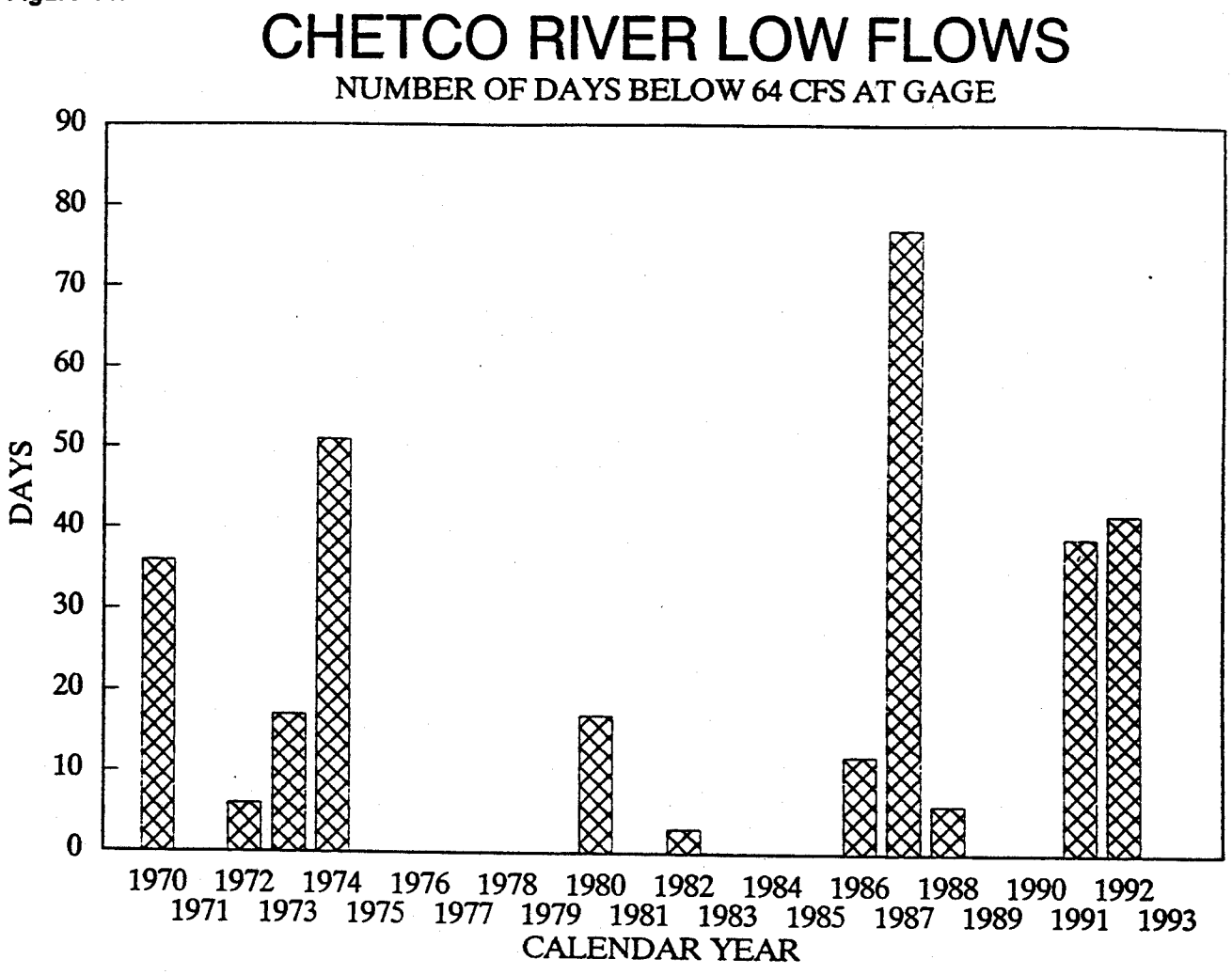
Supporting Data for Priorities for Road Treatment to Minimize Sediment Delivery by Watershed Analysis Area

Based on the presence of roads on steeper slopes having larger fills that may fail, and a higher incidence of debris flows triggered.

Table 15.

WAA #	Description	Miles >60%	Miles 40-60%	Total miles
04F02F	South side mainstem, Little Redwood	1	6	14
04E06W	North East upper Emily	1	3	7
04U01F	Mainstem, @turn-Eagle	1	3	18
04F07F	West of Basin Butte	1	2	6
04H07W	Upper Eagle, including Section 36	1	2	8
03M07W	Slide/Miller Creeks, mining	1	2	11
04F06F	Mainstem, First & Second Creeks	0	4	23
04L05W	Mill Creek	0	3	9
04E05W	South East upper Emily Creek	0	2	4
04S06F	South Fork below West Coon	0	2	5
03U01W	Ditch Creek in Little Chetco	0	2	5
03B08W	Boulder Creek headwaters	0	2	6
03M05W	Upper Babyfoot	0	2	8
04H08W	North Fork Eagle	0	2	8
04S02W	Basin Creek	0	2	9
04Q01F	Lower Quail	0	2	11
04L01F	Jack Creek	0	2	22
04L04F	Mainstem, @low water bridge	0	2	25

Figure 11.


CHETCO RIVER LOW FLOWS
NUMBER OF DAYS BELOW 64 CFS AT GAGE
DAYS
90
80
70
60
50
40
30
20
10
0
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993
CALENDAR YEAR

Percent Harvest and Road Density by Watershed Analysis Area

WAA	Watershed Analysis Area
ACRES	Total acres in Subwatershed or WAA
NON-FS	Non-Forest Service ownership acres
% > 75	Percent of acres harvested before 1975
% < 75	Percent of acres harvested after 1975
% BCC	Percent of acres treated as brushfield conversion
% TOT	Total percent of acres with vegetation altered
RD_MI	Miles of road within Subwatershed or WAA
RD_DENS	Miles of road per square mile of Subwatershed or WAA

Table 16.

WAA	ACRES	NON-FS	% < 75	% > 75	% BCC	% TOT	RD_MI	RD_DENS
03B	13973		0.02	0.00	0.00	0.02	12.51	0.57
03B01F	2940		0.00	0.00	0.00	0.00		0.00
03B02F	1588		0.00	0.00	0.00	0.00	0.6	0.24
03B03W	2315		0.00	0.00	0.00	0.00		0.00
03B04W	2096		0.00	0.00	0.00	0.00	0.04	0.01
03B05F	1479		0.00	0.00	0.00	0.00	0.56	0.24
03B06F	1061		0.02	0.00	0.01	0.03	1.66	1.00
03B07W	669		0.23	0.01	0.00	0.25	4.02	3.85
03B08W	1825		0.05	0.00	0.01	0.06	5.63	1.97
04E	7982	61	0.12	0.04	0.01	0.18	18.8	1.51
04E01F	1772	61	0.03	0.01	0.00	0.06	0.7	0.25
04E02W	843		0.00	0.00	0.00	0.00	0.2	0.15
04E03W	1117		0.09	0.00	0.00	0.09	2.3	1.32
04E04F	1271		0.04	0.00	0.00	0.04	0.6	0.30
04E05W	1398		0.17	0.12	0.01	0.30	4.5	2.06
04E06W	1581		0.32	0.09	0.05	0.47	10.5	4.25
04F	16280	8727	0.37	0.11	0.06	0.68		4.40
04F01W *	1265	1259						
04F02F	2598	458	0.34	0.10	0.00	0.50		
04F03W	1933	1684	0.42	0.10	0.13	0.78		
04F04W	1257	561	0.45	0.28	0.08	0.81		
04F05W	874	0.29	0.03	0.00	0.33			
04F06F	2397	2005	0.21	0.00	0.00	0.70		
04F07F	1112	588	0.31	0.28	0.14	0.77		
04F08F	2045	854	0.47	0.01	0.12	0.68		
04F09W	2799	1318	0.39	0.12	0.09	0.69		
04H	13150	2013	0.12	0.05	0.09	0.34		2.00
04H01F	922		0.20	0.02	0.02	0.24		
04H02F	2519		0.08	0.09	0.07	0.23		
04H03W	1367		0.16	0.06	0.00	0.22		
04H04W	831		0.01	0.01	0.06	0.08		
04H05W	894	122	0.00	0.00	0.13	0.23		
04H06W	1618	1212	0.29	0.13	0.43	0.81		
04H07W	2593	679	0.16	0.04	0.18	0.49		
04H08W	2406		0.10	0.02	0.07	0.19		

WAA	ACRES	NON-FS	% < 75	% > 75	% BCC	% TOT	RD_MI	RD_DENS
04L	11650	7368	0.28	0.04	0.00	0.63		3.50
04L01F *	3153	3136						
04L02W	978	764	0.60	0.00	0.00	0.76		
04L03W	1505	131	0.11	0.05	0.00	0.22		
04L04F	3296	2972	0.39	0.00	0.00	0.76		
04L05W	1491	292	0.46	0.09	0.01	0.60		
04L06W	545	64	0.46	0.00	0.00	0.50		
04L07W	682	9	0.04	0.00	0.00	0.05		
04M	7028		0.09	0.03	0.00	0.12	10.3	0.94
04M01F	1571		0.29	0.08	0.02	0.39	6.2	2.53
04M02W	1027		0.00	0.00	0.00	0.00		0.00
04M03W	1776		0.00	0.00	0.00	0.00		0.00
04M04W	1317		0.00	0.00	0.00	0.00	0.1	0.05
04M05W	1337		0.10	0.04	0.00	0.15	4	1.91
04Q	7350	343	0.10	0.06	0.05	0.23	24.2	2.11
04Q01F	1902	343	0.19	0.13	0.00	0.40	10.8	3.63
04Q02F	1166		0.10	0.13	0.02	0.26	3.9	2.14
04Q03F	483		0.04	0.06	0.00	0.10	2.2	2.92
04Q04W	1576		0.14	0.00	0.14	0.28	3.8	1.54
04Q05W	2223		0.02	0.02	0.04	0.08	3.5	1.01
04S	20360		0.09	0.05	0.01	0.15	39.6	1.24
04S01F	1995		0.07	0.03	0.00	0.10	2.9	0.93
04S02W	1709		0.40	0.18	0.02	0.60	8.7	3.26
04S03W	717		0.00	0.00	0.12	0.12	1.6	1.43
04S04W	677		0.00	0.00	0.00	0.00	0.1	0.09
04S05W	820		0.49	0.16	0.00	0.65	5.3	4.14
04S06F	1316		0.12	0.05	0.00	0.16	4.9	2.38
04S07W	530		0.00	0.00	0.15	0.15	0.4	0.48
04S08F	1265		0.03	0.08	0.02	0.13	1.8	0.91
04S09W	1369		0.23	0.10	0.01	0.33	7	3.27
04S10W	737		0.00	0.02	0.00	0.02	1.1	0.96
04S11F	944		0.01	0.07	0.00	0.08	3.2	2.17
04S12W	1191		0.02	0.09	0.00	0.11	2.6	1.40
04S13W	973		0.00	0.00	0.00	0.00		0.00
04S14F	1923		0.00	0.00	0.00	0.00		0.00
04S15W	498		0.00	0.00	0.00	0.00		0.00
04S16W	675		0.00	0.00	0.00	0.00		0.00
04S17W	3021		0.00	0.00	0.00	0.00		0.00
04U	10617	284	0.18	0.06	0.05	0.30		2.40
04U01F	4287	244	0.24	0.10	0.01	0.37		
04U02W	586		0.12	0.00	0.01	0.13		
04U03F	2243	40	0.07	0.02	0.14	0.24		
04U04W	700		0.29	0.08	0.24	0.61		
04U05F	1350		0.00	0.00	0.00	0.00		
04U06W	1451		0.28	0.08	0.01	0.38		

* No Harvest Data

Chetco River Watershed
Stream Surveys on File

Note that river miles listed in stream surveys do not correspond to GIS-generated river miles used in the Watershed Analysis document. Check maps to find corresponding segments.

Table 17.

Stream	Survey Dates	Miles Surveyed
Chetco River	8/78	River mile 11.00 to 25.50 mainstem
	8/79	River mile 48.5 to 50.00 mainstem
	8/79	River mile 52.25 to 56.75 mainstem
	3/77	1.00 mile Ferry Creek
	3/77	0.50 mile Joe Hall Creek
	4/77	5.00 mile Jack Creek
	3/77	0.75 mile Hamilton Creek
	3/77	0.5 mile Jordan Creek
	4/77	1.75 mile Mill Creek
	8/72	8.75 mile Bravo Creek
	8/72	3.50 mile Ransom Creek
	6/77	0.25 mile Nell Creek
	6/77	0.25 mile Dry Creek
	7/77	0.75 mile Little Emily Creek
	6/73	4.95 mile Emily Creek
	7/87	4.85 mile Emily Creek
	8/77	0.75 mile Elk Creek
	8/77	1.00 mile Wilson Creek
	7/77	0.75 mile Nook Creek
	8/77	0.25 mile Little Redwood Creek
	6/79	0.50 mile Big Redwood Creek
	1989	2.5 mile Panther Creek
	8/78	0.75 mile Sluice Creek
	8/78	1.25 mile Granite Creek
	8/78	0.10 mile Slide Creek
	8/79	2.25 mile Fresno Creek
	8/79	2.75 mile Madstone Creek
	8/79	1.5 mile Broken Cot Creek
	8/79	3.5 mile other tributaries segments
South Fork Chetco	8/78	12.92 mile South Fork Chetco
	7/87	12.95 mile South Fork Chetco
	9/95	12.5 mile South Fork Chetco
	7/87	0.75 mile Karen Creek
	7/78	2.00 mile Basin Creek
	7/87	0.46 mile Basin Creek
	7/78	2.75 mile West Coon Creek
	7/87	2.00 mile West Coon Creek
	7/78	2.25 mile Red Mountain Creek
	9/87	0.62 mile Red Mountain Creek
	7/87	First 0.5 mile other tributaries
Quail Prairie Creek	6/78	6.0 mile Quail Prairie Creek
	6/87	6.0 mile Quail Prairie Creek
	6/87	2.0 mile North Fork Quail

Stream	Survey Dates	Miles Surveyed
Eagle Creek	7/80	6.25 mile Eagle Creek 2.0 mile North Fork Eagle Creek 0.75 mile Noname Creek 0.3 mile Robinson Spring Creek 5.00 mile Mineral Hill Fork
Mislatnah	7/79 1990 7/79 1990 7/79 1990	3.25 mile Mislatnah Creek 3.4 mile Mislatnah Creek 1.0 mile Craggie Fork 0.25 mile Craggie Fork 0.5 mile Blueslide Creek 0.25 mile Blueslide Creek
Boulder Creek	6/78	9.25 mile Boulder Creek 2.25 mile Moore's Creek 1.05 mile other tributaries
Tincup Creek	7/78	9.5 mile Tincup Creek 1.0 mile Fall Creek 0.75 mile Darling Creek 0.95 mile other tributaries
Box Canyon Creek	8/78	2.25 mile Box Canyon
Little Chetco	7/79	5.55 mile Little Chetco River 0.5 mile Henry Creek 1.6 mile Ditch Creek 1.0 mile Hawk Creek 0.5 mile other tributaries

50-11-40 Analysis

50-11-40 rule refers to 50 percent of a quarter township having trees 11 inches or larger diameter breast height and 40 percent or more canopy closure. 50-11-40 allows for dispersal of spotted owls across the landscape. 50-11-40 was considered under the ROD and covered by riparian reserve widths for class I and II streams. If these riparian reserves are changed, it may affect 50-11-40 for the quarter township.

The following is a table showing the quarter townships within the Chetco Watershed, the acres of existing suitable and dispersal habitat, and the percent of 50-11-40 met. The amount of capable habitat within the quarter township is also shown. Quarter townships within the Kalmiopsis Wilderness are not included except those that overlap outside of the Wilderness.

Table 18.

1/4 Township Habitat Number	General Location	Acres of Existing Dispersal Habitat	Capable Owl Habitat in 1/4 Township	Percent
35	Jack Creek	2432	5141	66
39	Mt Emily	1669	2363	71
50	Miller/Nook Bars	618	1429	43
51	Snaketooth	information not listed		
52	West Coon Creek	1397	1397	100
61	South Fork Bar	1509	2283	66
62	South Fork	3968	5387	74
65	Red Mountain	5536	6149	90
71	Mineral Hill Fork	4778	8277	56
72	Long Ridge	4282	6107	70
74	Quail Prairie	7509	8240	91
80	Eagle Creek	3856	4757	81
87	Mineral Hill	6293	7979	79
88	High Prairie/Pines	5712	6411	89
90	Lately Prairie	7151	7269	98

Information taken from the November 1990 Siskiyou GIS/PMR 501140 Report G. Vegetation-type for acres shown have changed little (less than 1%) since this report.

