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Forest Service
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Region

1996

QUOSATANA CREEK 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 Bonnie J. Wood DATE February 6, 199_

District Ranger
Gold Beach Ranger District
Siskiyou National Forest

Introduction

The Quosatana Creek Watershed Analysis was initiated to obtain information on the condition of the watershed. That information will be used to guide future resource management projects. It will also be used in 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 the *Ecosystem Analysis at the Watershed Scale, (Version 2.2, August 1995)*. The watershed analysis has three components: the aquatic 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. For example, both aquatic and vegetative ecosystems are derived in part from the geology of the watershed. And, riparian areas are essential to the aquatic ecosystem, but they are also very important to the terrestrial ecosystem and to the social aspects of the watershed.

This watershed analysis report contains the watershed analysis summary, the watershed analysis 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.

Quosatana Creek Watershed

The Quosatana Creek watershed is approximately 16,400 acres. The watershed lies within 20 miles of the Pacific Ocean. Quosatana Creek drains into the Rogue River approximately 14 river miles northeast of the community of Gold Beach. The elevation ranges from 70 feet at the confluence with the Rogue River to 3512 feet at Signal Buttes. Average annual precipitation varies from 85 to 135 inches occurring primarily between October and May. Coastal fog during the summer months often extends inland to elevations near 1,500 feet, blanketing the lower one-third of the Quosatana watershed. This maritime influence often ends at Wildhorse Ridge on the eastern portion of the watershed. Vehicle access to the watershed is via Road 33 and Road 3313 from the north and west, Road 3680 from the south, and Road 33 and 3318 from the northeast.

Figure 1: Management areas in the watershed allocated by the Siskiyou Land and Resource Management Plan as amended by the ROD, 1994.

Allocations	*Management Areas*	*Acres*
Unique Interest	5	405
Supplemental Resource	7	429
Late Successional Reserves	8	8,509
Special Wildlife	9	110
Riparian Reserves	11	977
Partial Retention Visuals	13	14
Matrix	14	3,319
Total National Forest Land		13,763
Total Private Land		2,652
Total Acreage		16,415

AQUATIC ECOSYSTEM

KEY QUESTION: What is the physical and biotic character of fish habitat in the watershed?

FACTORS	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
Sediment	Sediment is delivered to streams by naturally occurring landslides Past timber harvest and road construction resulted in increased sediment delivery to smaller tributaries. These tributaries are recovering gradually. It does not appear that the increased sediment in the tributaries affected the mainstem or the main forks of Quosatana Creek.	Reduce future sediment delivery	Roads which cross streams and concentrate runoff. Roads not needed for resource management and not highly used by the public. (See appendix for road priority ranking)	Improve stream crossings to reduce the probability of a debris flow. Improve drainage on roads which concentrate runoff. Obliterate roads not needed for management or public use.
Channel morphology	The channel morphology of Quosatana Creek is varied. Upper reaches have good pools. Lower reaches are aggraded resulting from natural processes. The last 1000 feet at the mouth is heavily aggraded with additional material deposited by the Rogue River.	Maintain processes.	Throughout the watershed.	None at this time.
Stream Flow	Stream flow is rainfall dominated: high in winter, low in summer. Timber harvest and road construction likely caused increased peak flows in local tributaries, however this did not have much of an effect if any on the mainstem.	Maintain stream flow.	Throughout the watershed.	None at this time.
Large Wood	There is an ample supply of large wood in the mainstem and main forks at this time. Timber harvest has occurred along 15% of the west fork, 15% of the mainstem, and almost 50% of the small streams in the watershed. This has depleted a portion of the future large wood to these channels.	Long term, future recruitment of large wood.	Riparian areas of old harvest units and future harvest units.	Plant and/or thin in Riparian Reserves of old harvest units as needed. Designate Riparian Reserves in future harvest units to ensure recruitment of large wood.
Temperature	Temperature is on the warm end of tolerance for salmonids. This is a natural condition, mainly due to the mainstem's wide shallow channel and its north to south orientation.	Prevent increase in temperature.	Riparian areas of old harvest units and future harvest units.	Precommercial thin within Riparian Reserves to maintain and increase shade. Designate Riparian Reserves in future harvest units.
Fish Distribution	Four 'at-risk' fish stocks inhabit Quosatana Creek during some portion of their life history: fall chinook, coho, winter steelhead, and sea-run cutthroat. Rearing habitat has excellent pool depths and cover, spawning habitat is good but there is some embeddedness of gravels in the salmon spawning reach, and there are two natural barriers that impede or block migration. Chinook, coho, and sea-run cutthroat inhabit the lower 2.7 miles of the mainstem. Winter steelhead and resident rainbow and cutthroat inhabit 6.3 miles of the mainstem and forks.	Maintain, restore, and protect habitat conditions for 'at-risk' fish stocks.	The first reach of Quosatana Creek and candidate roads in the watershed.	Maintain and modify existing 'fish structures' in the first reach. Decommission roads that are not necessary for management or public use Improve drainage and stream crossings and provide maintenance for those roads which remain open.

FACTORS	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
Macroinvertebrates	Little is known about the aquatic non-fish fauna. Sampling took place in 1994 and 1995. Report from the 1994 collection will be available in early, 1996	Maintain high quality habitat.	Throughout the watershed	None at this time.
Human Recreation Interactions	Campers in lower mainstem have been observed fishing in the past which is illegal. This has directly affected juvenile salmonids. Recreationists have also manipulated the stream channel bed for access and cut riparian vegetation.	Eliminate illegal fishing and inform recreationists of regulations and the need for quality habitat.	Lower two miles of mainstem.	Educate campers and [illegible] regulations on fishing [illegible] access if necessary.

KEY QUESTION	KEY PROCESSES	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What are the important processes in the Riparian Reserves?	**Ephemeral channels** transport sediment, water and nutrients and may have a site-specific biological role. **Intermittent channels** transport and supply sediment, water, allochthonous material and nutrients, and large woody material. It is important to maintain riparian vegetation as a source of allochthonous material. These areas provide thermal refuge for hillslope organisms, travel corridors for terrestrial organisms and important habitat for amphibians. **Perennial and fish bearing streams** have the same processes as intermittent streams, although these streams are more important biologically. Important processes include slope stability, large wood delivery to streams and riparian areas, and shade for stream temperature and microclimate.	See the physical and biotic character factors for the existing condition of the streams in the watershed.	Define important aquatic and terrestrial processes so that Riparian Reserve widths may be adjusted based on a site-specific basis. Achieve Aquatic Conservation Strategy objectives and wildlife dispersal objectives.	Intermittent stream riparian buffers are the most likely to be adjusted from interim widths. Perennial streams could be adjusted but less likely.	Interim Riparian Reserve w[illegible] may be adjusted to better m[illegible] on the ground conditions ([illegible] topography, vegetation, etc.[illegible] Aquatic Conservation Strateg[illegible] objectives and wildlife dispe[illegible] objectives are met. Adjustm[illegible] of Riparian Reserve widths ma[illegible] investigated and/or propose[illegible] specific management proje[illegible] the future.

TERRESTRIAL ECOSYSTEM

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What is the historic and existing late successional stage distribution in the watershed?	Approximately 54% of the late-successional habitat in the watershed has been harvested since 1958. The amount of interior late-successional habitat has been reduced from the historic level (1950) of approximately 66% to the existing level of 13%. 52% of the watershed has been allocated to Late-Successional Reserve.	Maintain existing large blocks of late-successional habitat. Accelerate growth and development of early-mid seral stands into late seral stands. Increase patch sizes of older forest and interior forest habitat by development of adjacent early and mid seral stands into late seral.	Early seral or mid-seral stands that could be precommercial or commercially thinned to enhance late-successional habitat. The highest priority would be those stands that increase future interior habitat or connectivity.	About 850 acres of precommercial thinning and release of managed stands in Late-Successional Reserve (LSR) can be done in the next 5 to 10 years. About 140 of these acres could fill gaps in the core habitat area in the center of the watershed. About 125 acres of commercial thinning opportunities also exist
What are the special/ unique habitats in the watershed and how are they changing?	Open meadow areas and open serpentine areas are being reduced in size by tree encroachment. These areas are also being impacted by trespass horses. Lakes and ponds are maintaining their current sizes.	Restore open meadow and open serpentine habitat.	Woodruff, Fritsche and Shea Meadows. Open meadows and serpentine areas throughout watershed.	Cut, girdle, or cut and remove encroaching trees in and around open meadows and grassy serpentine areas Manage with a prescribed fire program. Remove trespass horses.
What is the relative abundance and distribution of the species of concern that are important in the watershed?	The following threatened/sensitive species have been observed in the watershed: bald eagle, northern spotted owl and marbled murrelet. Pacific big-eared bat, red-legged frog, California mountain kingsnake and Del Norte salamander. Habitat for northwestern pond turtle, white-footed vole and wolverine occurs in the watershed. The following sensitive plant species have been documented in the watershed: *Bensoniella oregana*, *Carex gigas*, *Poa piperi*, *Salix delnortensis*, *Arctostaphylos hispidula*, and *Triteleia hendersonii var. leachiae*.	Maintain or increase population of threatened and sensitive plant and animal species within the watershed by maintaining or increasing habitat capability within the watershed.	Protect known sensitive species sites. Develop potential habitat areas for spotted owls and marbled murrelets. Priority areas include those that will contribute to the development of large blocks of interior late-successional habitat. Maintain and improve unique habitats.	Maintain and protect known sensitive plant and animal sites. Develop murrelet habitat (large limbs) and spotted owl structure within stands. Improve habitat conditions for spotted owls by developing recruitment/potential habitat stands. Restore and maintain meadows and remove trespass horses.
What risk does each road in the watershed present in spreading *Phytophthora lateralis*?	Port-Orford-cedar occurs in lower quantities than in the adjacent Lawson watershed, mostly in riparian areas and wet serpentine sites. Port-Orford-cedar root disease (*Phytophthora lateralis*) is extensive and most tributaries are infested. The disease was introduced 20 to 30 years ago. Now, the spread of the disease has slowed but still occurs.	Reduce risk of spread.	Individual trees, upslope areas, and remaining uninfested tributaries, especially west side of Wildhorse Ridge.	Cut Port-Orford-cedar from edges of roads. Closure of selected roads to motorized vehicles. Clean equipment before operations. Restrict high risk uses to dry season. Use disease-free water in fire suppression and other activities. Place lift of rock on infested road sites where appropriate. Plant disease-resistant trees. Public education and enforcement of road closures.

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What are the locations and risk of spread of noxious weeds?	Seven noxious weed species currently inhabit the watershed. Most weed sites are currently restricted to disturbed sites. Gorse, meadow knapweed, and scotch broom are beginning to appear in the watershed. Canada thistle, bull thistle, and tansy ragwort are established in the basin. Star thistle has not yet been found in the watershed but has been found on areas bordering the watershed making it a potential problem.	Minimize impact of noxious weeds by restricting their spread and introduction to new sites. When possible eradicate species that are not well established in the watershed	Road 3313: three gorse sites, scotch broom. Junction of 3313 and 3313.100, a colony of scotch broom, a population of meadow knapweed Road 3313.020: a colony of scotch broom. Road 3313.100: small colonies of scotch broom and gorse. Road 3313.104: scotch broom. Road 3313 150: colony of scotch broom. Road 3313.151: gorse site. Road 3318: new gorse sites reported in vicinity. Road 3318.250: scotch broom.	Cut/pull/burn colonies of gorse, meadow knapw[illegible] and broom, and monitor [illegible] for reoccurrence. Close [illegible] ed roads to motorized v[illegible] Clean construction mac[illegible] before and after operati[illegible] Use only "clean" fill mate[illegible] and "certified" weed fre[illegible] Reduction of soil disturb[illegible] (i.e. ripping roads) in wee[illegible] infested areas will help co[illegible] populations. Use of biolo[illegible] controls (tansy ragwort) w[illegible] help control populations
What risk does white pine blister rust present in the watershed?	White pine blister rust occurs in lower quantities than the adjacent Lawson and Pistol watersheds. High stand density in sugar pine sites is increasing the risk of stress and introduction of bark beetles and blister rust.	Reduce risk of spread.	Upslope and ridgetop areas, serpentine white pine sites with high density, and the westside of Wildhorse Ridge.	Reduce stand density th[illegible] thinning and/or burning, [illegible] planting disease-resista[illegible] trees.
What is the fire history and the future role of fire in the watershed?	From 1910 to the mid-1930's, ten human-caused fires burned over 30% of the watershed. About 40% of the watershed has been burned by stand replacement events. Nine fires were recorded after 1956, none were over two acres. If fire does not occur in 30 to 80 years, natural fuels build-up will be great enough that a major stand replacement disturbance could occur. Ridgetop Douglas-fir stands along the eastern and northwest rim likely originated from stand-replacement fires. Meadows have been maintained by fires. Brushfields scattered east of Quosatana Creek were likely created by fires of high intensity. The serpentine sites west of Quosatana Creek show evidence of lower-intensity fires that maintained openings.	Determine what areas and habitats would benefit from the use of prescribed fire. Determine conditions and fire intensity levels where benefits would be achieved.	Encroached meadows and serpentine areas, late successional habitat, stands with high fuel loading.	Prescribed fire can be used to achieve the objectives of special and unique habitats Late-Successional Reserves and other land allocations Fire management plans w[illegible] need to be completed to determine conditions wh[illegible] prescribed fire will be u[illegible] Private land holdings w[illegible] need to be accounted fo[illegible] these management plans
What areas are available for land exchange/purchase that would benefit unique habitats in the watershed?	About 16% of the watershed is in private ownership. Fritsche Meadows has been identified as a possible candidate for land exchange. Currently, little funding for land exchange exists.	Maintain unique habitats such as meadows for landscape diversity. Work with private landowners to maintain continuous unique habitat between ownerships.	Fritsche Meadow and other meadows. Lands with potential Late-Successional Reserve (LSR) characteristics.	Land exchange with pri[illegible] land owners should be c[illegible] ered where unique habita[illegible] meadows, and LSR goals could be achieved

SOCIAL ASPECTS

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What were the prehistoric uses of the watershed?	Known sites indicate seasonal use of the watershed for hunting and gathering foodstuffs and raw materials for stone tool manufacture, basket making, woodworking etc. Trade and travel routes also traverse the watershed with associated short term traveling camps. Quarry sites for the procurement of raw stone for tool manufacture exist in the watershed.	Identify and protect cultural resources.	Meadow areas, major dividing ridgetops, chert outcrops and riverine terraces on all major watercourses.	Conduct cultural resource surveys prior to any ground disturbing projects. Identify, document and evaluate any discovered sites for the Forest inventory and possible inclusion to 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 uses of the watershed?	Historic elements represent early settlement, mining for precious or strategic minerals, 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 period. 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.	Identify and protect cultural resources.	Mining sites and their associated dwellings scattered throughout the watershed, particularly the Signal Buttes Area. Meadow areas, many of which contain early settlement structures and remains. Sites containing Forest Service administrative facilities such as Wildhorse Lookout, and historic camps. Existing trails and trail segments, and former trails located on historic Siskiyou National Forest maps	Conduct cultural resource surveys prior to any ground disturbing projects. Identify, document and evaluate any discovered sites for the Forest inventory and possible inclusion to the National Register of Historic Places. 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, Karuk, Takelma/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.

KEY QUESTION	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
What are the major recreational uses in the watershed?	Recreational uses include hiking and motorized recreation (sightseeing, hunting, camping, Christmas tree cutting, non-commercial collecting of special forest products, and snow related activities). Most activities have similar use as in the past, but there has been an increase in motorized and non-motorized snow-related activities. Overall use is light and is expected to remain the same or gradually increase. The Recreation Opportunity Spectrum classification for the entire watershed is Roaded Natural. In the past, recreationists along the mainstem of Quosatana Creek have been seen fishing (which is illegal), manipulated the stream bed for access, and cut riparian vegetation.	Provide recreational facilities, roads, and trails which meet the needs of the public and are appropriate with other management goals.	Motorized recreation occurs on Road #3313 which is the primary transportation route through the watershed, secondary roads, and other short spur roads. The mainstem of Quosatana Creek, meadows and buttes, open serpentine areas, and non-system trails receive off-road recreational use.	Develop and provide [illegible] tion to the recreating p[illegible] on appropriate use of u[illegible] oped dispersed areas, [illegible] of unique habitats, and [illegible] regulations Determine [illegible] priate recreation use of [illegible] roads. Rehabilitate area[illegible] have been damaged C[illegible] closure of roads and se[illegible] areas that have a high po[illegible] of damage. Enforce clos[illegible] and regulations
What areas are appropriate for electronic sites in the watershed?	Signal Buttes has been designated as an electronic site. It is currently used by two parties for radio communications Additional users are possible. The dirt road which accesses the site is badly rutted, there is dead Port-Orford-cedar along the route, and a small meadow has been impacted.	Maintain the site and rehabilitate the access	Signal Buttes is located in the southwest corner of the watershed. It is the only known location in the watershed that would be appropriate for an electronic site	Rehabilitate the road to [illegible] site and control access [illegible] necessary

SOCIAL ASPECTS

KEY QUESTION: What commodities can be produced from the watershed?