Known Fire History for the Chetco River Watershed

From approximately 1910 through the late 1930's, fire records were kept in map form. Some recordings were annotated in great detail, while others lacked much specificity. Maps and mapping techniques of the day also suffered from inaccuracies.

Table 19.

Year	Fire Name	Fire Ignition	Acres
1910	Lately Prairie	human-caused	1000
1911	South Fork	human-caused	125
1914	Swede Heaven	human-caused	80
1915	South Fork	human-caused	125
1916	Emily	human-caused	600
1917	South Fork	human-caused	80
1917	Eagle Creek	human-caused	1680
1917	Eagle Creek	human-caused	2560
1919-1926	**Data Gap**	-	-
1927-1930	Carter Creek	lightning	1100
1927-1930	Mill Creek	human-caused	200
1927-1930	Jack's Creek	human-caused	100
1927-1930	Jack's Creek	human-caused	20
1927-1930	Emily Creek	lightning	2500
1927-1930	South Fork	human-caused	30
1927-1930	Robinsion	human-caused	1570
1927-1930	Rainbow	human-caused	350
1927-1930	Eagle Creek	human-caused	60
1927-1930	Creekaggies	lightning	1700
1931-1933	**Data Gap**	-	-
1934-1940	Taggart's Bar	human-caused	20,160
1934-1940	Lately Prairie	human-caused	1600
1934-1940	Long Ridge	human-caused	160
1934-1940	Nook Creek	human-caused	600
1934-1940	South Fork	human-caused	325

Year	Fire Name	Fire Ignition	Acres
1934-1940	Basin Creek	human-caused	375
1934-1940	Emily Creek	human-caused	60
1934-1940	Emily Creek	human-caused	750
1934-1940	Elk Mountain	human-caused	1150
1937	Cedar Camp	lightning	34,600
1939	Eagle Creek	human-caused	8000
1940	Little Chetco	human-caused	2000
1941-1948	**Data Gap**	-	-
1949	High Prairie	lightning	less than .25
1950	Vulcan Lake	lightning	less than .25
1951	Mislatnah	lightning	200
1951	South Fork	lightning	19
1952	Wilson Creek	human-caused	195
1953	Eagle Creek	lightning	256
1956	Boundary	lightning	less than .25
1956	Rainbow Creek	lightning	less than .25
1956	Eagle Creek Trail	lightning	less than .25
1960	Vulcan	lightning	less than .25
1965	Tincup	lightning	19
1965	Granite	lightning	less than .25
1966	Buzzards Roost	lightning	less than .25
1970	Snaketooth	human-caused	4
1972	Bungler	lightning	less than .25
1972	Red Mountain Prairie	human-caused	less than .25
1974	South Quail	human-caused	2
1977	Nooky	lightning	less than .25
1982	Devils Back	human-caused	less than .25
1984	Chopco	lightning	less than .25

Year	Fire Name	Fire Ignition	Acres
1985	Long Ridge	lightning	less than .25
1986	Chance	lightning	less than .25
1987	Emily	lightning	less than .25
1987	Silver	lightning	23,500
1988	Finale	human-caused	less than .25
1988	Vulcan	human-caused	2
1990	Mineral	lightning	less than .25
1991	Box	human-caused	4
1991	Grass	human-caused	less than .25
1991	Grass II	human-caused	less than .25
1992	Redwood Bar	human-caused	less than .25
1992	Slade	lightning	less than .25
1993	Nook	human-caused	less than .25
1993	Cedar	human-caused	2
1993	Bailey	lightning	4
1994	South Fork	human-caused	less than .25
1994	Eagle	lightning	2
1994	Bear	lightning	less than .25
1994	Fork	lightning	less than .25
1994	Sunrise	lightning	20
1994	Madstone	lightning	483

APPENDIX C
Subwatershed Descriptions of Aquatic Processes

The following narrative descriptions focus on conditions and processes within each of the subwatersheds, including physiographic, natural and human-caused disturbance, hydrologic effects, riparian large wood supply, water temperature data, and extent of fish habitat. The subwatersheds are organized from upstream to downstream. Maps of the subwatersheds and longitudinal profiles of portions of the mainstem and major tributaries follow the text.

Table 20.

Major Segments of the Mainstem Chetco:	
Headwaters to Tolman Ranch	Headwaters down to river mile 28
Tolman Ranch to Eagle Creek	River mile 28 to river mile 20
Eagle Creek to Ocean	River mile 20 to mouth

03U Upper Mainstem

This subwatershed includes the area that drains into the Chetco River (river mile 49.25 and above) and Little Chetco River. Named tributaries of the Chetco are Broken Cot, Madstone, and Fresno; of the Little Chetco are Hawk, Ditch, Copper, and Henry.

The ridgetop divide between the Chetco and the North Fork Smith to the south, and the Little Chetco and Rough and Ready Creek to the east, lies between 4000 feet and 5000 feet elevation; the confluence is near 1650 feet elevation. Most of this watershed lies within the transient snow zone where rain-on-snow events concentrate runoff from precipitation stored as snow, and increase peak flows. The divide lies in the snowpack zone; river valleys are rain-dominated.

The Chetco and its tributaries reflect their glaciated past in U-shaped valleys, with stream profiles rapidly dropping from headwaters to the long, gentler valley floor with mainstem gradient of 2%. Fresno and Madstone Creeks flow in a sinuous pattern through alluvium (and possibly glacial outwash) in the valley, but steepen and straighten in the lower reach before joining the Chetco. The Little Chetco and its tributaries are unglaciated. Its mainstem has the more gradually concave profile typical of Klamath Mountain streams, flattening to 1% along midreaches, then gradually steepening to 4% as it drops to the baseline elevation set by the Chetco River.

Natural sediment delivery processes are dominant. Several large older slides along the Chetco River and major tributaries were reactivated during the 1964 flood. One massive slide in partly serpentinized peridotite about a mile upriver from Madstone Cabin site temporarily dammed the river and caused a large buildup of gravel behind it (Ramp, 1975). Debris avalanches are relatively abundant in the metagabbro bedrock.

The subwatershed lies entirely within the Kalmiopsis Wilderness, and the only channel-affecting human activity has been mining. Late 1800's placer activity was concentrated in the "China Diggings" district. Along the Little Chetco, it extended for three miles from about a mile above Hawk Creek to a point between Copper and Henry Creeks. Some placers were probably mined along the main Chetco. Near Emily Cabin, Chinese miners constructed rock work, damming a ditch in Ditch Creek. The Ditch Creek WAA also has 5 miles of mining roads, 2 miles of which are on moderately steep slopes of 40 to 60%.

The following observations on channel condition are from stream surveys completed in 1979 to determine feasibility of fish migration improvement (barrier removal), and from Forest Service recreation personnel and conversations with miners. On the Little Chetco, a maximum temperature of 63° F was recorded in July, 1979, with an average of 60% shade along the stream channel. The predominant vegetation of Port-Orford-cedar is subject to the *Phytophthora lateralis* that has since been found in the Little Chetco. Evidence of the influence of past fires included commonly charred vegetation, and a large landslide was noted near the headwaters above where the stream forks, on the south fork.

This subwatershed provides 11 miles of migration, spawning, and rearing habitat for steelhead and resident rainbow trout as well as anadromous and resident cutthroat trout. Spring chinook are suspected to spawn in 2 miles of Little Chetco River. Office reconnaissance suggests the presence of low gradient, high value reaches along 2 miles of Little Chetco and along 3 miles of the mainstem above Little Chetco.

03M Middle Mainstem

This subwatershed includes the Chetco River from the mouth of Little Chetco (river mile 49.25) to the mouth of Sluice Creek (river mile 40.3). Named tributaries along this segment are Carter Creek, Babyfoot Creek with its tributaries Eagle and Morrison Gulch, Slide Creek with its tributary Miller Creek, and Granite Creek with its tributary Crater Creek. The density of named tributaries in both the Middle and Upper Mainstem reflects the level of mining activity.

Elevations range from over 5000 feet on Pearsoll Peak to slightly over 800 feet at Sluice Creek. About half of the watershed is in the rain-dominated zone, half in the transient snow zone, and some snowpack zone along the ridgetops to the east.

The mainstem profile enters this subwatershed on the 2% gradient it had above the Little Chetco and while the overall profile is a concave flattening to 1%, there are two distinct breaks. The double bend above Carter Creek has 4 to 6% gradient, and the first reach after the river turns to flow west has 2% gradient from Slide Creek to Granite Creek, between long stretches of 1% above and below.

The Chetco River flows through a canyon between Babyfoot and Carter Creeks, and again downstream of Taggart's Bar. A large natural landslide enters the river between Slide Creek and Taggart's Bar. There are also natural slides from Bailey Mountain into Carter Creek, and the headwaters of Carter is a cascading waterfall (Stream surveys, 1979, Forest Service recreation personnel and conversations with miners). Aerial photos show a relatively high density of landslides in Granite Creek.

The subwatershed lies entirely within the Kalmiopsis Wilderness, and the only channel-affecting human activity has been mining. Some placer mining occurred in the main Chetco and tributaries, including Carter, Babyfoot, Slide, and Miller Creeks. Historic mining caused some damming in Babyfoot, Carter, and Slide Creeks. Currently, large road erosion features occur near a side tributary in the vicinity of Taggart's Bar where vehicles ford, and where a mining road ravels into the river near Taggart's Bar. There are 11 miles of mining road within this subwatershed, with one mile on very steep ground (>60% sideslope) and two miles on moderately steep ground (40 to 60%). The road segment on the south side of the river upstream of Taggart's Bar appears to cross some headwalls. The drainage diversion potential of this road needs to be inventoried.

This subwatershed provides 10 miles of steelhead and resident trout habitat. One reach of the mainstem offers 2.5 miles of low gradient, high value fish habitat.

03L Lower Mainstem

This subwatershed includes the Chetco River from Sluice Creek (river mile 40.3) to Boulder Creek (river mile 30.4). Named tributaries along this segment are Sluice Creek, Box Canyon Creek, and Tincup Creek. Box Canyon and Tincup have been delineated as separate subwatersheds and will be discussed in the following sections.

Elevations range from nearly 4500 feet on Tincup Peak to just over 400 feet at Boulder Creek. About 2/3 of the watershed is in the rain-dominated zone, 1/3 in transient snow, and a small portion on Tincup Peak in the snowpack zone.

The mainstem of the Chetco River has a nearly constant gradient of 1% through this subwatershed. On aerial photographs it appears confined, with pool/riffle morphology and few large bars. The segment from Tincup Creek to Boulder Creek lies along the same north-south shear zone as the first three miles of Tincup Creek, and has many inner gorge slides.

Sluice Creek has a debris avalanche scar in its headwaters, leading to a debris flow track that scoured approximately two miles of its channel. This is the cause of the "sluiced" crossing on the mining access road.

Water temperatures recorded by a miner near river mile 37 throughout the summer of 1992 had daily peaks in the high 70's most of the time from 7/12 to 8/22. On one of his recorded days, a trail crew recorded a temperature one degree cooler at Taggart's Bar, about 4.5 miles upstream, tending to corroborate this finding.

This is the furthest downstream subwatershed to lie entirely within wilderness. The bar at the mouth of Boulder Creek is a recreational attraction. Some recreation trails function as intermittent creeks, eroding regularly.

This subwatershed offers 10 miles of rugged fish habitat suitable for steelhead and trout.

03C Box Canyon Creek

Box Canyon Creek enters the Chetco River at river mile 39.7. It has no named tributaries, but its watershed contains two named lakes: Vulcan and Salamander.

Elevations range from 4655 feet on Vulcan Peak to about 800 feet at the mouth. About half of the watershed lies within the transient snow zone and half within the rain-dominated zone, with a small portion near Vulcan Peak in the snowpack zone. The headwaters begin in a glacial cirque basin, which includes the Vulcan Lakes, and the upper channel flows in a U-shaped valley.

Debris flow tracks are evident from steep slopes with relatively shallow soils. Rapid runoff may transport the sediment through the stream, leaving relatively coarse substrate in the channel.

Box Canyon lies entirely within the Kalmiopsis Wilderness. It offers 3.5 miles of rugged fish habitat suitable for steelhead and trout.

03T Tincup Creek

This is the watershed of Tincup Creek, which enters the Chetco River at river mile 33.1. Named tributaries include Lucky, Heather, Darling, and Fall Creeks.

Elevations range from 4620 feet on Craggie Peak to about 600 feet at the mouth. About half of the watershed lies within the rain-dominated zone, half in the transient snow zone, and small ridgetop portions in the snowpack zone.

The terrain of the subwatershed is rocky, with sparse vegetation. In the steep-walled canyon of Tincup Creek, the 1964 flood undercut streambanks and generated slides that stripped soil and vegetation down to bare rock. The heads of the slides extended to the ridge tops in some places. Slide debris, which probably dammed Tincup Creek temporarily, was quickly transported into the lower reaches of the canyon forming gravel bars 10 or more feet thick and several acres in extent (Ramp, 1975). The predominance of hardwoods in the riparian area reflects this event. Only 42% of the riparian zone has mid-seral to climax vegetation (Figure 7). Measured stream temperature in July, 1978 was 66° F with average shade estimated at 40% over the 9.5 miles surveyed (USFS stream surveys, 1978). The Silver Fire of 1987 burned a large portion of the subwatershed, but not the riparian areas.

The lower 3 miles of Tincup Creek lie along a north-south shear zone and have numerous inner gorge slides. From mile 4.0 to 7.0 there was evidence of an extensive fire, years before the 1978 survey. At mile 6.0, there was a 30 feet high bedrock waterfall, and at 6.25 a very long logjam below landslides on both banks. The creek flowed subsurface in cobbles from mile 6.75 to 7.00. This was attributed to flood damage from 1964. Photos show a channel recut through terrace and large standing dead trees. At the time of the survey, lower reaches appeared to be recovering from severe scouring by the 1964 flood, but upper reaches were not. The channel was scoured to bedrock, and the steep gradient hindered recovery. Several areas had no shade. Stream survey notes state that the survey was discontinued at stream mile 9.5 and did not include the last 1.5 miles because the terrain was too hazardous.

Although not all of the channels in the Chetco River Basin have been surveyed, of the documented channels, Tincup Creek appears to have been most affected by the natural disturbance of fire and flood. The subwatershed lies entirely within the Kalmiopsis Wilderness.

This subwatershed offers 10 miles of chinook, steelhead, and trout habitat, including a 2 mile low gradient, high value reach.

03B Boulder Creek

Boulder Creek enters the Chetco River at river mile 30.4. It has no named tributaries.

Elevations range from about 4655 feet on Vulcan Peak to just over 400 feet at the mouth. About 2/3 of the watershed lies within the rain-dominated zone, 1/3 in the transient snow zone, and a small portion in the snowpack zone.

Stream surveyors in 1978 noted that the creek was aptly named, the channel being a "boulder orchard" from the mouth to mile 7.5, with little gravel. A history of fire is apparent in the mosaic of vegetation. Inner gorge landslides are present. Riparian vegetation along the lower reach of Boulder Creek is dominated by hardwoods. Stream shade was estimated at 55% for the length of the survey (USFS Stream surveys, 1978). Remote sensing data estimate that 71% of the vegetation within 200 feet of streams is mid to late successional.

Most of this subwatershed lies within the Kalmiopsis Wilderness. The 25% outside the wilderness has been managed for timber harvest, with clearcuts and roads. GIS data indicate that riparian buffers were harvested along 15% of the stream length in the subwatershed (may be an overestimate of stream length harvested, but can be verified by aerial photo examination).

Harvest and road construction took place primarily before 1975, with only 10 acres harvested since then.

Table 21.

Watershed Analysis Area	% of Timber Harvested	Road Density
03B06F	3% harvested	1.00 road mi/sq mi
03B07W	25% harvested	3.85 road mi/sq mi
03B08W	5% harvested	1.97 road mi/sq mi

WAA 03B07W, west of Vulcan Lake, is most likely to have experienced changes in hydrology with affects to small channels, resulting from the combination of harvest and roading.

Two of the six miles of road in 03B08W are on moderately steep ground (40 to 60%), with the remaining miles on slopes gentler than 40%. Harvest of 25% of 03B07W, especially combined with road density of 3.85 miles per square mile (mi/sq mi), indicates a likelihood that the hydrology of this WAA was affected.