TYPES OF COMMODITY	EXISTING CONDITION	OBJECTIVES	PRIORITY LOCATIONS	OPPORTUNITIES
Timber	Timber harvest has occurred on 6,112 acres in the watershed (3,460 acres of National Forest and 2,652 acres of Private land). In the future, timber harvest could include commercial thinning or regeneration harvest in matrix. Commercial thinning could occur in Late-Successional Reserve (LSR) if it would improve the stand's ability to develop late-successional habitat characteristics at an earlier date.	Produce commercial timber while meeting management area objectives.	Commercial thinning: treatment of dense, overstocked mid-seral stands in matrix and next to late successional habitat patches in LSR. Regeneration harvest: Late seral stands in matrix Brushfield conversion, dense hardwood stands on eastern side of Quosatana Creek in matrix or that meet objectives for stand diversity within LSR.	The following broad opportunities exist: commercial thinning in matrix - 500 acres, regeneration harvest in matrix - 250 acres; commercial thinning in LSR - 500 acres Site-specific information would have to be obtained before specific recommendations could be made for harvest in these stands
Special Forest Products	Collecting has occurred over a broad area of the watershed with minimal impacts. No specific areas for boughs, beargrass, huckleberry or mushrooms have identified. Bough collection has recently been coordinated with roadside cedar removal. The abundance of serpentine-derived soils supports a diversity of plants with potential for special forest products, including Port-Orford-cedar boughs and beargrass. The Coos-Curry Powerline Corridor has been identified as a potential area where concentrated harvest of Port-Orford-cedar boughs and other special forest products can occur.	Produce special forest products while meeting management area objectives.	Areas close to roads and markets (mostly west side of Quosatana Creek). Locations need to be assessed for risk of spreading Port-Orford-cedar root disease.	Provide a sustainable collection of special forest products and meet management goals through collection permits and/or contracts.
Mining	Prospecting has occurred in the past. Currently there are areas that have claims although no significant minerals have been produced. There is quarry rock which can be sold for aggregate.	Facilitate mineral exploration and development while protecting surface resources and environmental quality.	No priority locations.	Mining may occur when economic conditions make the operation viable.
Grazing	A limited amount of grazing occurs in the watershed on the Signal Buttes grazing allotment (less than $100 value).	Maintain grazing allotment while protecting range and other natural resource values.	Signal Buttes area.	Maintain grazing allotment

Watershed Analysis Narratives

KEY FINDINGS

The four "at risk" **fish stocks** that inhabit Quosatana Creek are fall chinook, coho, winter steelhead, and sea-run cutthroat. Rearing habitat has excellent pool depths and cover. Spawning habitat is good but there is some embeddedness of gravels in the first 2.7 miles. There is an opportunity to maintain and modify existing "fish structures" in this reach to improve fish habitat. There is an opportunity for road decommissioning, "stormproofing" and maintenance to reduce future sediment delivery to the streams of the watershed.

Physical aspects of the fish habitat in the Quosatana Creek watershed are dominated by natural processes. Summer stream temperatures are near the warm end of tolerance for salmonids in the mainstem of Quosatana Creek. Although the smaller tributaries of the watershed have been impacted by timber harvest and road construction, riparian and channel conditions of fish bearing streams are good.

Interim Riparian Reserve widths may be adjusted in conjunction with management activities if Aquatic Conservation Strategy objectives and wildlife dispersal objectives are met. Intermittent streams are the most likely to be adjusted due to their highly variable characteristics.

Late-successional and interior forest habitat conditions are highly fragmented. The amount of late-successional habitat has been reduced from a level of 66% before timber harvest began in the 1950's to an existing level of 13%. Most larger trees and interior forest habitat areas are present in the center of the watershed.

Open meadows and serpentine areas are being reduced in size by conifer and hardwood tree encroachment and impacted by trespass horses.

One cave in the watershed contains a colony of **Pacific western big-eared bats**. This is the only known colony on the Siskiyou National Forest. There have been 16 sightings of **red-legged frogs** in this watershed. There have only been 24 sightings on the Ranger District and 46 on the Forest.

Noxious weed infestations occur primarily on road associated with the 3313 and 3313.100 road systems. Sites are spreading along infested roads.

Port-Orford-cedar occurs in lower quantities than in the adjacent Lawson watershed, mostly in riparian and wet serpentine sites. Disease is extensive including most tributaries.

White pine blister rust occurs in lower quantities than the adjacent Lawson and Pistol watersheds. There are locations where the risk of spread can be reduced through stand density measures, such as thinning and burning, and planting disease-resistant trees.

Stand replacement fires have burned about 40% of the watershed. Low intensity fires have occurred on serpentine ground in the western half of the watershed, while higher intensity fires have created brushfields in the eastern half. Douglas-fir stands and meadows on the northwest and eastern rim have been maintained by frequent, moderate intensity fires.

Potential **commodity production opportunities** in the watershed include timber harvest, special forest products, mining and grazing. **Timber harvest opportunities** in matrix include commercial thinning, brushfield conversion, and regeneration harvest of scattered late seral stands. There are opportunities for **special forest products collection** in the watershed. **Grazing** is limited to Signal Buttes grazing allotment. **Mining operations**, other than some prospecting, are not active at this time.

Recreational use is currently light and is expected to continue at that level or gradually increase. Recreational uses include hiking and motorized recreation including sightseeing, hunting, and snow related activities. There is an opportunity to educate campers along the mainstem of Quosatana Creek that fishing is illegal in that area

There is an opportunity to rehabilitate the road and possibly control the access to the **Signal Buttes electronic site**.

A priority area for **land exchange** in the watershed is Fritsche Meadows

AQUATIC ECOSYSTEM

The following fisheries issues focus the analysis of the aquatic ecosystem of the Quosatana watershed. The key questions were developed from these issues.

Fisheries Issues

Quosatana Creek provides habitat for fish stocks that are considered to be "at-risk". Steelhead in the Klamath Mountain Province and coho salmon have been proposed to be listed as "Threatened" by the National Marine Fisheries Service (NMFS); lower Rogue River fall chinook are considered to be at a "high risk of extinction" by Nehlsen et al (1991); and sea-run coastal cutthroat are considered to be at "moderate risk of extinction" by Nehlsen et al. (1991).

Summer stream temperatures measured near the mouth in Quosatana Creek are warm. In 1994, the average maximum 7-day high was 67.2 degrees Fahrenheit (F). Reeves et al. (1987) found that competitive interactions between redside shiners and juvenile steelhead trout were influenced by water temperature. At cooler stream temperatures (53.6 to 59.0 degrees F) steelhead could compete for preferred habitat with redside shiners. At warmer stream temperatures (66.2 to 71.6 degrees F) redside shiners had the competitive advantage over steelhead for preferred habitat.

The mouth of Quosatana Creek has subsurface flow in the summer, typically beginning in July and lasting until adequate precipitation increases stream flow. This has negative effects for juvenile and adult salmonids. Emmigrating juveniles cannot escape to the Rogue and there may be strong competition for both habitat and prey. The Rogue Basin Evaluation Program (October 1975) found that fall chinook and steelhead concentrate in the lower pools of Quosatana and as a result there are decreased growth rates. The subsurface flow condition also delays spawning adults from entering into Quosatana Creek which has had negative effects during drought years.

Dispersed camping along the lower 2.5 miles of Quosatana Creek occurs during the summer months. In the past, recreationists have been seen fishing in Quosatana, even though the tributaries to the lower Rogue River are closed to fishing. In addition, the recreationists have manipulated the stream bed and riparian vegetation for vehicular access and have left trash behind.