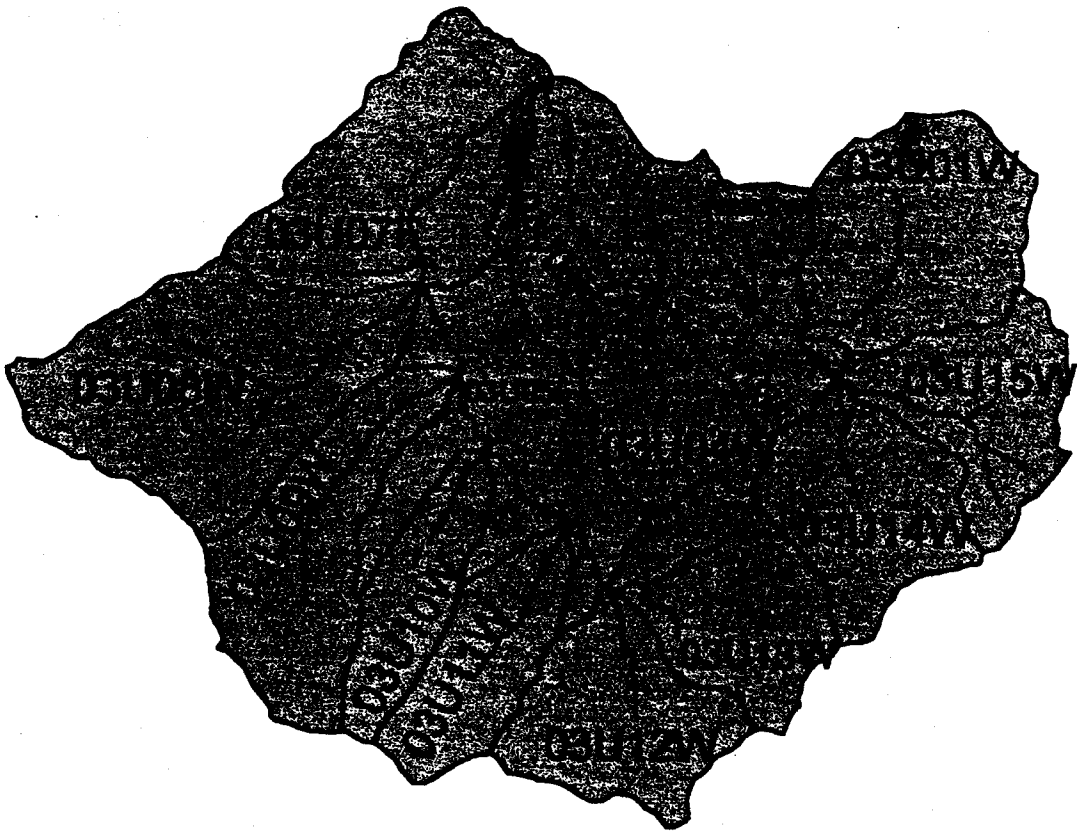
Logging was apparent to the stream surveyors from mile 8.25 to 9.25 (USFS Stream Survey, 1978). Although they did not note effects on the channel, it is possible that channels were affected, particularly the small tributaries within WAA 03B07W.

This watershed offers 8 miles of fish habitat. The first 5 are suitable for chinook. The remaining 3 are suitable for steelhead and trout.

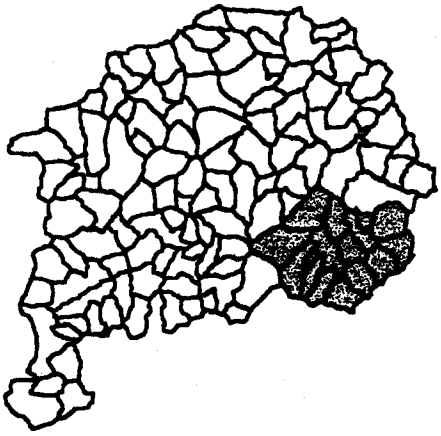
Information Needs: Current condition of managed WAA's, particularly 03B07W

Management Opportunities: The least restrictive management allocation within 03B is Late-Successional Reserve (LSR). In light of this, evaluate future management opportunities for the stands in WAA's 06, 07, and 08 to accelerate old growth characteristics; and the riparian areas for over- or under-stocking. Based on that, and access to Vulcan Lake and wilderness trails, determine the need for existing roads. Evaluate the resource risk of these roads. Determine a plan to treat stands and decommission roads that will best meet the objectives of Riparian Reserves and Late Successional Reserves; and the Kalmiopsis Wilderness that comprises 75% of this subwatershed, downstream of the managed area.