Key Questions

What is the physical and biotic character of fish habitat in the Quosatana Creek watershed?

There are a number of factors involved in answering this key question: characterization of the Rogue River and Quosatana Creek fisheries, characterization of the geology of Quosatana Creek, physical and biotic factors of fish habitat, and human recreation interactions.

Rogue River Basin Characterization

The Rogue River lies in Southwest Oregon and is the largest coastal stream in Oregon. The Rogue and the Umpqua River basins are the only Oregon coastal basins which originate in the Cascade Mountains. The Klamath River to the south and the Columbia River to the north begin east of the Cascade Mountains. The Rogue River is located in the Klamath Mountain physiographic area and the Cascade Mountain area which includes the west Cascade sub-province.

The Rogue River basin is approximately 110 miles from east to west, roughly rectangular, with the main river about 210 miles in length from Crater Lake National Park to Gold Beach. The headwaters of the river originate primarily in the steep topography of the Rogue-Umpqua Divide, the west slope of the Cascade Mountains, and the Siskiyou Mountains

- Illinois River - 628,500 acres
- Applegate River - 491,000 acres (contains Little Applegate River - 72,100 acres)
- Bear Creek - 218,000 acres
- Little Butte Creek - 230,000 acres
- Upper Rogue - 800,000 acres
  (North, South and Middle Forks of Rogue River plus Elk and Trail Creeks)
- Middle Rogue - 603,500
  (Grave Creek, Galice Creek, facing drainages to Little Butte Creek)
- Lower Rogue - 322,000 acres
  (Gold Beach upstream to Grave Creek with facing drainages)

See the Fisheries Appendix for a description of the fisheries resources of the Upper Rogue River and its tributary segments

The climate of the Rogue River basin is varied because of the basin's topography and distance from the Pacific Ocean. Lower temperatures and more precipitation occur on the west slope of the Cascades and in the mountains of the Coast Range. The valleys between these slopes are generally drier with high summer temperatures. Annual precipitation is high on the coast (100+ inches near Gold Beach) and low in interior valleys (19 inches at Medford). Snowfall is prevalent at Crater Lake with an average of more than 500 inches. Stream flow at the mouth of the Rogue River can vary from under 1,000 cubic feet per second (CFS) in the record drought years of 1931 to 1940 (before Lost Creek and Applegate Lake flood control projects) to greater than 500,000 CFS in the December, 1964 flood event. During the dry summer, most of the stream flow is attributable to the high mountain snowpack areas in the Cascade and Siskiyou Mountains.

By 1955, there was considerable human settlement in the interior and coastal valleys of western Oregon. From the 1920's through the 1950's, many storage reservoirs were constructed to supplement irrigation withdrawals (Fish Lake, Emmigrant Lake, Agate Lake, Howard Prairie, Hyatt Lake). The 1955, 1964 and 1974 flood events were of great importance in reforming stream and river channels in the Rogue basin. In the 1970's and 1980's, the Lost Creek Dam and Applegate Dam were constructed for flood control, recreation, and to raise summer streams flows for fish and irrigation. Agriculture development had channelized many streams and removed instream scour elements like large wood and boulders. Much of the meandering and side channel habitat historically present had been eliminated. Timber harvest and road building were increased in the upslope, steep headwater areas of the Coast Range, Cascade mountains and Siskiyou mountains after World War II. All of these human activities have had cumulative effects on sediment delivery to streams, channel morphology, large wood quantity, summer and winter flows, stream temperatures, range of anadromous salmonids in the basin and other freshwater fish habitat components.

Even with these effects, the Rogue River is cited by the Oregon Department of Fish and Wildlife (ODFW) as the most productive basin in the State for chinook salmon outside of the Columbia River system. It produces a variety of species from diverse sub-basin environments with quite different geology, flow regime and habitats. The interior valleys were once wetlands and important for coho salmon. Coho spawn and rear in smaller tributaries and off-channel areas of low gradient streams. These riparian habitats have been changed by agricultural activities and water diversions for irrigation. The upper sections of the river have cooler water temperatures and provide habitat suitable for spring chinook and summer steelhead to hold for the summer before spawning. The short facing drainages provide spawning habitat for summer steelhead while winter steelhead tend to spawn and rear in larger tributaries. Chinook, both fall and spring races, tend to spawn and rear in the mainstem or lower segments of tributaries. However, lower Rogue River fall chinook are considered to be tributary spawners.

ODFW has divided the river into three principal segments for separating distinct stocks of anadromous fish. The lower Rogue includes the section from the ocean to Agness, middle Rogue from Agness to Gold Ray dam, and upper Rogue from Gold Ray to the headwaters. ODFW lists coho salmon as sensitive throughout the basin, fall chinook salmon are sensitive in the lower Rogue, winter steelhead are sensitive in the Illinois, and summer steelhead are of concern throughout the basin.

The Quosatana Creek watershed is located in the lower Rogue River and its confluence with the Rogue is approximately 14 miles from the Pacific Ocean. The watershed is about 16,400 acres in size. There is a strong marine influence on the climate due to the proximity of the Pacific Ocean. Quosatana and Lobster Creek (44,000 acres) are the largest watersheds in the lower Rogue River (below the Illinois River), and are important producers of anadromous salmonids.

Quosatana Creek provides habitat for a variety of salmonid fishes These include fall chinook salmon (*Oncorhynchus shawytscha*), coho salmon (*O. kisutch*), winter steelhead and rainbow trout (*O. mykiss*), and both migratory and resident coastal cutthroat trout (*O. clarki*). Other fish that occur in the watershed include sticklebacks (Family Gasterosteidae), sculpins (Family Cottidae), and redside shiners (Family Cyprinidae).

Geologic and Topographic Characterization

Geology

Most of the rocks in the watershed were deposited as marine sediments between 95 and 150 million years ago. Subsequent tectonic activity accreted these rocks onto the North American continental plate. During this process these marine sediments were subjected to higher temperatures and pressures which metamorphosed some of these rocks into phyllites and schists

The watershed contains three major formations and four rock types. The three formations are the Colebrooke, the Dothan and ultramafics. The rock types are sediments, metamorphics (schists), submarine volcanic rocks and serpentinite/peridotites.

Colebrooke schist covers the largest part of the area. It is found in the northwest, center and eastern edge of the watershed. Included within the Colebrooke are metamorphic rocks derived mainly from fine-grained sedimentary rocks and subordinate amounts of submarine basalt. The rocks of this formation are made primarily of fine-grained schist or phyllite with abundant quartz veins. Most likely, the Colebrooke schist was originally Galice formation which was tectonically metamorphosed.

Metavolcanic rock occurs in a number of areas in the watershed. The largest areas are Skookumhouse Butte, the west part of Quosatana Butte and the vicinity of Wildhorse Lookout. Areas of metavolcanics are more resistant to erosion than surrounding rocks and tend to form topographic highs.

The Dothan formation is located in the eastern portion of the watershed. Rocks of this formation are late Jurassic in age and are about 150 million years old. The Dothan tends to be graywackes, which contain small quartz and occasional calcite veinlets. The Dothan has been thrust under older formations, including the Colebrooke schist, ultramafics, Rogue formation and Galice formation. The Dothan formation is equivalent to the Franciscan formation in California. The Dothan formation includes metavolcanic rocks such as pillow basalts and greenstones (altered tuffs and breccias). Colored banded cherts also occur within the Dothan.

The ultramafics are serpentinites and its parent rock, peridotite, and are generally found in the western portion of the watershed. The serpentinite and peridotite contain high amounts of magnesium (Mg) and iron (Fe) and very little calcium (Ca). This chemistry, when combined with the fact that these rocks tend to have high concentrations of metallic elements, such as nickel (Ni) and chrome (Cr), gives these areas distinctive plant associations. Typically, these areas are sparsely vegetated. Thin soils and bedrock outcrops are characteristic of ultramafic terrain. These rocks were tectonically emplaced onto the continental crust (they are thought to be the sole of a thrust fault) and are typically sheared.

Serpentinite and ultramafics on the west extreme of the watershed are thought to be about 150 million years old Older rocks have been overthrust on top of younger rocks, so they generally occur in the upper plate Thrust faulting may have continued until about 60 million years ago

At least two episodes of high-angle faulting have occurred. The trends of these faults are northwest and northeast, with the northwest faults being the younger. The Mountain Wells fault is the largest fault in the area and has been mapped for a distance of at least 20 miles. It separates the Colebrooke and Dothan formations in the eastern portion of the watershed. Contacts between formations in the watershed are fault contacts. Some of the high-angle faults may have been active within the last million years or so, and have some potential for movement in the future.

Topography

The watershed ranges in elevation from 70 feet at the confluence with the Rogue River to 3512 feet at Signal Buttes. The terrain is moderate with slopes in the western portion of the watershed averaging 8 to 30% and slopes in the center and east averaging 30 to 60%. About 10% of the watershed has slopes greater than 60% (all slope information was gathered using a digital elevation model).

Bedrock and fault activity exhibit some control of slope angle. Areas of serpentine which represent the sole of a thrust plate are typically areas of low slope. Overall the west side of the watershed, which is dominated by ultramafic rocks and melange, has a slope of 8 to 30%.

Areas of volcanic rocks (Quosatana and Skookumhouse Buttes) exhibit steep slopes, typically 60 to 90% and greater. This is primarily due to volcanic rocks within the watershed being more resistant to erosion than the surrounding sedimentary rocks.

Sediments of the Dothan and Colebrooke formations generally have slopes between 60 and 90% with some areas of greater than 100%.

Basin Morphology

The mouth of the basin appears to be influenced by a fault that crosses the Rogue River. The fault is on a northwest and southeast trend, crosses the Rogue River and continues along the west side of Quosatana Creek. The fault was identified by aerial photos. It is parallel/subparallel to other mapped faults in the area (Ferrero 1991, Ramp 1977). Relative movement of the fault has both vertical and horizontal components. The west side moves up and to the north and the east side moves down and to the south. Motion of this kind along a fault would have the effect of raising the stream's local base level. This would decrease the stream's gradient and its ability to transport sediment. As the stream aggrades it begins to meander, alternately running against opposite sides of the channel and eroding them. As erosion continues, the stream oversteepens slopes resulting in mass failure (landslide). The failures further aggrade the stream and enhance meandering which in turn causes more mass failures. Through this process, the valley of the creek continues to widen.

The fault movement has also affected the Rogue River. The motion, as described above, has offset the course of the river with several effects. Similar to the effects on Quosatana Creek, the local base level of the Rogue has been raised, creating a lessening of gradient and enhancing conditions for deposition. Inspection of topographic and geologic maps shows the channel of the Rogue is wider above Quosatana Creek and alluvial deposition is greater. The offset of the river has tightened its meander curve and created an eddy at the confluence with Quosatana Creek. This eddy is an area of decreased energy which is favorable to deposition.

Quosatana Creek is a powerful stream in the winter. However, the combination of the alteration of local base level and the eddy effect has caused the mouth of Quosatana Creek to aggrade to the point where summer flows are inadequate to maintain surface flow.

Quosatana Creek becomes more confined at Stream Mile 2.5, but still shows some signs of aggradation. In addition landslide activity seems to be increased. The lower two miles of stream show what appears to be bedrock meanders These meanders could be a result of fault action or possibly changes in bedrock composition.

Physical Factors of Fish Habitat

Timber harvest and road construction in the Quosatana watershed began in 1958. Prior to this time, the physical processes of the watershed resulted from natural events. The earliest aerial photographs of the Siskiyou National Forest were taken in 1939 and 1940, with the next photos in 1955. These photos can be used as a pre-development reference condition for the physical factors of fish habitat.

Sediment

Man's activities usually have little effect on the geologic environment, but they can have an effect on some of the more ephemeral processes such as landsliding and erosion which can affect streams.

Sources of sediment can be natural or created by human activity, such as timber harvest and road construction Roads can accelerate the rates of landsliding and the formations of debris flows. Usually this is due to the construction of fill slopes that are too steep or not compacted, increased peak flows, diversion of runoff water and culvert failure

The first timber harvest in the watershed occurred in 1958. Since that time, 6,112 acres have been harvested and almost 59 miles of road have been constructed (both private and National Forest lands).

The cutting of trees kills root systems which decreases the shear strength of soils. As a result, slopes may become oversteepened and mass failures may occur. Possible effects from timber harvest, particularly tractor logging, can cause increased surface erosion although it is dependent upon many factors, (i.e. soils, rock types, vegetation, slopes, etc.).

Numerous small perennial (Class III) streams in the watershed have had increased sediment delivery due to timber harvest and road construction. Much of the timber on private land was harvested with tractors which can increase the risk of sediment delivery to these streams. Although these small streams have been affected, it is not apparent that man's activities have had any effect on the mainstem or the main forks of Quosatana Creek. 1986 aerial photographs show that those portions of Quosatana Creek appear to be in a condition similar to that of 1940. Landsliding along the mainstem and forks of the stream seems to be at a similar rate as in 1940.

Landslide activity in the 1940's was apparent throughout the watershed. Large landslides can be observed along the mainstem and its two forks. Many of these landslides delivered sediment and large wood to streams and have affected the channel morphology. These landslides range in activity from active to inactive for hundreds of years.

Many landslides can be seen along the small perennial and intermittent streams in the watershed. It can be reasonably assumed that many additional small landslides are obscured by the canopy. These probably had only localized effects.

Natural processes predominate in the mainstem of the stream and it appears to be in a near "natural" condition. In the tributaries which have experienced timber harvest and road construction, landslide rates seem to have increased. This is due in part to increased peak flows, increased erosion and efficiency of flow, and decreased root strength in some soils.

Channel Morphology

Quosatana Creek and its forks are rich in sediment and large wood, with sufficient flow to organize the material into step pools or pools and riffles, depending on gradient. Throughout the system, natural landslides bring in sediment and large wood, and create side channels for fish during winter high flows. The substrate ranges from gravels to large boulders and bedrock, with a predominance of cobbles.

From the confluence of the forks downstream to the mouth, Quosatana Creek has average gradients from 2% to less than 1% The upper 0.7 mile is moderately confined, with pools, riffles, gravel/cobble bars, and some narrow flood plains. The middle 1.3 miles are totally confined by steep inner gorge slopes with multiple landslides, and cascades through car-sized boulders. This appears to be a reach that has been actively downcutting over a time scale of centuries. The lower 2.5 miles meander through an open, aggraded valley with pools, riffles, flood plains and terraces. Material transported from upstream landslides is deposited here, forming extensive gravel bars. The last 1000 feet at the mouth is heavily aggraded with additional material deposited by the Rogue River, which often causes the stream to flow subsurface in summer. These observations are consistent with the geologic hypothesis of a fault dropping the channel elevation in the lower mainstem, causing deposition in the lower 2.5 miles, with downcutting in the middle reach as the channel transitions toward the more slowly changing elevation of the upper reach.

Sediment contributions to the mainstem and its two forks from harvest and roads have been insignificant in relation to the large volume of natural sediment. Aerial photos from 1940 through 1986 show no apparent changes in size of sediment deposits or width of riparian openings.

The west fork of Quosatana Creek ranges from a 40% gradient in the headwaters to a 7% gradient at the confluence with the mainstem. The east fork has gradients from 50% in the headwaters to 3% at the confluence. The east fork's channel is confined within steep side slopes, but has depositional bars and side channels where landslides enter. Although the west fork is more open with a wider valley floor and gentler side slopes, it too has frequent landslides on adjacent slopes.

Tributaries have steep gradients and are confined by steep valley walls. Some are incised, showing evidence of downcutting several feet in recent decades while others are heavily aggraded. Roads have contributed to these changes in morphology through water concentration and diversion as observed in gullies below pipe outlets, through debris flows, and fill failures. Harvest and roads may have contributed additionally through increased peak flows.

Pool Depths

The Siskiyou Final Environmental Impact Statement (FEIS) LRMP states that during summer flows, pool depth of medium and small Forest streams becomes critical and is considered an important limiting factor for 1+ age class steelhead, juvenile coho, and resident trout. The FEIS LRMP has identified the need for pool depths of 3 feet minimum for low-flow survival of juvenile steelhead and coho to the smolt stage. The Hankin and Reeves Riparian Inventory uses 3 feet as the minimum pool depth in which "depth" could be considered a form of cover.

All reaches in the mainstem, and both portions of the forks surveyed, had an average residual pool depth of greater than 3 feet. Residual pool depth is the absolute minimum depth a pool would have. The following residual pool depths have been averaged for the entire reach. Many pools in the mainstem are over 10 feet in depth with excellent cover.