Watershed Analysis Areas for Subwatershed 03U

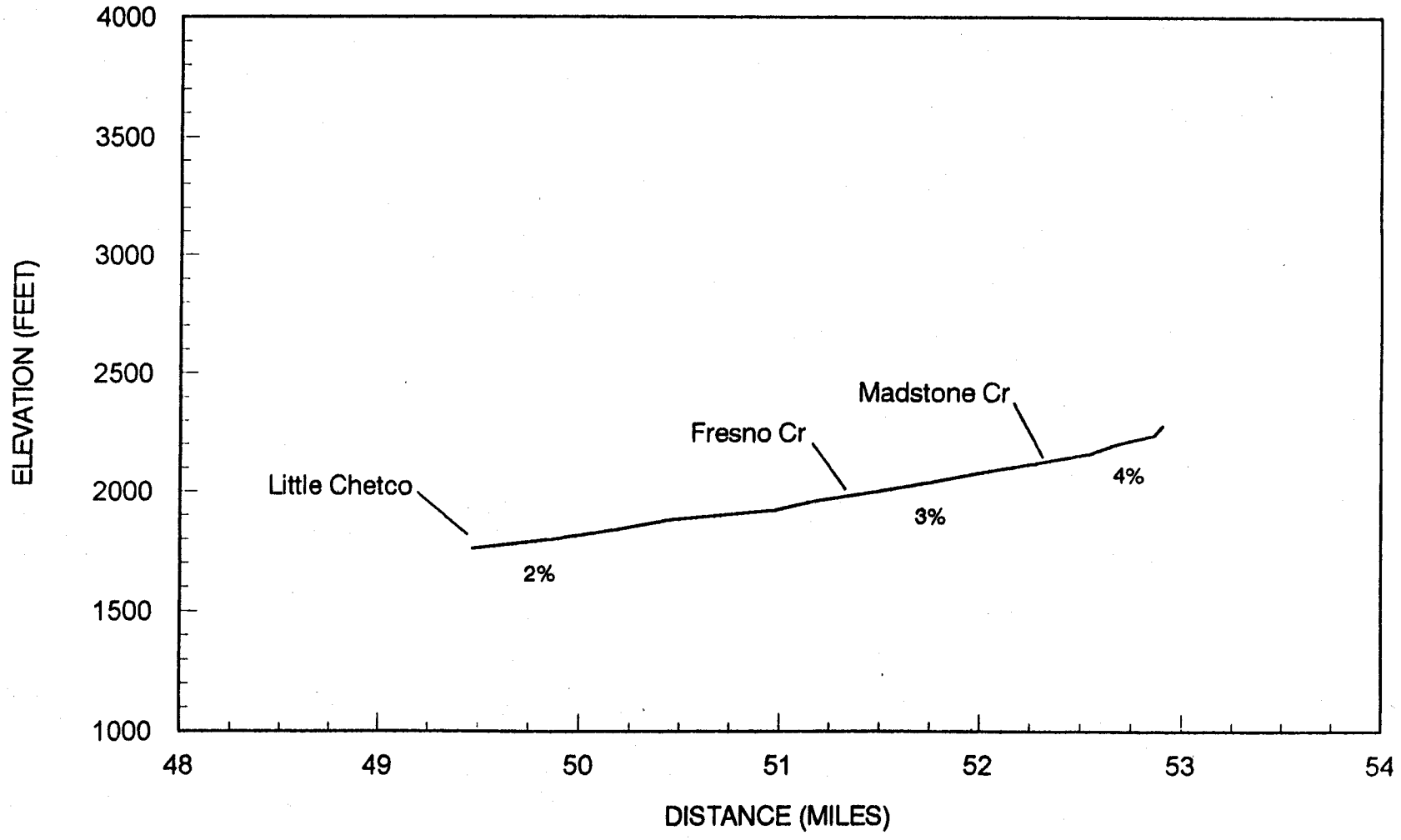


Class I and II Streams Shown



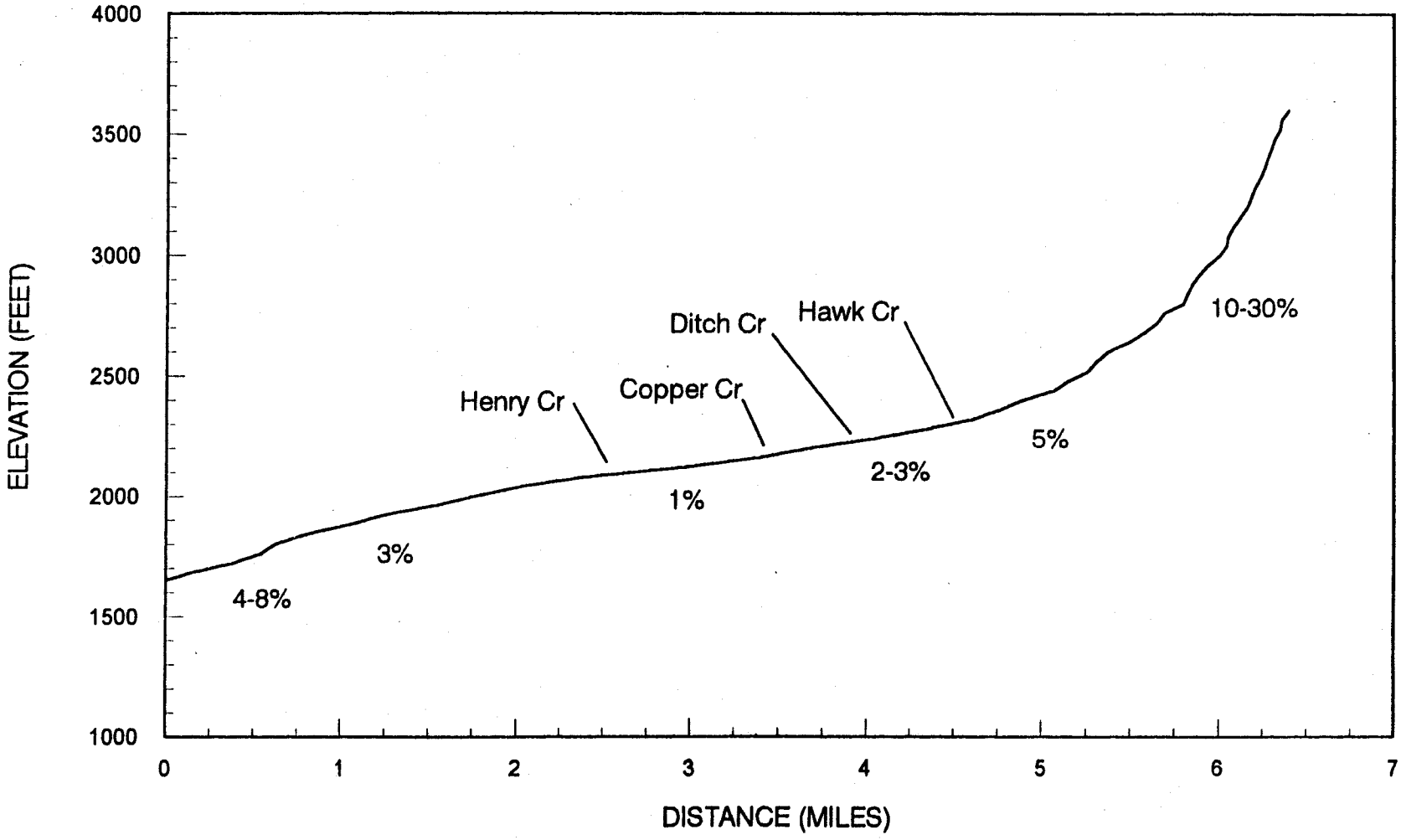
CHETCO RIVER, 03U

PROFILE

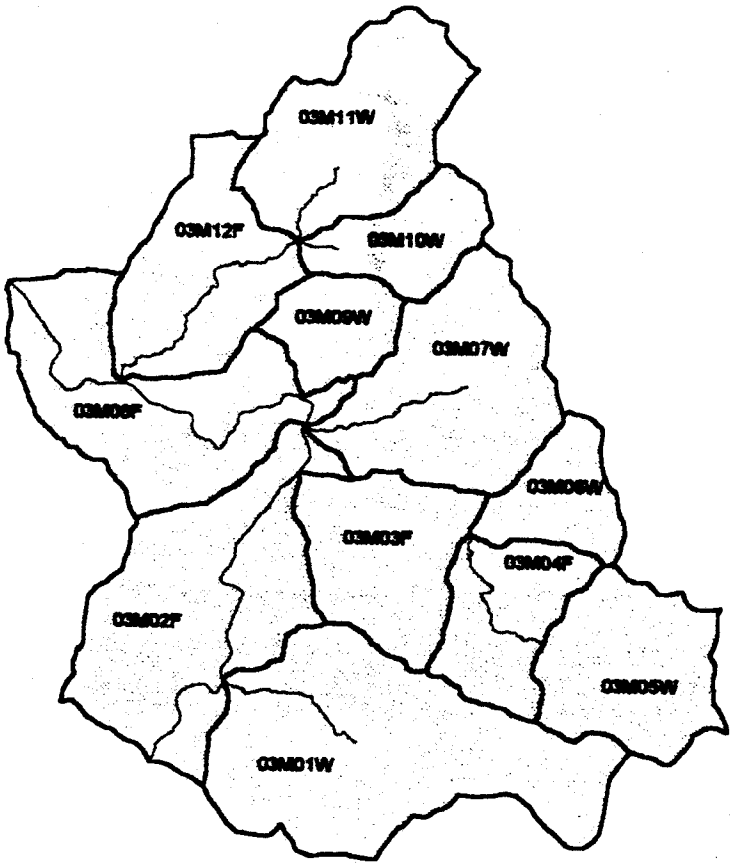


LITTLE CHETCO RIVER

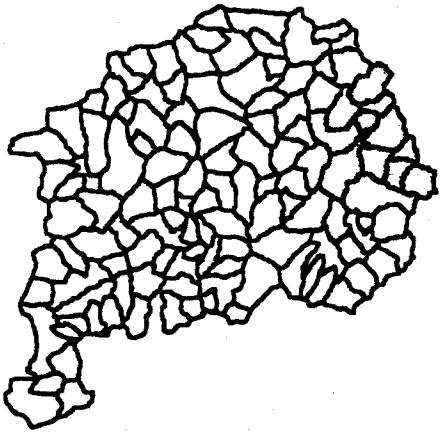
PROFILE



Watershed Analysis Areas for Subwatershed 03M

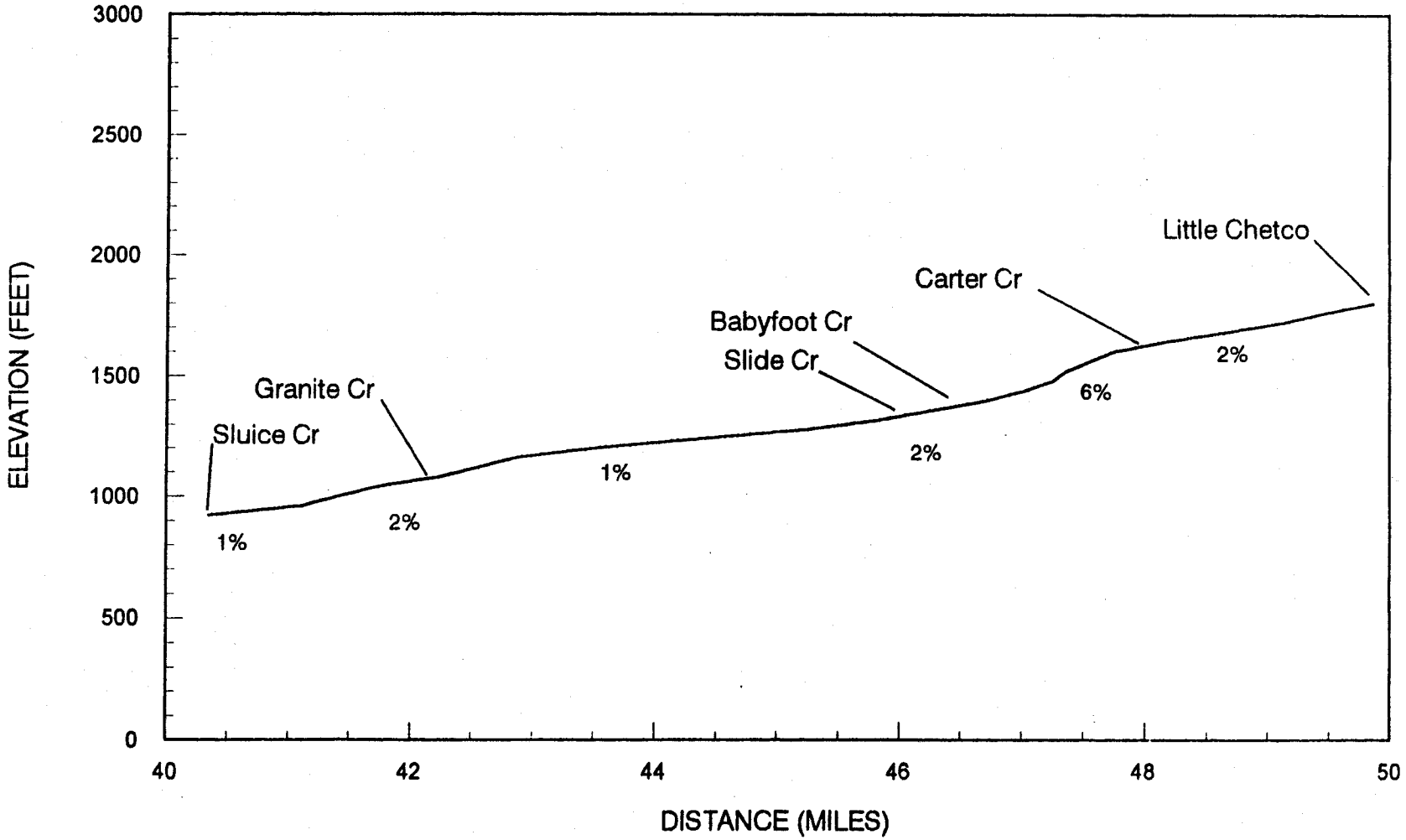


Class I and II Streams Shown



CHETCO RIVER, 03M

PROFILE



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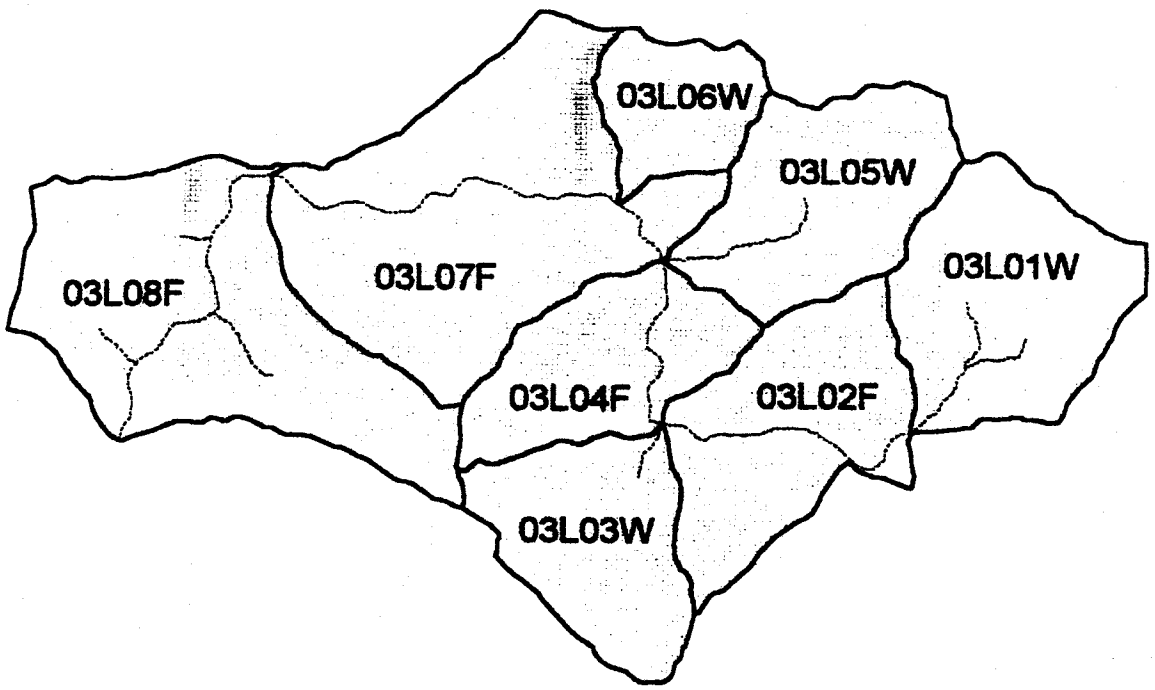
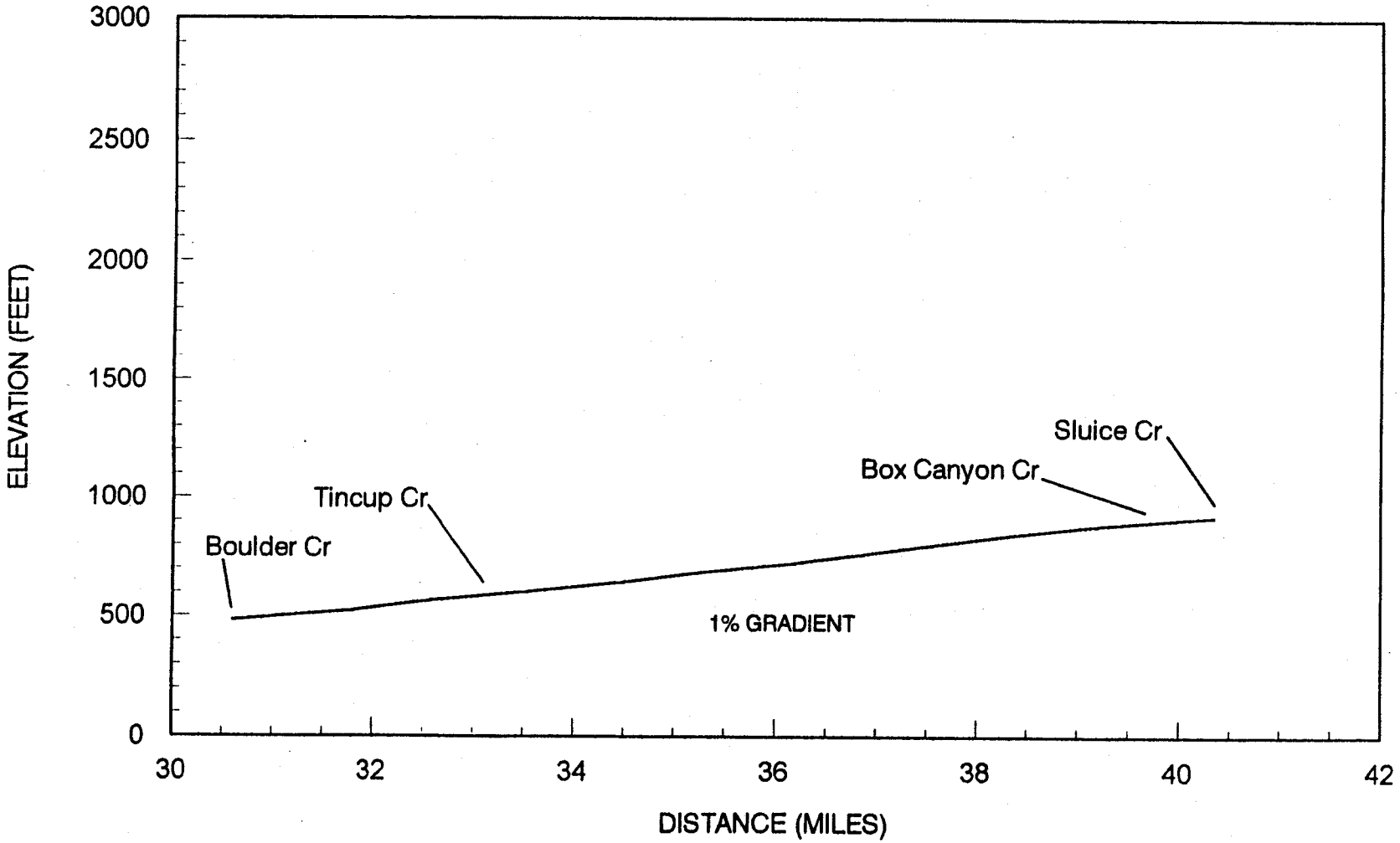


Class I and II Streams Shown

CHETCO RIVER, 03L

PROFILE



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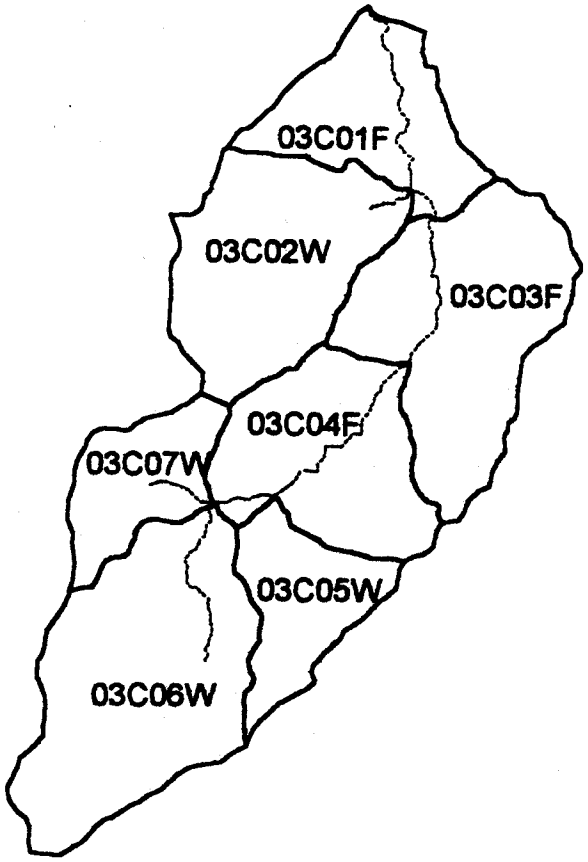

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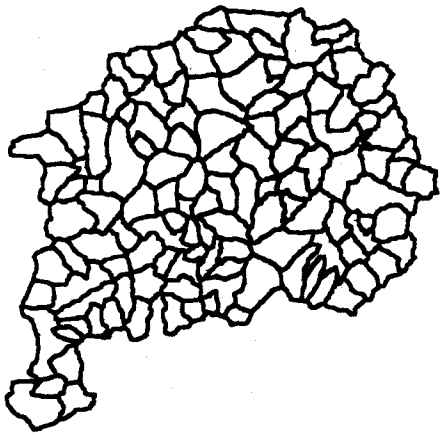

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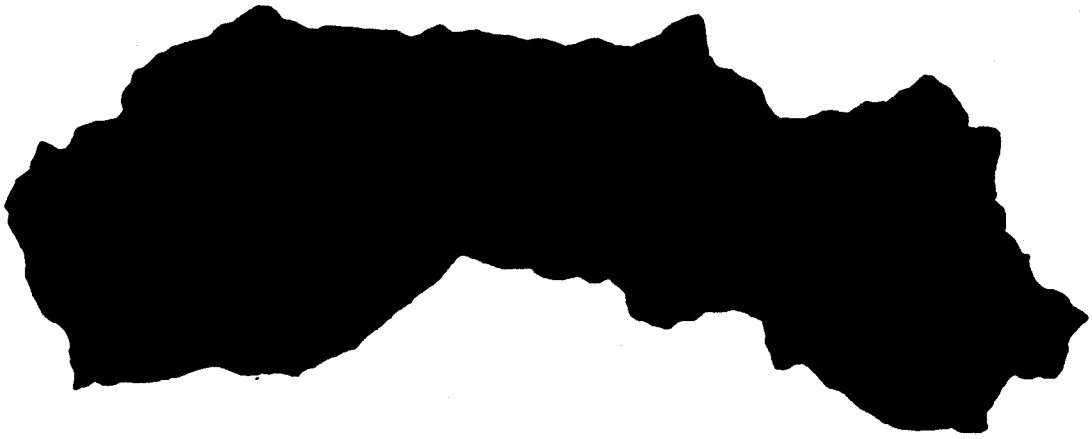

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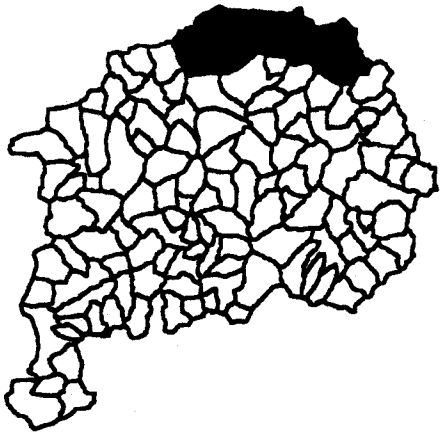
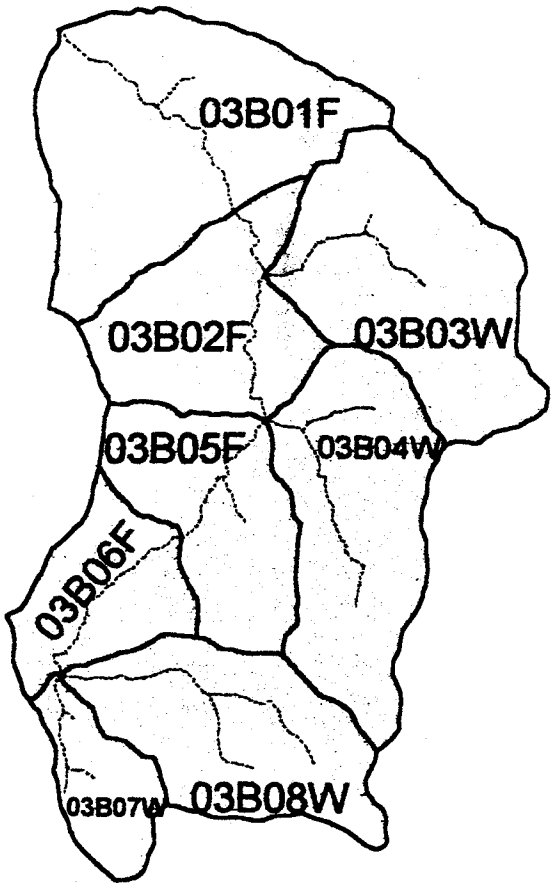


Watershed Analysis Areas for Subwatershed 03B



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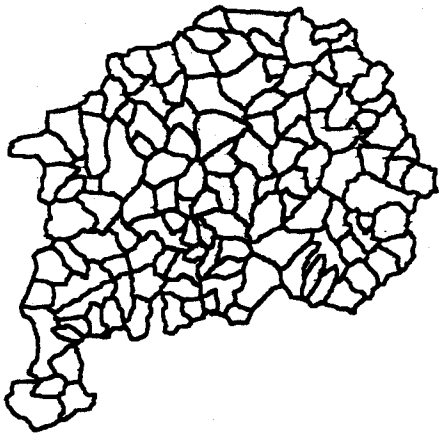


04U Upper Chetco

This subwatershed includes the Chetco River from Boulder Creek (river mile 30.4) to Eagle Creek (river mile 20.4). The only named tributary along this reach is Mislatnah Creek, which has been delineated as a separate subwatershed, as have Boulder Creek and Eagle Creek.

Elevations range from 3000 feet on Quail Prairie Mountain to about 120 feet at the mouth of Eagle Creek. Nearly all the watershed is within the rain-dominated zone, with small portions of transient snow zone on High Prairie and Quail Prairie Mountain.

The Chetco River gradient gradually decreases from 1% below Boulder Creek to 0.1% above Eagle Creek, with two steeper sections: a 2% stretch near river mile 24, west of Long Ridge; and a 1% stretch in the gorge between the steel bridge and Eagle Creek. From Boulder Creek to the bend where the river's orientation changes from east-west to north-south, the channel meanders between large cobble bars. From this bend to the steel bridge, sinuosity increases, with many inner gorge slides, including some on the north side of the river that may have been triggered by Road 1376.

This portion of the subwatershed from the bend downstream is WAA 04U01F. It has 1 mile of road on steep slopes (>60%), 3 miles of road on moderately steep slopes (40-60%), and a total of 18 miles of road or 2.7 mi/sq mi. On the southeast side of the river, the channels of tributary face drainages have many bank failures. Large areas of timber harvest on both National Forest (Brown Bear sale) and private land may have increased peak flows and caused channels to incise.

WAA's 04U01F, 04U04W, and 04U06W had over 20% of their area harvested prior to 1975, with less than 10% harvested since then. These data would suggest that the WAA's are largely recovered hydrologically. Brushfield conversion removed vegetation from 14% of 04U03F, which combined with timber harvest for 23% vegetative disturbance. WAA 04U04W, an unnamed face drainage flowing from Long Ridge Prairie to the river, had 29% harvested prior to 1975, 37% harvested since 1975, and 24% of its area in brushfield conversion, for a total of 61% vegetation removal. This WAA has the highest likelihood for altered hydrology and channel changes resulting from timber harvest.

Overall road density of 2.4 mi/sq mi is moderate. Individual face drainages may have been affected hydrologically, especially in combination with high levels of harvest.

This subwatershed offers 10 miles of fish habitat. Chinook use it for migration to Mislatnah Creek, Tincup, and beyond. It is too steep and powerful for successful spawning by any species in all but the very mildest of winters. It does offer important rearing habitat for steelhead and trout.

Information Needs: Current condition of 1376 on north side and clearcuts and roads on south side, especially 04U01F and 04U04W.

Management Opportunities: Stabilize any potential failures on 1376; decommission roads with present or potential drainage problems on south side.

04M Mislatnah Creek

Mislatnah Creek enters the Chetco River at river mile 28.2. Named tributaries are Craggie Fork and Blueslide Creek.

Elevations range from 3850 feet on Green Craggie to about 400 feet at the mouth. About 75% of the watershed is in the rain-dominated zone, and 25% in the transient snow zone.

Stream survey reports state that the basin is steep and unstable, with 18 major landslides along the 5.1 miles of Mislatnah, Blueslide, and Craggie Fork that were surveyed. Notes included many photos of large, active slides. Mislatnah Creek gradient was estimated at 2% to 50%, with lots of large wood and many log jams.

Slopes along the west side of Mislatnah Creek have been harvested. Including hardwood conversion sites, approximately 39% of WAA 04M01F, roughly corresponding to the lower west side, was harvested. The road density for this WAA is 2.5 mi/sq mi.

Along perennial streams, 14% of the length has been harvested, and 50% of the vegetation within 200 feet of streams is mid to late successional stage (Figure 7). The 1979 survey noted three clearcuts along the west bank, with buffers less than one chain (66 feet) wide, allowing more sun to reach the stream. Maximum stream temperature recorded was 64° F.

The lower 1.5 miles of Mislatnah Creek offers the most productive known chinook spawning habitat above the South Fork Chetco. Steelhead use another two miles above the lower gradient high value reach.

04H Eagle Creek

Eagle Creek flows into the Chetco River at river mile 20.4. Named tributaries are Mineral Hill Fork and Robinson Spring Creek. Elevations range from 3650 feet on Mineral Hill to about 160 feet at the mouth. The watershed is primarily in the rain-dominated zone, with about 10% in the transient snow zone along ridgetops to the north.

Eagle Creek and Mineral Hill Fork are very steep and unstable. High angle faulting has controlled the north-south alignment of the stream channels low in the North Fork Eagle, in one northern tributary to the North Fork, and in most of Mineral Hill Fork (Ferrero, 1991). Groundwater recharge in the faults and sheared rocks contributes to the active landslides in the inner gorges of these channels. The erosion-resistant volcanic rock at the head of Mineral Hill Fork has caused the stream gradient to steepen more than in other areas, creating an inner gorge with exceptionally continuous and active landslides and erosion. Undercutting and slope steepening also causes unstable slopes where Dothan mudstones underlie sandstones, or wherever resistant volcanic rocks are located near channels.

Rapid downcutting of sheared Dothan mudstones has undercut hillslopes on the west side of upper North Fork Eagle and in upper Mineral Hill Fork, causing older large-scale landslides and landslide deposits (Ferrero, 1991: Slope Stability Map). Earthquakes have been suggested as a mechanism for triggering some of the older landslides. Rejuvenated streams draining these deposits continue to incise, and deposit material has generated more recent landslides. Some unstable and potentially unstable lands are likely to be located outside of the interim Riparian Reserves in this area, and will require landslide field mapping.

The alluvial fan in the Chetco River at the mouth of Eagle Creek attests to the amount of sediment delivered to the streams and transported through them. Harvest and road construction have contributed to the naturally high disturbance level in this subwatershed. However, field traverse data on landslides in the North Fork/Mineral Hill area indicates that the volume of sediment delivered by natural slides far exceeds any road and harvest-related slides. The four road-related slides inventoried on the traverse were cutbank slumps, with little direct delivery, but with potential for drainage diversions. The traverses also encountered four slides along the lower margin of clearcuts within inner gorges. An inventory of historic air photos would be required to verify these as pre-harvest inner gorge slides or timber harvest-related. On the 1986 aerial photographs, landslides and erosion from roads and tractor trails had not yet revegetated (off 1846 road).

On the eastside of Mineral Hill Fork, several inches of soil erosion has left rock fragments on the surface in areas of soil disturbance and loss of organic material. This surface erosion resulted from clearcut and burn treatments on Dothan metasediment slopes steeper than about 70% (in some areas, steeper than 50%, Ferrero, 1991).

Road densities are not high, but some road locations are on steep, unstable slopes. In WAA 04H07W there is one mile of road on steep (>60%) ground and 2 miles on moderately steep (40 to 60%). In 04H08W there are also two miles of road on moderately steep ground, near the ridgetop.

Hydrologic effects of harvest and roading are probably greatest in WAA's 06 and 07, where harvest on National Forest and other ownership have combined to alter vegetation on 80% and 50%, respectively. In other WAA's, effects are probably moderate and localized. District silvicultural records show that brushfield conversion occurred on 11% of 04H05W and 04H06W, and 13% of 04H07W (included in harvest percentages). Potential effects of this on groundwater hydrology, sediment delivery, and channel morphology are discussed in the hydrology section of this document.

Stream channels reflect the high natural and human-caused disturbance levels. In Eagle Creek, stream surveyors in 1980 noted multiple logjams and waterfalls in the steep inner gorge section with near-vertical walls. Sediment was contributed by 13 major landslides, and extremely steep banks with roads and tractor-logged clearcuts. A photo at mile 4.6 showed a culvert trapped in a logjam. Sand and silt were filling pools in some places.

Stream temperatures have also probably been affected by harvest. Riparian buffers were harvested in units on both National Forest and Private land (river mile 2.75 to 5.1). Revegetation and shade restoration were being inhibited by the increased erosion, and the channel had extreme solar exposure. A maximum stream temperature of 68° F was recorded with an estimated 45% of the stream shaded, mostly by alder. GIS data estimate that 26% of the length of perennial streams has been harvested, and 45% of riparian buffers are in a mid-late successional stage (Figure 7).

Eagle Creek itself is very rugged and offers 3 miles of steelhead spawning and rearing habitat. Mineral Hill Fork, a tributary, provides 2.5 miles of high value, low gradient spawning and rearing habitat suitable for chinook as well as steelhead and trout.

04F Middle Chetco

Includes the Chetco River from Eagle Creek (river mile 20.4 to Elk Creek (river mile 9.8). Named tributaries are Rainbow Creek, Panther Creek with tributary Prairie Creek, South Fork Chetco with its tributaries discussed under the South Fork subwatershed, First Creek, Second Creek, Big Redwood Creek, Little Redwood Creek, Nook Creek, and Wilson Creek.

Elevations range from about 2175 feet on Northern Prairie to about 50 feet at Elk Creek. All of the subwatershed is within the rain-dominated zone.

The gradient of this stretch of the Chetco River is less than 1%. The segment down to the low water bridge continues the inner gorge landslides that began at the steel bridge. There are massive deposits of sediment in river terraces on the double bend near the low water bridge, and below the mouth of the South Fork Chetco. The river channel moved from the north bank to the south bank below the South Fork, some time between the 1940 and the 1957 photos, possibly during the 1955 flood. Grazing may be inhibiting revegetation on the parts of the terraces that are not periodically scoured by floods.

Forty-six percent of the subwatershed is under National Forest management. Harvest on National Forest land comprises 25% of the subwatershed. If 80% of non-National Forest ownership were assumed harvested, then 68% of the subwatershed would have been harvested. This would probably have affected flows in the face drainages, but not the Chetco River.

Harvest in riparian buffers is estimated at 65% of the length of perennial streams (GIS data), and 27% of the riparian vegetation is in mid to late successional stage (Figure 7). Effects on stream temperature would depend on the extent to which the smaller vegetation shades the small tributaries.

Nook Creek (04F04W) has experienced the highest level of harvest. Of National Forest land, 45% was harvested prior to 1975 and 28% since then. If 80% of non-National Forest land harvest is added, 81% of this WAA would have been harvested. Combined with roading, this is likely to be experiencing continued effects on hydrology.

The face drainage with the most available data is Panther Creek (04F09W). The 1957 aerial photos of the Panther Creek watershed show extensive tractor logging above the Prairie Creek confluence, with a wide, scoured channel below the confluence and no riparian vegetation. A stream survey on Panther Creek in 1989 found cascades along the first 2.5 miles surveyed, with heavy siltation from slides and logging from mile 2.25 to 2.5, and an average gradient of 2%. Above Prairie Creek, which contributed half the flow, the gradient steepened to 25%, with large boulders and cascades. Shade overall varied from 17% to 85% and was mostly alder. GIS data show that 39% of the National Forest land in this WAA was harvested prior to 1975, 12% since 1975, and 9% received brushfield conversion.

Overall road density in this subwatershed is 4.4 mi/sq mi, which is high. WAA 04F02F has 1 mile of road on steep slopes and 6 miles on moderately steep slopes, on the south side of the river. WAA 04F06W, which includes the mainstem, First and Second Creeks, has 4 miles of road on moderately steep slopes.

The mainstem here is primarily migration habitat. Spawning would only be successful during the mildest of winters and rearing would be limited by the naturally high summer water temperatures.

04S South Fork Chetco

This subwatershed includes the South Fork Chetco River from the mouth of Quail Prairie Creek to the headwaters. This discussion will also include the segment of South Fork Chetco from Quail Prairie Creek to the mouth, which is delineated as 04F07F. Named tributaries are Coon Creek, Red Mountain Creek, West Coon Creek, and Basin Creek. Quail Prairie Creek is discussed separately below under 04Q.

Elevations in the South Fork drainage range from over 4400 feet on the ridge between Vulcan Peak and Red Mountain to 150 feet at the mouth. Most of the subwatershed is in the rain-dominated zone, with small portions near Vulcan Peak in the transient snow and snowpack zones.

The mainstem of the South Fork Chetco is approximately 14.1 miles long. The upper two miles flow out of the headwaters on a gradient steeper than 10%. The gradient from river mile 12.6 to 10.9 alternates between 5 and 10%. The remainder of the river has a low gradient, 1% except for two reaches of 2 to 3%, from river mile 10.3 down to 8.4, and from 2.6 down to 1.4. Reaches immediately below the steeper gradients may receive greater deposition. These are above Coon Creek, above West Coon Creek, and above Quail Prairie Creek. Stream surveyors reported some sand and silt in pools in the depositional reach above Quail Prairie Creek in 1995. The large terraces and depositional bars in the Chetco River indicate that much of the sediment carried by the South Fork may be transported entirely out, and not deposited in the South Fork channel.

Stream surveys report that the South Fork flows through an inner gorge with steep, unstable side slopes that contribute large amounts of sediment. There is little large wood in the channel, probably because of high stream power. This stream power has also altered or removed structures placed to improve fish habitat. Cobble dams constructed each summer near the campground at the mouth may impede low flow fish migration. (Nawa, South Fork Chetco Stream Survey Report, 1995)

Surveys of Red Mountain Creek found it to be steep, with step pools, cascades, and falls. Survey photos show large rubble, logs, and slides. They did not note any effects of roads or harvest.

Surveys of West Coon Creek report effects of harvest in the 1960's along the lower reaches. Much large wood was in the channel, mostly in two major jams. Riparian vegetation has come back in alder. It was providing good shade, but there was no large wood in the units, nor conifers in riparian areas. The area harvested near the forks in 1979 had riparian buffers that provided good protection.

Surveys of Basin Creek found cascades and rapids, and lots of large wood.

Table 22. Watershed Analysis Areas with over 20% harvested

WAA	% harvested before 1975	% harvested since 1975	% brush conversion	% NF land harvested	Total NF acres harvested
04F07F	31	28	14	73	381
04S02W	40	18	3	60	1020
04S05W	49	16	0	65	533
04S09W	23	10	1	33	457

Combined with road densities of 3.3 to 4.1 mi/sq mi, WAA's 02 and 05 on the north side of Snaketooth, and 09 in the upper end of West Coon Creek, are mostly likely to have experienced changes in hydrology resulting from harvest and road construction. WAA 04F07F, west of Basin Butte and near the mouth of South Fork Chetco, has one mile of road on steep slopes and two miles on moderately steep slopes. WAA 04S02W, Basin Creek, and 04S06F, below West Coon Creek, each has two miles of road on moderately steep slopes.

This subwatershed marks the upstream limit of the exceptionally high value spawning habitat characteristic of the lower Chetco basin. Nineteen miles are available to chinook, as well as steelhead and trout for spawning and rearing. Most of these miles are low gradient and highly valuable.

04Q Quail Prairie Creek

Quail Prairie Creek flows into the South Fork Chetco River at river mile 1.3. The two primary forks, which split at river mile 2.9, are not officially named, but are known as the north and south forks.

Elevations range from 3000 feet on Quail Prairie Mountain to about 240 feet at the mouth. Most of the subwatershed is in the rain-dominated zone, with a small portion along the ridge extending south from Quail Prairie Mountain in the transient snow zone.

On the south fork of Quail Prairie Creek (WAAs 02, 03, and 04), harvest and roading have added to the natural sediment regime. WAA 02 had 26% harvest, evenly divided between 20-year periods. WAA 04 had 28% harvest, of which half, or 221 acres was brush conversion, primarily more than 20 years ago. In the stream channel in WAA 04, Section 36, large amounts of sediment were traced to extensive tractor-yarded harvest units. Stream surveys of the south fork noted four landslides along the stream. Morphology was mostly riffles and cascades. There were multiple log jams; some logs had sawn ends.

On the north fork (04Q05W), 1978 surveys said most of the stream length was exposed to solar radiation, with average shade 35%, mostly alder. By 1987, the survey found shade restored to 75 to 100%. The earlier survey noted recent clearcuts along the stream, with some siltation and a reach of braided riffles near the confluence. Surface erosion was trailing out of a large burn on a "brush conversion" site, and was identified as the source of heavy silt buildup about 1.75 miles above the confluence with the south fork. They also found an absence of aquatic fauna at this site. According to more recent observations, this erosion would have been short-lived. The unit shows no evidence of surface erosion and has good productivity. This conversion site was 4% of the WAA; only an additional 4% of the WAA was harvested. Road density is only 1 mi/sq mi, but multiple washouts along Road 1917150 have been noted.

The mainstem (04Q01F) has been affected by sediment from roads in the past, but they are not sources at the present time. Of National Forest land, 31% has been harvested, less than half of this within the past 20 years. If 80% of non-National Forest land is assumed harvested, total for this WAA would be 40%. The road density is 3.6 mi/sq mi. Two miles of road are on moderately steep slopes. Probable effects are on hydrology of smaller tributaries, with possible increases in sediment delivery to mainstem.

This subwatershed offers 4 miles of habitat suitable for chinook as well as steelhead and trout spawning and rearing. It has a low gradient reach near its forks, yet the highly mobile coarse bedload prevents this reach from being very productive.

04E Emily Creek

Emily Creek enters the Chetco River at river mile 8.9. There are no named tributaries.

Elevations range from 2930 feet on Mt. Emily to about 70 feet at the mouth. Nearly all of the subwatershed is within the rain-dominated zone, with a small portion near the summit of Mt. Emily in the transient snow zone.

The stream flattens rapidly from very steep at the headwaters, mile 8.5, to a moderate 5% from mile 8.0 downstream to mile 7.0. It varies from 4% to 14% in the next 2.5 miles down to the first main tributary, which comes out of the Snaketooth area. Below this tributary, the gradient gradually decreases to 2%, then from mile 4.25 it is 1% or less, with the exception of a steep reach near mile 2.2. The four miles of relatively flat gradient are unusual for a mountain stream this small.