Figure 2. Average residual pool depths.

Reach	Average residual pool depth
1	4.9
2	3.7
3	3.6
East Fork	3.2
West Fork	3.3

Low Gradient Habitats

Low gradient habitats (side channels and glides) are important for rearing salmonids. Reach 1 has the lowest gradient of all reaches identified. Inventories show that this is the only reach with glide habitats, and side channels. Side channels are vital for overwinter cover habitat

The inventories do not show that there are side channels in other reaches. However, during a channel walk numerous "dry" side channels were identified. These typically are areas where mass soil movement has occurred. They appear to be debris flows where the stream has cut side channels through the deposited material and there is abundant large wood. These areas occur in the mainstem and the west fork and are vital winter habitat for steelhead and resident trout.

Stream Flow

Quosatana Creek and its forks have high stream power with high transport capacity. Annual precipitation in the watershed is 85 to 135 inches, primarily from rainfall. Approximately 70% of the watershed is in the rain dominated zone (under 2500 feet); 30% in the transient snow zone (2500 to 4000 feet); and none in the snowpack zone.

Timber harvest and roads may have affected streamflow in the past. Thirty seven percent of the watershed has been harvested since 1958. Approximately 7% of the watershed was harvested within the transient snow zone. Road densities average 2.4 miles per square mile (mi/sq mi) over the watershed.

Figure 3. **Characteristics of each subwatershed, or Watershed Analysis Area (WAA), described in greater detail.** Private land holdings are included in the calculations and assumed to be harvested. A map showing the subwatershed boundaries is included in the appendix.

WAA	Acres	% Harvested	% Harvested in Transient Snow	Road Miles	Road Density Mi/Sq Miles
1	2264	34*	0	8.28	2.3
2	450	3	0	0	0
3	264	57*	0	0.93	2.3
4	1739	63*	2	7.67	2.8
5	616	31*	0	0.74	0 8
6	1456	82*	5	5.77	2.5
7	820	31*	0	2.20	1.7
8	1288	38*	18	3.91	1 9
9	922	26*	25*	3.44	2 4
10	2732	18	14	10.23	2.4
11	1093	37*	15	6.48	3.8*
12	2737	28*	3	8 94	2 1

* *Levels of harvest and road density that could affect the hydrology of the watershed .*

ubwatersheds 1, 3, 4, 6, and 8, timber was harvested primarily with tractors on skid roads. These skid roads not included in road densities, but would have effects similar to constructed roads. These levels of management ould cause increased peak flows in local tributaries, but are unlikely to have had much effect on flows in the nstem Tributaries draining subwatersheds 1, 3, 4, and 6 show evidence of previously stable channels ncutting one to three feet within the past two to three decades, and are now revegetating This observation onsistent with increased peak flows following harvest activities.

Large Wood

All streams observed have ample large woody material at this time Unstable banks and inner gorge landslides continually deliver large wood to the streams. Aerial photos from 1940 to 1986 show a wide fluctuation in the amount of large wood in Quosatana Creek prior to harvest and roading, as well as in recent decades.

Harvest along streams in the western half of the watershed depleted future large wood along small tributaries. This will probably not affect the mainstem or forks of Quosatana, which receive most of their supply from adjacent slopes. However, harvest in the riparian area along 15% of the mainstem and 15% of the west fork depleted some of the future large wood to those channels.

Overhead and Instream Cover

Reach 1 (River mile 0 to 2.5): The majority of overhead and instream cover for rearing purposes is wood placed by humans. Some of these "stream structures" have failed, some are still in place, and some have trapped organic material. The functional structures that have trapped organics are providing excellent instream cover, especially for those species that have a strong association to large wood (ie. coho and cutthroat). The structures that are functional, but have not trapped organics, are providing some instream and overhead cover. These structures could be enhanced by adding more wood to them.

Reach 2 (River mile 2.5 to 3.8): Large wood in this reach is from natural sources. This reach is steep and is predominantly cascade habitat. The major forms of cover in this type of habitat are pool depth and turbulence.

Reach 3 (River mile 3.8 to 4.5): This reach has some existing large wood in the channel and good pool depths. There has been timber harvest in the riparian area in Reach 3. This has had an impact on the riparian area's ability to contribute a continuous supply of large wood to this reach.

East and West Forks: These two reaches have abundant large wood.

Temperature

Summer stream temperatures in the lower mainstem of Quosatana Creek are warm, approaching the tolerance limit for salmonids. Nearly half the length of non-fish-bearing perennial streams has been altered by harvest. Some shading has been restored by vegetation growth and some has been provided by topography. The upper west fork is still largely unshaded, but its temperature is 1.5 degrees cooler than the east fork at their confluence. Although less than 15% of the fish-bearing stream length throughout the watershed has been altered by harvest, much of the length of fish-bearing streams has a north to south orientation and broad enough channel to be exposed to the sun during midday regardless of vegetation. Stream temperatures measured with recording thermometers show an increase of one degree on the mainstem from the confluence of the forks to river mile 2.5, the beginning of the aggraded reach. A five degree increase was recorded from river mile 2.5 to the mouth of Quosatana Creek. Efforts to improve shade on tributaries may have little effect on mainstem temperature, becaus most of the summer flow and heating are in this exposed reach.

Stream temperatures have been monitored with recording thermographs in Quosatana Creek since 1991. The following chart shows 7-day average high temperatures in degrees Fahrenheit.

Figure 4. Seven day average high temperatures.

Year	at Quosatana Mouth	at Fish Blockage
1991	66.4	
1992	69.3	
1993	*	63 2
1994	67.7	
1995	69.4	64.6

*Thermograph Malfunction

Stream temperatures that range from 45 degrees Fahrenheit (F) to 59 degrees F are considered "optimum" for salmonids on the Siskiyou National Forest (Siskiyou FEIS LRMP). Temperatures that range from 59 degrees F to 69 degrees F are considered "less than optimum". It is believed that growth ceases from 69 degrees F to 75 degrees F, and above 75 degrees F mortality should occur. With that as reference, stream temperature monitoring shows conditions for Quosatana are less than optimum for salmonid fishes where monitoring has occurred

Steelhead and redside shiners both inhabit Reach 1 of Quosatana Creek. All temperature data that is available shows that during peak temperature periods in the summer redside shiners would have the competitive advantage. This competition may be compounded by the fact that anadromous salmonids are trapped in Quosatana for most of the summer.

Biotic Factors of Fish Habitat

Habitat Conditions

Some information on the habitat conditions for fish can be located in the "temperature" and "channel morphology" sections of this watershed analysis.

Migration Habitat

The Siskiyou Land and Resource Management Plan (LRMP) states that salmonid aquatic habitat will provide migration habitat that provides upstream and downstream passage for both juvenile and adult salmonids. Management prescriptions in the LRMP state that the Forest Service should improve or develop fish passage at culverts, natural falls, velocity barriers, etc. where the desirability has been determined in cooperation with Oregon Department of Fish and Wildlife (ODFW). ODFW's current policy on passage is to not introduce anadromous fish where they have not historically occurred.

There are two natural blockages that pose migration barriers to adult and juvenile anadromous salmonids. These barriers are the sub-surface flow condition of the mouth, and a waterfall at approximately river mile 2.6. These barriers prevent, or impede, the upstream migration of adult anadromous salmonids and the downstream migration of juvenile anadromous salmonids.

Mouth of Quosatana Creek

The mouth of Quosatana Creek goes subsurface by July in most years, and traps juvenile anadromous salmonids. This conditions appears to be natural, and is caused by a fault that parallels the first reach of Quosatana Creek. The 1940 aerial photos show the mouth of Quosatana to be in a similar condition.

This subsurface flow condition has negative effects for both juvenile and adult anadromous salmonids. The Rogue Basin Evaluation Program (October 1975) found that juvenile fall chinook and steelhead concentrate in the lower pools of Quosatana Creek during the summer months because of this subsurface condition and there are resulting decreased growth rates.

The subsurface flow condition also delays spawning adults from entering Quosatana Creek which has had negative effects during drought years. Lower Rogue River fall chinook are considered tributary spawners. During some of these drought years, there was not enough precipitation to bring stream flows up until December. The peak spawning time for Quosatana Creek is usually in late November (spawning survey information from 1986-1994). Consequently, the peak spawning period had already passed when stream flows allowed access to Quosatana Creek.