The flat gradient relative to stream power also makes it subject to deposition. The mainstem is heavily aggraded near the mouth, flowing subsurface in summer. Historical aerial photos show some aggradation in the lower 0.5 mile in 1940. On the 1957 photos, no harvest or road construction had yet taken place anywhere in the subwatershed, but the first mile of Emily Creek had a noticeably wider riparian opening, about double the width of the 1940 channel, with bank to bank aggradation. It is likely that this was the result of the 1955 flood. Analyses have found that the effects of the 1955 event were greater than the 1964 event in coastal streams such as Elk River, east of Port Orford.

The two upper forks draining off Mt. Emily and Snaketooth, WAA's 5 and 6, were intensively harvested and roaded in the 1960's. WAA 5, near Mt. Emily, was 17% harvested prior to 1975 and 12% harvested since 1975, with 2.1 mi/sq mi of roads. Two miles of this road are on moderately steep slopes. WAA 6, Snaketooth country, was 32% harvested prior to 1975, 9% since then, plus 6% brushfield conversion. The road density is 4.25 mi/sq mi, with 1 mile on steep ground, over 60%, and 3 miles on moderately steep ground. Streams in both of these WAA's show signs of sediment delivery from harvested areas and roads, with aggradation. WAA 6 is most likely to still be experiencing effects from the high level of roading and harvest.

Emily Creek is the prime candidate for substantial coho production in the Chetco. Low productivity of coho was observed here in 1993. Nine miles could be used by coho and are currently used by chinook and steelhead and trout.

04L Lower Chetco

This subwatershed includes the Chetco River from Elk Creek, river mile 9.8, to North Fork Chetco, river mile 4.9. Named tributaries are Elk Creek, Little Emily, Dry Creek, Nell Creek, Mill Creek, and Jack Creek with its tributaries Jordan and Hamilton Creeks. Except for Jack Creek, these are face drainages less than three miles in length. Emily Creek is discussed under 04E.

Elevations range from 2930 feet on Mt. Emily to about 35 feet at the North Fork. The subwatershed lies almost entirely within the rain-dominated zone, with a small portion of transient snow zone near the summit of Mt. Emily.

The Chetco River gradient is a nearly constant 0.1% through this subwatershed. The channel meanders between large depositional bars. Residential, agricultural, and industrial use increase as the river moves downstream. Undeveloped areas have heavy recreational river use.

Dry Creek was the site of a large debris flow March 22, 1993 (USFS Geologic Services Report, 1993). The flow originated at a harvest landing near the headwaters and travelled the entire length of Dry Creek, both scouring out the channel and depositing slide debris all along the way. An estimated 7,000 cubic yards of slide material were delivered to the Chetco River (river mile 8.1), with coarse debris depositing on a bar near the Dry Creek mouth and finer particles sweeping out to sea in a plume. Dry Creek does not carry enough water to provide stream power to remobilize much of the material deposited along the channel, but storms will probably erode some of it during the first 5 to 10 years.

About 37% of subwatershed 04L is National Forest land. Of this, 32% has been harvested, mostly prior to 1975. If 80% of non-National Forest land has been harvested or cleared for other uses, in combination with the National

Forest harvest, 63% of the subwatershed would have been vegetatively altered. This is very likely to have affected the hydrology of these face drainages.

Mill Creek (04L05W) and Dry Creek (04L06W) are 80 to 90% National Forest land. About 45% of the National Forest land in each of these was harvested prior to 1975.

Approximately 30% of the Jack Creek drainage (04L01F, 04L02W, and 04L03W) is National Forest land. Of this, 14% has been harvested. Although some of the non-National Forest land has been harvested, recent aerial photos show most of the steep, brushy slopes little changed from 1940 photos.

The overall road density is 3.5 mi/sq mi. WAA 5, Mill Creek, has 3 miles of road on moderately steep ground; WAA 1, lower Jack Creek, has 2 miles of road on moderately steep ground, and WAA 4, near the low water bridge, has 2 miles on moderately steep.

The mainstem here is primarily migration habitat. Gravels are too mobile for successful spawning most years and summer temperatures too high to be rich rearing habitat. Mill Creek is a small but productive tributary with 1.5 miles of low gradient, high value habitat for chinook, steelhead, trout, and potentially coho. Jack Creek is another productive tributary in the subwatershed, providing 6 miles of high value habitat for salmon and trout.

04N North Fork

The North Fork enters the Chetco River at river mile 4.9. Principal tributaries are an unnamed stream coming off of Bosley Butte, Bravo Creek with its tributary Ransom Creek, and Mayfield Creek.

Elevations range from 3430 feet on Bosley Butte to about 35 feet at the mouth. Nearly all of the subwatershed is in the rain-dominated zone, with a small portion near Bosley Butte in the transient snow zone.

The North Fork Chetco profile is similar to the mainstem Chetco River, South Fork Chetco, and Emily Creek in having an especially short section of steep gradient near the headwaters, then rapidly flattening. But the North Fork has more pronounced steps in this flat gradient. It has less than 0.5 mile of perennial stream near the headwaters with a gradient greater than 10%, flattening to 2% for 1.2 miles, a half-mile step of 3 to 6%, two miles of 1%, a half-mile step of 2 to 5%, then four miles of 1% and 1.5 miles of less than 0.5% approaching the mouth.

The North Fork provides 8 miles of high value fish habitat for salmon and trout. It is also the upper limit of most hatchery steelhead.

04X Estuary

This subwatershed includes the Chetco River from North Fork Chetco (river mile 4.9) to the mouth, where it enters the Pacific Ocean. Tributaries are North Fork Chetco, discussed under 04N; Jack Creek, with its tributary Hamilton Creek; Joe Hall Creek, Ferry Creek, and Fish House Creek.

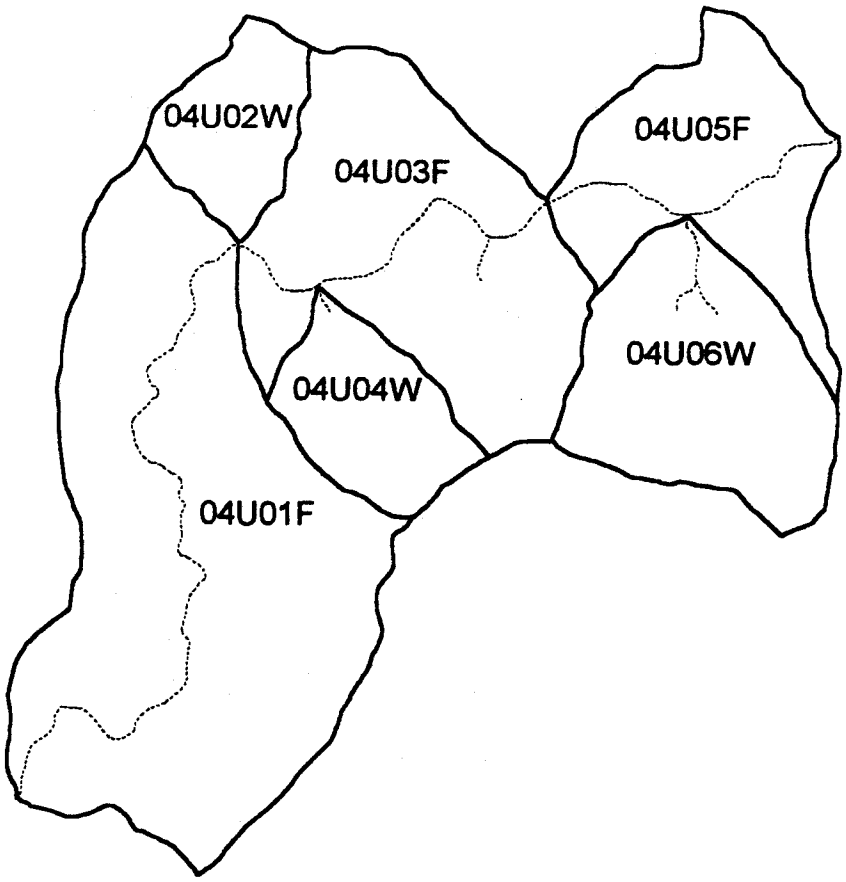
Elevations range from over 1200 feet on the ridgetops to the north, to sea level at the mouth. The subwatershed lies entirely within the rain-dominated zone.

The altered hydrology of this subwatershed is discussed under the Hydrology section of this watershed analysis. Added to the effects of urban, industrial, residential, and agricultural development are the probable effects from a road density of 5.7 mi/sq mi.

The primary dynamic in the Chetco River as it flows through this subwatershed is the interaction between the water, wood, and sediment coming downstream and tidal action of the Pacific Ocean coming upstream. Tidal influence on water level extends to "Tide Rock" near river mile 2.2, or at very high tides into the riffle about a half mile further upstream.

The lower five miles of river serve as a staging area for all Chetco anadromous fish. Adults hold in this section of the river in the fall until flows are sufficient to allow upstream migration. Juveniles hold here for a short (steelhead) or long (chinook) period of time to complete smoltification and enter the ocean.

Watershed Analysis Areas for Subwatershed 04U



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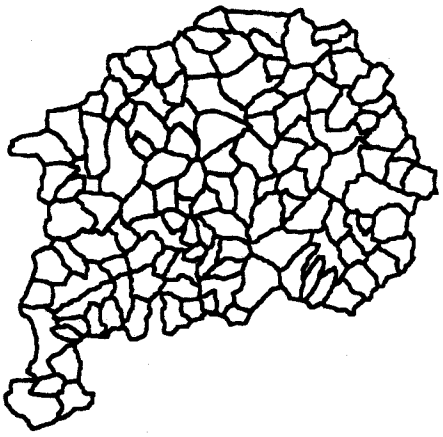
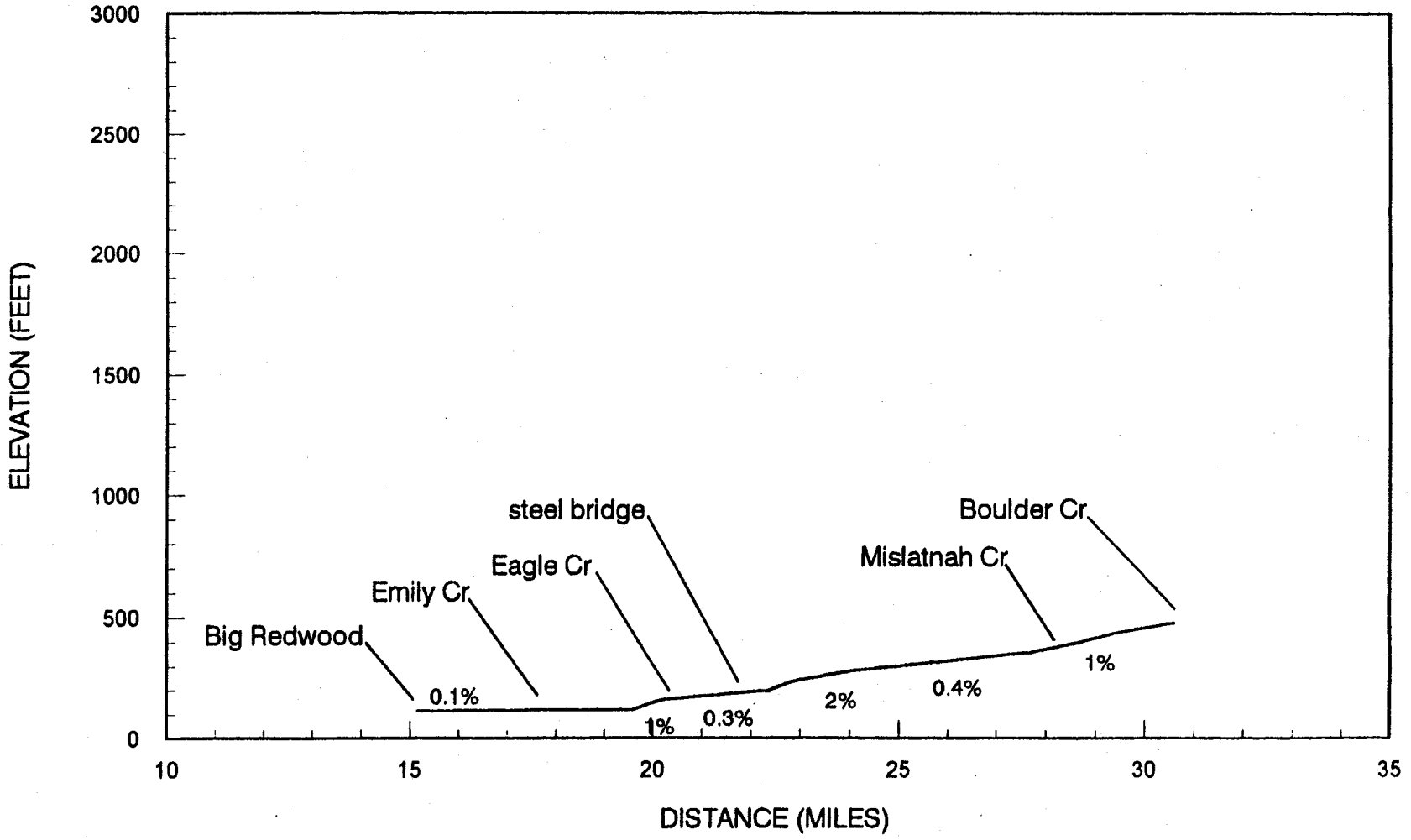


CHETCO RIVER, 04U

PROFILE



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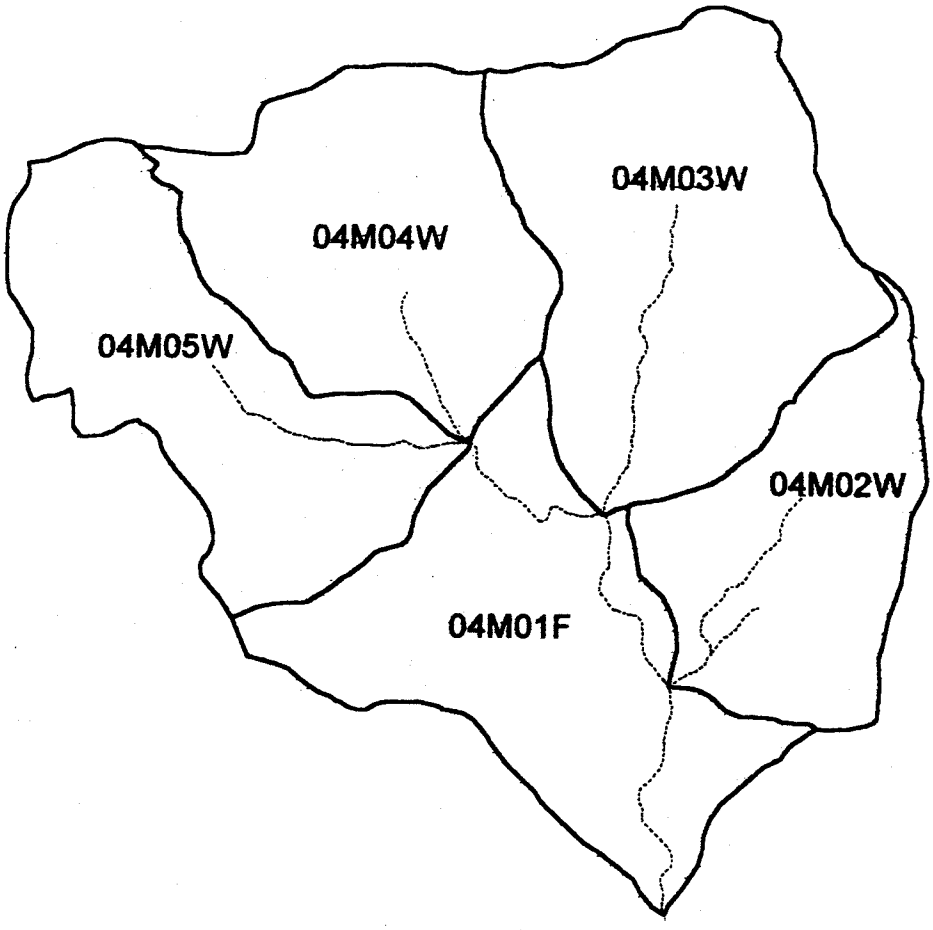
Watershed Analysis Areas for Subwatershed 04M



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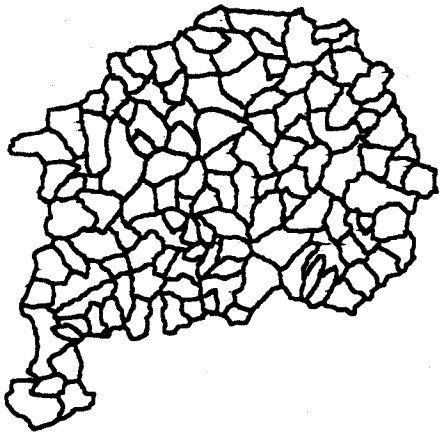

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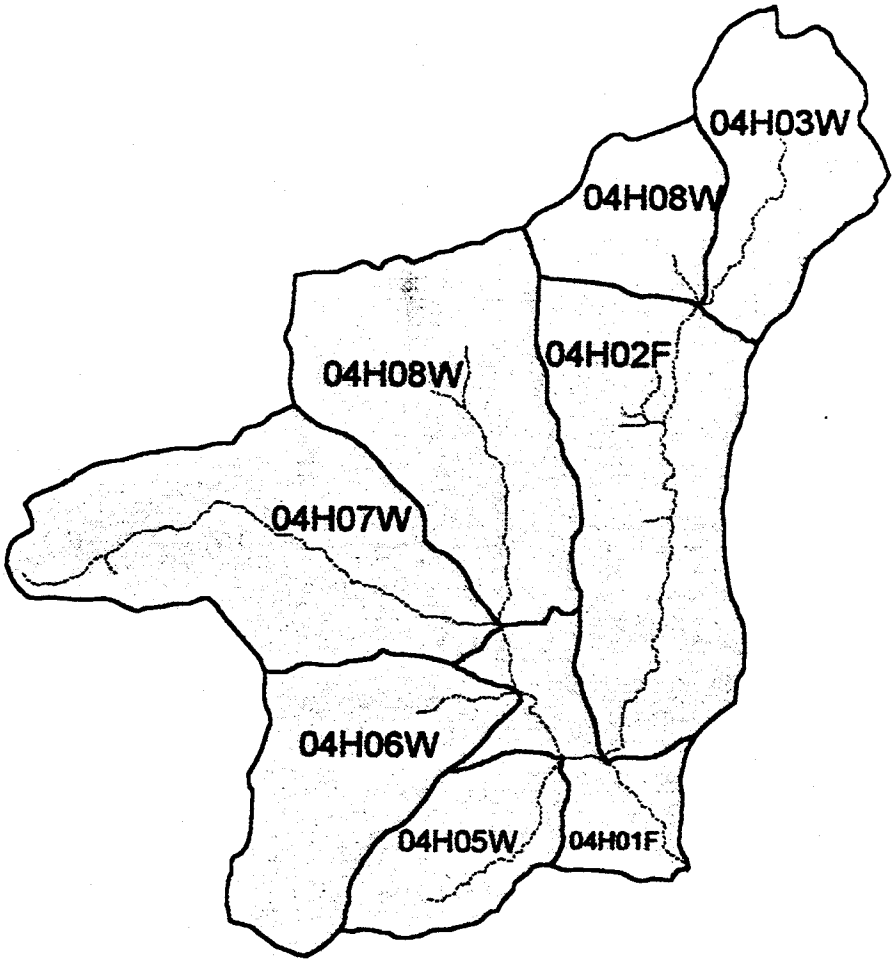

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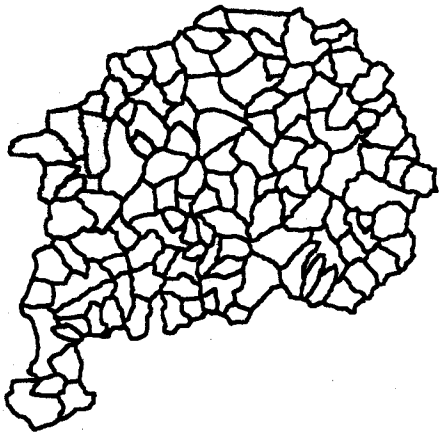

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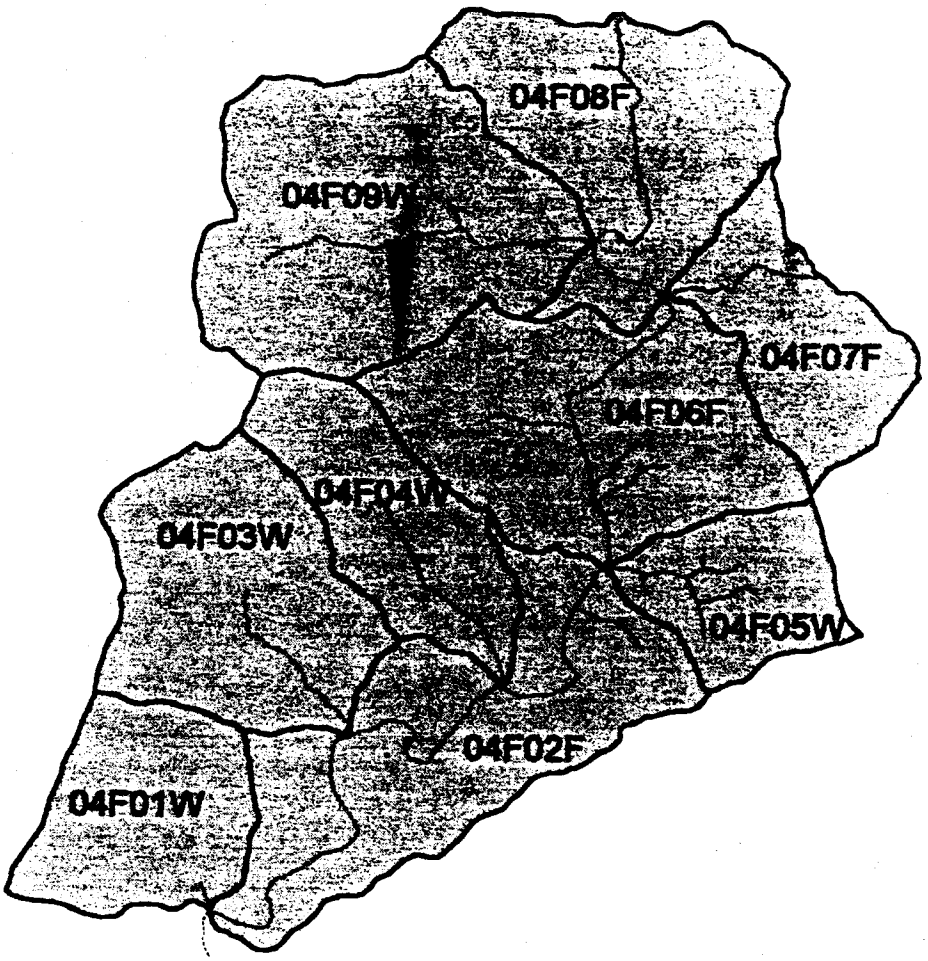

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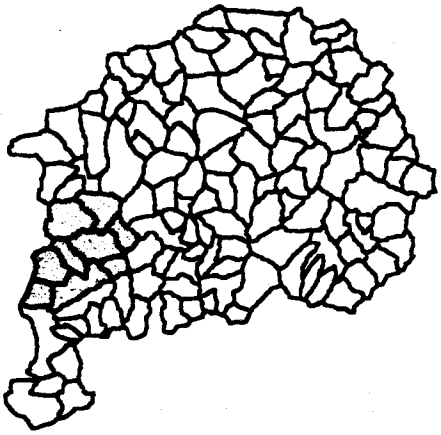

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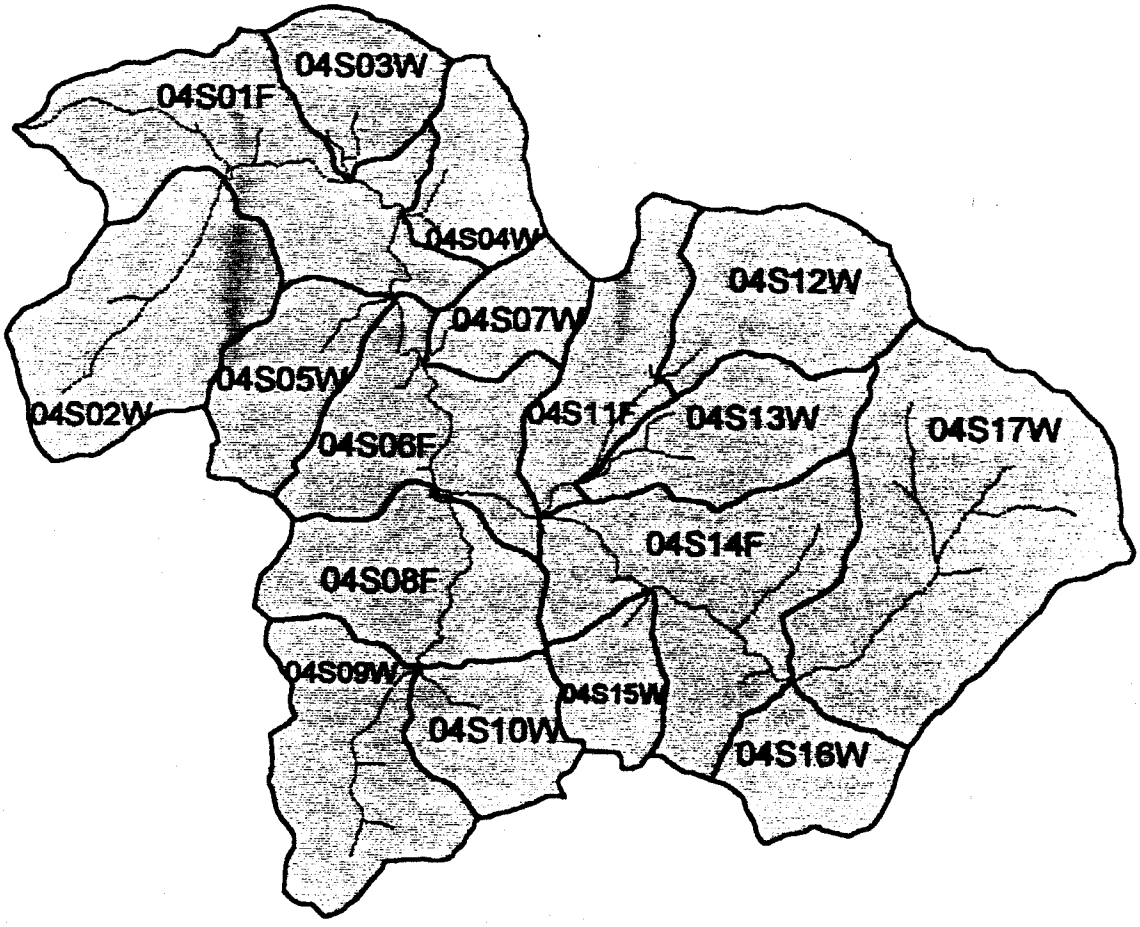
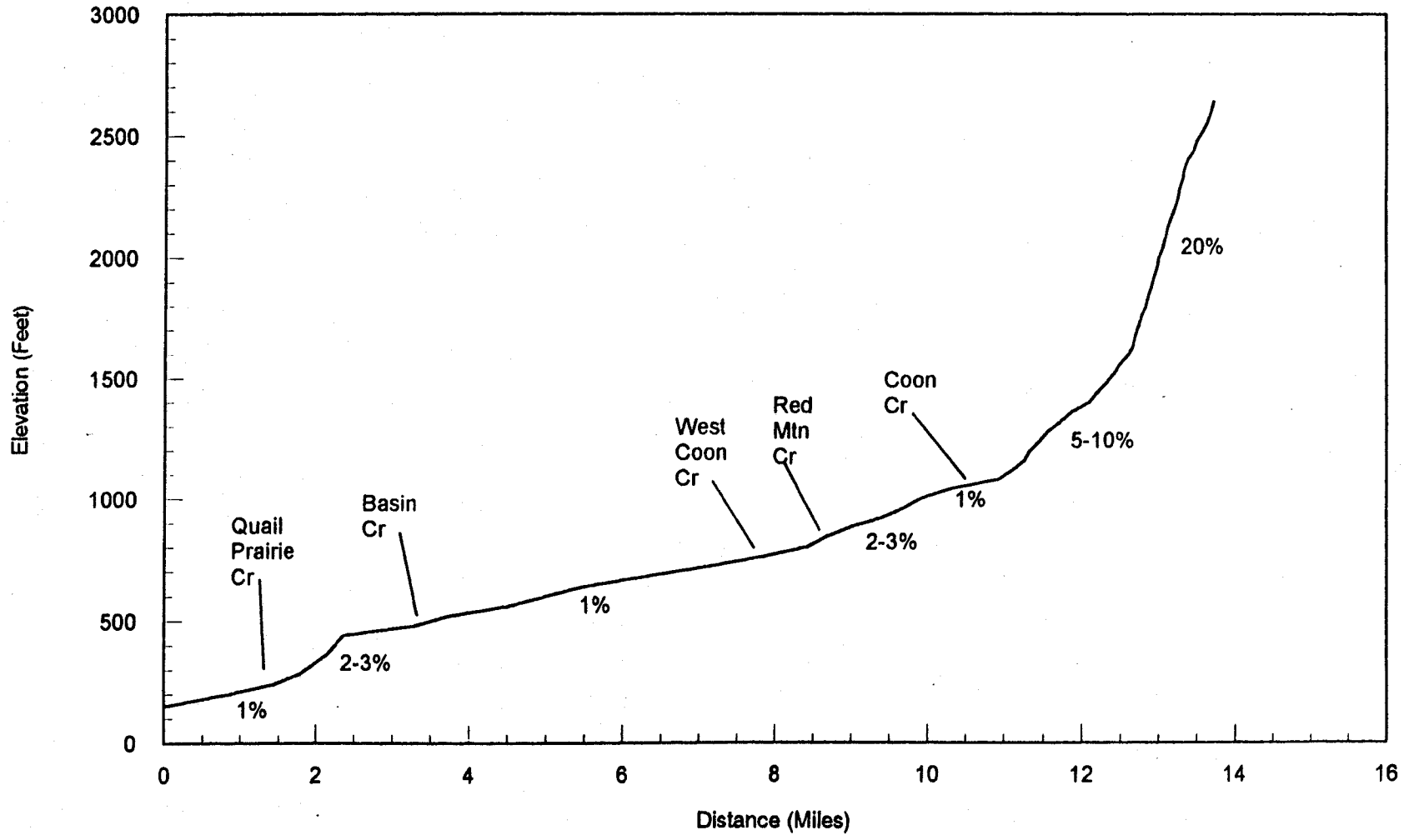


Class I and II Streams Shown

SOUTH FORK CHETCO RIVER

PROFILE



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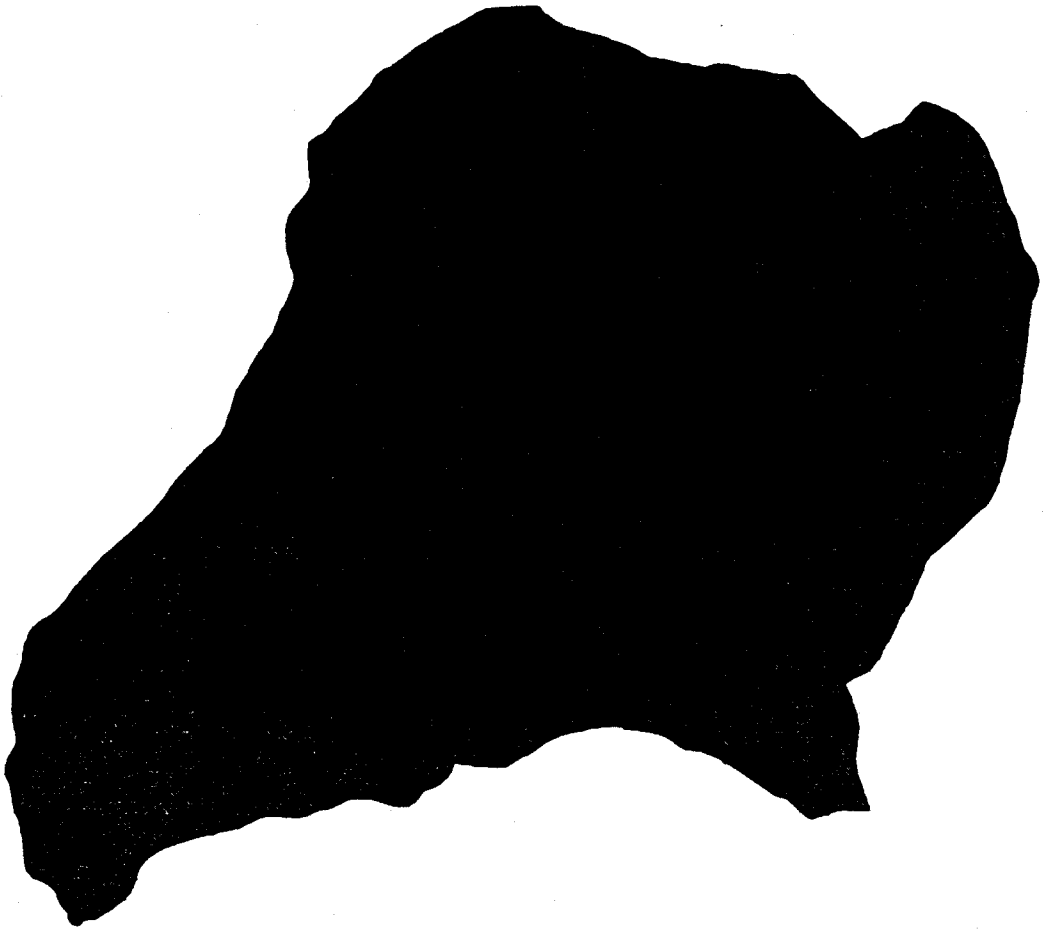