Waterfall

A partial anadromous blockage occurs in Reach 2. The blockage is natural and is a waterfall and log jam. In 1983 and 1987, dynamite was used to facilitate passage through this blockage. Currently this blockage still impedes, or fully blocks, the migration of salmon and possibly sea-run cutthroat, but steelhead can negotiate the barrier

Rearing Habitat

The Siskiyou National Forest Land and Resource Management Plan (Siskiyou LRMP) places emphasis on the following elements of "rearing habitat": water temperatures, pool depths, overhead and instream cover, instream woody debris and low-gradient habitats (e.g. side channels, glides and overwintering areas).

For information on "Rearing Habitat" see the temperature and channel morphology sections of this watershed analysis.

Spawning Habitat

Qualitatively it can be said that spawning habitat in the Quosatana Creek watershed is good. There are abundant gravels and cobbles throughout the system to provide suitable spawning substrates In Reach 1 where the "at-risk" fish stocks spawn, there is some embeddedness of spawning substrates due to the low gradient nature of the reach.

Spawning habitat in the upper reaches where steelhead and coastal cutthroat spawn is in good condition. There is one section in Reach 3 where timber has been harvested from the riparian area. This has depleted the continuous supply of large wood for the mainstem. The harvested area is now dominated by hardwood species (i.e. alder, big leaf maple, myrtlewood) with some small conifers present. Large wood provides cover for spawning adults, and retains and stabilizes spawning gravels.

Fish Distribution

The following table shows the known Fish Distribution in Quosatana Creek and Lobster Creek in miles. (Lobster Creek information is shown for comparison)

Figure 4. Fish Distribution.

	Quosatana	Lobster
Coho salmon	2.69	17.22
Fall Chinook salmon	2.69	17.09
Winter Steelhead	6.30	22.81
Sea-run Cutthroat	2.69	18.58
Resident Rainbow and Cutthroat	6.30	33.10
Redside shiner and sticklebacks	2.35	5.50
Sculpin	3 69	25.28

Population Status and Trends

The following is a summary of two studies on population status and trends for anadromous salmonids that inhabit the Rogue River system. Summer steelhead are not listed because they do not inhabit Quosatana Creek. Klamath Mountain Province steelhead and coho salmon are currently proposed for Federal listing on the Threatened and Endangered Species List.

Figure 5. *Population Status*

Species	Rating
Fall Chinook	High Risk of Extinction (Lower Rogue) * Depressed (Lower Rogue) **
Coho	High Risk of Extinction (Rogue Basin)* Depressed (Lower Rogue)**
Winter steelhead	no rating * Healthy (Rogue Basin) **
Coastal Cutthroat	Moderate Risk of Extinction (Coastal Tributaries) * Lack of inventory data precludes quantitative assessment. It is believed populations may already be much lower than historic levels due to habitat loss. **

*Nehlsen et al. (1991)
ODFW

** Nickelson et al. (1992)
American Fisheries Society

Population Trends

Fall Chinook

Chinook salmon in Oregon coastal streams from the Rogue River south are considered southward migrating in the marine environment. Studies by ODFW show that north-migrating chinook stocks are generally healthy, and south-migrating stocks are generally not.

Many south-migrating populations increased from very low levels in the early 1980's to very high levels in 1985-88 and have declined again to very low levels in 1991-92. For example, the run of spring and fall chinook salmon entering the Rogue River basin was about 30 thousand fish in 1983, increased to about 200 thousand fish in 1988, and declined to about 30 thousand fish in 1992.

Coho

Abundance of wild coho salmon spawners in Oregon Coastal streams declined during the period from about 1965 to 1975 and has fluctuated at low levels since that time. Little information is available on populations of coho salmon in Curry County, and they were probably never very large. However, the information that is available suggests that wild coho populations in the Rogue Basin are at 10% of historic levels.

Winter steelhead

Steelhead populations vary in abundance from year to year for many reasons. A report released in 1992 by Nickelson stated that catch of all winter steelhead (hatchery and wild) in the Rogue was below average in 9 out of the last 10 years, 4 out of the last 5, and 2 out of the last 3.

Coastal Cutthroat

There are no consistent indicators of trends in abundance for most populations of sea-run cutthroat trout However, anecdotal information, creel surveys, and fish counts at dams have raised concerns that sea-run populations in Oregon may be experiencing widespread decline.

Macroinvertebrate Populations

Macroinvertebrate sampling and collection was completed in the first reach of Quosatana Creek in 1994 Sampling and collection was completed at five sites ranging from headwater streams to the mouth of Quosatana in October, 1995. The report on the 1994 sampling will be available in early 1996

Information Needs: Class IV streams and third order subwatershed boundaries need to be identified and mapped in Geographic Information Systems (GIS) Timber harvest and road density analysis needs to be completed Additional quantifiable fish population data needs to be collected Additional fish distribution surveys in the East Fork and its tributaries need to be completed.

Management Opportunities: After analysis of the subsurface condition at the mouth of Quosatana Creek, it is not recommended to alter the channel to facilitate passage. Any effect would be temporary at best.

There is an opportunity to add woody material to the existing structures in the first reach. Monitoring of the existing structures indicates that structures which have woody complexes associated with them are providing excellent cover for coho salmon and coastal cutthroat. Woody material should be brought in for addition to existing structures rather than removing wood from the surrounding riparian area

Road treatments should take place in the watershed where needed. Quosatana Creek is a designated Key Watershed in the Northwest Forest Plan. The Record of Decision for the plan states that "the amount of existing system and nonsystem roads within Key Watersheds should be reduced through decommissioning of roads." This is important because Key Watersheds are expected to provide long term high quality habitat. These Key Watersheds will serve as refugia and are critical for maintaining and recovering habitat for at-risk stocks of anadromous salmonids as well as resident fish species.

Road stream crossings can be improved to reduce the probability of creating a debris flow if a culvert becomes plugged. Road drainage can be improved so runoff will not be concentrated. Roads not needed for management of resources or not receiving a high degree of public use could be considered for road decommisioning. Although no sites are known currently, vegetation planting and/or structure placement could be implemented to help stabilize slopes if necessary.

There is an opportunity to educate the people who recreate on the lower mainstem of Quosatana Creek about fishing regulations and protection of fish habitat. There is also an opportunity to enforce fishing regulations at this location. More restrictive measures, such as blocking access or prohibiting camping, could be considered if there are continued problems in this area.

What are the important processes in Riparian Reserves for the Quosatana Creek watershed?

The Quosatana Creek watershed can be stratified into the east side of the watershed (primarily Dothan formation and Colebrooke schist geology) and the west side (primarily Ultramafic melange and Colebrooke schist geology). The stream ecosystem can be stratified by stream order, and streams can be addressed as intermittent, perennial, and fish-bearing.

Stream Ecosystems

One important process that all Riparian Reserves share is "energy flow". There are two sources of energy for biological organisms in stream ecosystems: **autochthonous sources** (photosynthesis by aquatic plants in the stream itself), and **allochthonous sources** (decomposition of organic matter imported from outside the stream). The mix of energy sources has a major influence on the structure and function of stream ecosystems (Murphy and Meehan 1991).

Autochthonous sources of energy are affected by stream size, gradient, and exposure to sunlight. Allochthonous sources of energy contribute organic matter to the stream by four main pathways: litterfall from streamside vegetation; groundwater seepage; soil erosion; and fluvial transport from upstream Organic matter from these sources differs in when and how it enters the stream, how it decays, and where it predominates (Murphy and Meehan 1991)

Nutritional Quality of Allochthonous Material

Most animals require food with a Carbon to Nitrogen ratio (C:N) less than 17:1 (Russell-Hunter 1970). Almost all forms of allochthonous organic matter have higher C:N ratios, so they require microbial processing to enhance food quality. The quality of various forms of organic matter varies widely, as measured by the C:N ratio. At the low end of the spectrum are woody debris and conifer needles; at the high end are periphyton, macrophytes, and fast-decaying deciduous leaves (Murphy and Meehan 1991). When prescribing silvicultural activities in Riparian Reserves the nutritional quality, as well as physical factors, must be considered. See Figure 8 in the Fisheries Appendix for C:N ratios of specific types of organic matter.