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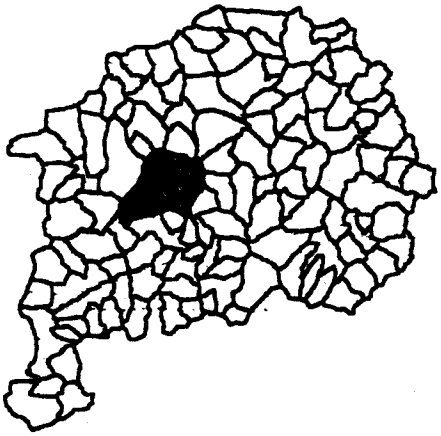

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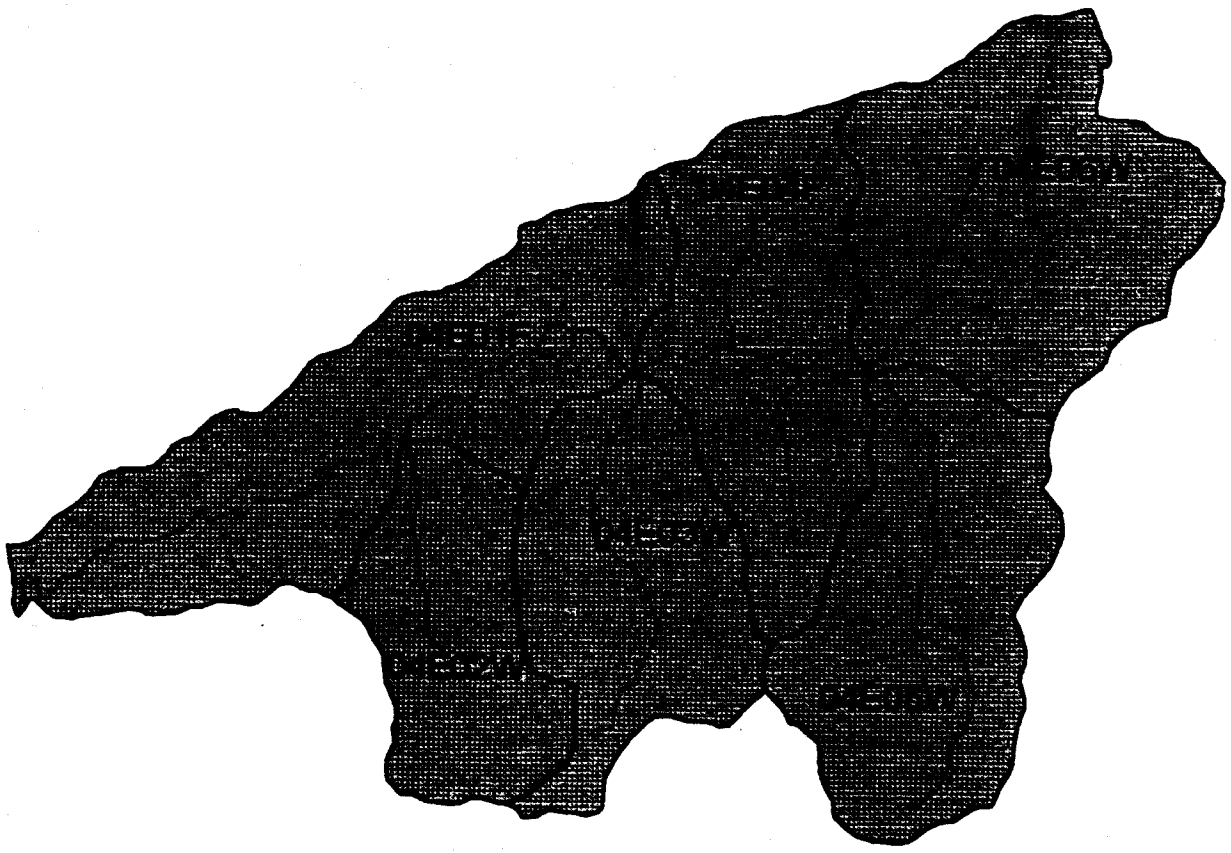

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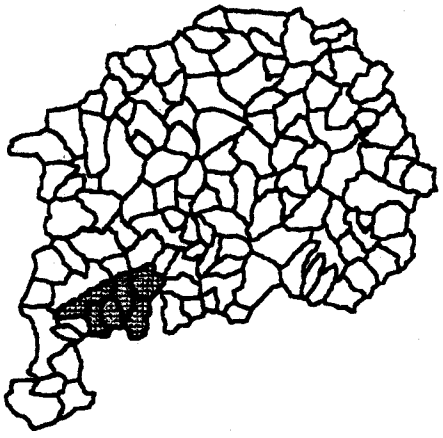
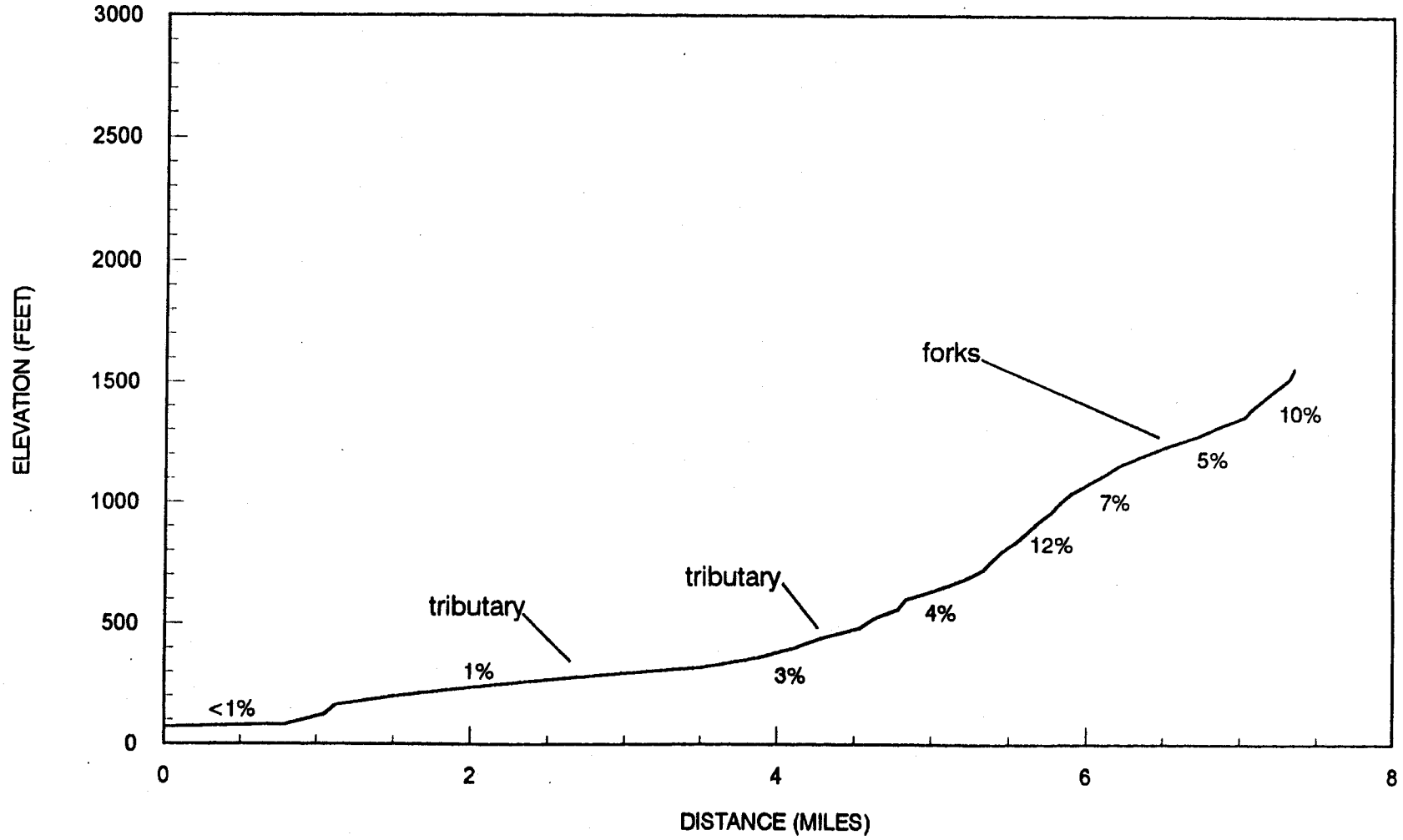


EMILY CREEK

PROFILE



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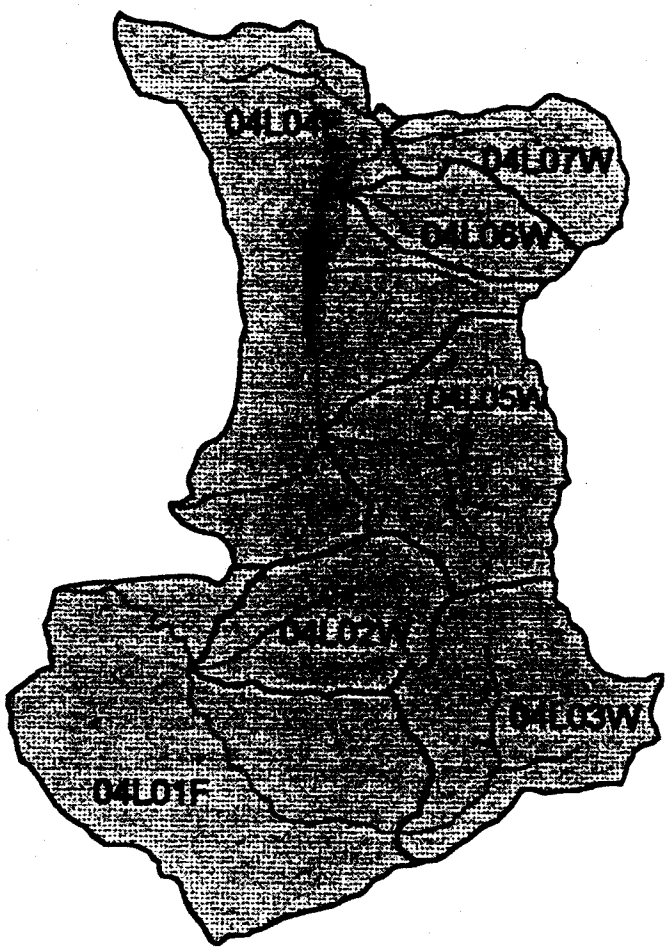

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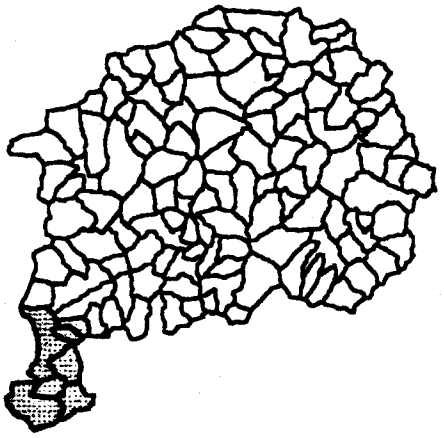
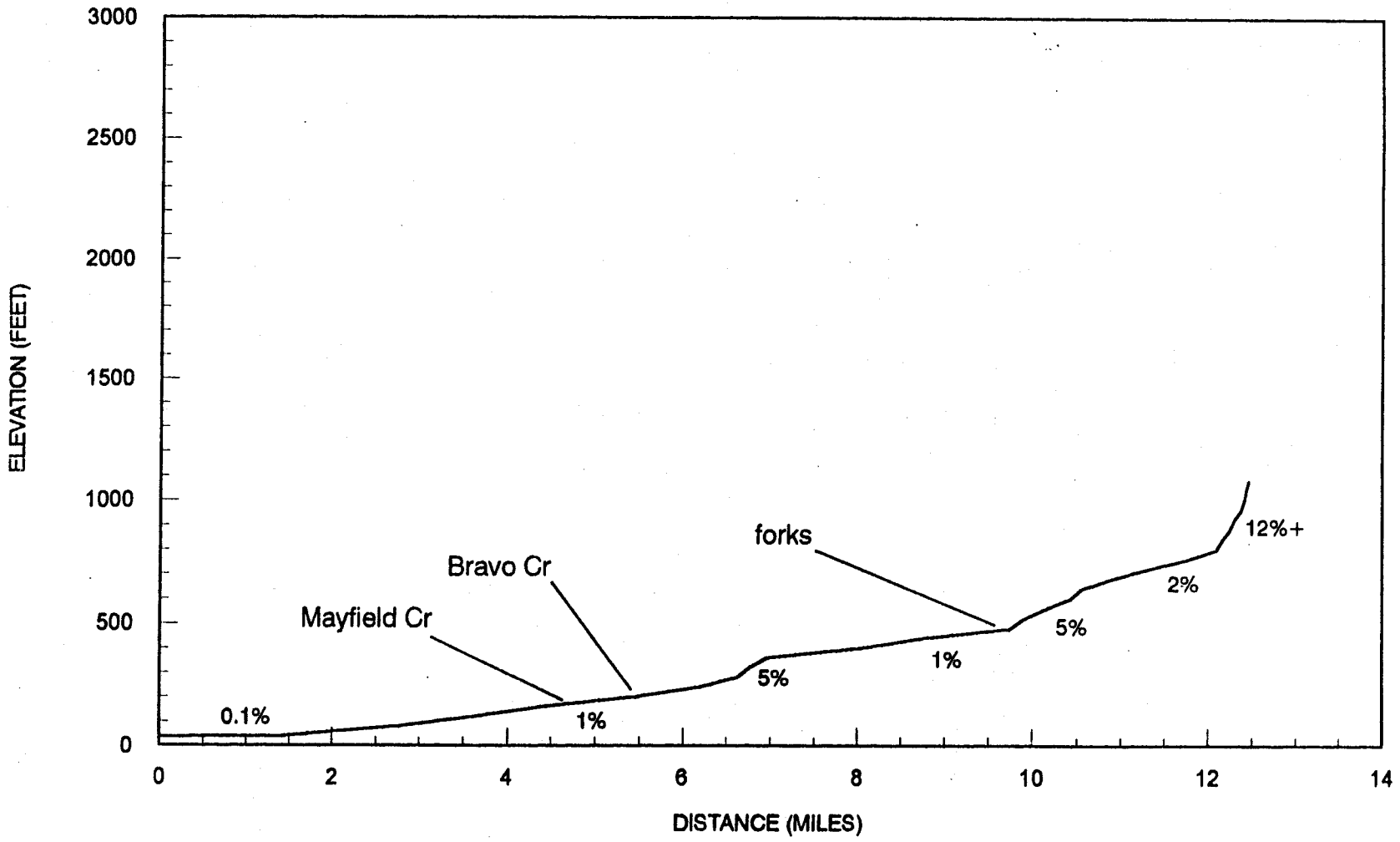


NORTH FORK CHETCO RIVER

PROFILE



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Angela Dillingham, *Fisheries Biologist*

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Bruce Floyd, *Fire/Fuels Specialist*

G. W. Martinek, *Archaeological Technician*

Cindy Ricks, *Geologist*

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