Riparian Reserves

Intermittent Streams

An intermittent channel is defined in the Record of Decision (ROD) as "any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition" (ROD, B-14). This definition includes both "ephemeral" channels and "intermittent" channels. These two types of channels are distinguished by flow: ephemeral channels carry only stormflow, while intermittent channels are supplied by groundwater during part of the year (Reid and Ziemer 1994).

The biological importance can be different for ephemeral and intermittent channels and is dependent primarily on the presence of water and distinctive riparian vegetation. The most ephemeral channels may contain water for only a few days of the year and may not support riparian vegetation, so they are unlikely to have much on-site biological significance. Their major biological role is likely to be their influence on downstream channels through their supply of sediment, water, and organic materials, and management of their physical role may be adequate to preserve their biological function. These "most ephemeral channels" are not likely to require special biological analysis unless they are used as migration corridors, there is presence of unique species, or other biological considerations (Reid and Ziemer 1994).

In the Quosatana Creek watershed, there are many ephemeral channels. During field reviews, ephemeral channels were observed on the east side of the watershed, on Wildhorse Ridge, which is predominately Colebrook schist. These channels are important for the organic material they transport downstream (energy flow). In some cases it is difficult to locate a "definable channel" and "annual deposition or scour". If future projects are planned in these areas, it is important to locate the spot where a "swale" turns into an "ephemeral channel".

Moving downhill off Wildhorse Ridge, these ephemeral channels become more distinct as they enter the Dothan formation. The channels take on a greater size and annual scour and deposition is evident. These channels are more "intermittent" than "ephemeral", and throughout the summer small reaches of flowing water can be located. This presence of water increases the biological significance of these channels.

Intermittent channels in the Quosatana Creek watershed are important to fish resources as seasonal sources of water, sediment, allochthonous material, and large wood. Intermittent channels can form a high proportion of the entire channel system in a watershed and they contribute a lot of nutrients to downstream reaches (Reid and Ziemer 1994). It is therefore important to maintain their allochthonous material input. These small streams are the most easily influenced by forest management activities and any manipulation of the canopy or streambank vegetation will influence the streams energy supply (Chamberlain et al. 1991).

Intermittent channels can also be important to amphibians. Most amphibians require water for reproduction, and some need open water throughout the year. These streams may be particularly important as nursery areas for amphibians because these sites support fewer predators than perennial channels (Reid and Ziemer 1994)

Riparian areas have a moist microclimate that is important to a variety of amphibians. For example, Pacific giant salamanders utilize headwater streams to lay their eggs (Stebbins 1966), and talus habitat in these moist areas can be important for Del Norte salamanders.

Intermittent channels on the west side of the Quosatana Creek watershed (Ultramafic melange) have been found to be important "refuge" areas for red-legged frogs. During field reviews, red-legged frogs were located in intermittent channels that flowed through serpentine meadows and in perennial channels on the west side of the watershed.

Intermittent channels and associated riparian zones provide an important source of food and water for hillslope ecosystems. They can function as travel corridors and they provide microclimatic refuge for hillslope animals during times of thermal stress (Reid and Ziemer 1994). The distinctive vegetation and higher moisture content of these sites can modify fire behavior, so their distribution can affect the patchiness of large burns.

Perennial and Fish Bearing Streams

Generally, perennial streams would be considered more significant biologically than intermittent streams. The ROD stated that "although Riparian Reserve boundaries may be adjusted on permanently-flowing streams, the prescribed widths are considered necessary for attaining Aquatic Conservation Strategy objectives" (ROD, B-13). The widths prescribed in the ROD were deemed necessary to maintain riparian processes.

The important riparian processes for these streams include root strength and sediment delivery, large wood delivery to streams and riparian areas, shade and temperature, riparian microclimate, and wildlife habitat. Additional information concerning these processes can be found in the Fisheries Appendix (Page 53). See the Physical Factors of Fish Habitat in this report for information concerning these processes as they relate to the Quosatana watershed. The importance of fish-bearing streams is discussed in the Biotic Factors of Fish Habitat portion of this report. The importance of wildlife habitat is discussed in the Terrestrial Ecosystem section. Specifically, the key question concerning late-successional habitat describes the importance of habitat connections. The key question on the relative abundance and distribution of species of concern discusses dispersal habitat.

Information Needs: Site specific surveys of streams should be completed prior to any activities that could potentially affect Riparian Reserves (ROD, B-21, 23).

Management opportunities: There may be resource management projects where it would be appropriate to modify Riparian Reserve interim widths. Aquatic Conservation Strategy objectives and wildlife dispersal objectives (ROD, B-13, B-16) must be met. Specific Riparian Reserve boundaries would be delineated during planning for site-specific projects based on the analysis of the critical hillslope, riparian, and channel processes. Riparian reserve boundaries for permanently-flowing streams should approximate the boundaries prescribed in ROD standard and guidelines. Riparian reserve boundaries for intermittent streams may vary from interim standards due to the high variability of hydrologic, geomorphic and ecologic processes of these streams (ROD, B-13). Management activities where adjustment of Riparian Reserve interim widths could be considered include but are not limited to timber sales, road construction and restoration, grazing, special forest products, recreation projects, and fish and wildlife enhancement projects.

TERRESTRIAL ECOSYSTEM

The following wildlife and vegetation issues focus the analysis of the terrestrial ecosystem of the Quosatana watershed. Following the issues, the characterizations and key questions were developed to describe the terrestrial ecosystem.

Wildlife and Vegetation Issues

Timber harvest has removed and fragmented a large portion of the late-successional habitat and interior forest habitat in the Quosatana watershed. This type of habitat is important to late-successional dependent species including the threatened northern spotted owl and marbled murrelet The Quosatana watershed is within the limited range of the marbled murrelet and occupied behavior has been observed in the watershed Murrelets have extremely limited occurrence beyond Wildhorse Ridge which is the eastern boundary of the watershed.

Meadows are important unique habitat in the Quosatana watershed. With the suppression of fire, these meadows are being encroached by hardwoods and conifers. It is important to maintain these meadows for the plant and wildlife species, including sensitive species, that depend on this habitat type for survival.

Non-native species such as noxious weeds, Port-Orford-cedar root disease and white pine blister rust are present and threaten to spread in the Quosatana watershed. Control measures for these species have been undertaken in recent years and should continue.

Vegetative Characterization

Marine climate and soils affect vegetation throughout the watershed. Average annual precipitation varies from 85 to 135 inches, with most occurring between October and May. Coastal fog during the summer months often extends inland to elevations near 1,500 feet, blanketing the lower one-third of the watershed.

Colebrooke schist, covering the largest part of the watershed, and the Dothan formation, located in the eastern portion, support stands dominated by Douglas-fir and tanoak. Alders occur instead of tanoak in riparian areas and on lower slopes. Western hemlock and/or Port-Orford-cedar are also found in some riparian sites on these soils. Incense cedar, madrone, and canyon live oak can be prevalent in scattered drier locations upslope

Ultramafic-derived soils support sparse, slow-growing Jeffrey pine, western white pine, and knobcone pine on drier sites and Port-Orford-cedar on wet sites. These soils are found in the western portion of the watershed, particularly in the Signal Buttes area.

The range of herbaceous species present includes those characteristic of areas with marine influence, such as evergreen huckleberry, and those more characteristic of drier inland areas, such as dwarf Oregon grape. *Bensoniella oregana, Carex gigas, Poa piperi, Salix delnortensis, Arctostaphylos hispidula*, and *Triteleia hendersonii var. leachiae* are sensitive plant species that have been found in the watershed.

About half of the Douglas-fir/tanoak/alder stands in the watershed are in plantations from 5 to 40 years old. Alders have dominated some plantations on lower slopes, especially on private and National Forest land in the central/west portion. Effects of fire history on vegetative composition are varied. Ridgetop Douglas-fir stands along the eastern and northwest rim likely originated from stand replacement fires and were maintained by frequent moderate-intensity underburning that inhibits tanoak

Dry meadows, grassy areas and brush fields are present on the east side of Quosatana Creek. Meadows such as the Fritsche Meadow complex and Wildhorse Prairie have likely been maintained by fires from Native Americans early settlers, and lightning. Brushfields scattered east of Quosatana Creek were likely created by fires of high intensity The vast serpentine sites west of Quosatana Creek show evidence of lower intensity fires due to lower fuel buildup

Wildlife Habitat Characterization

Fifty-two percent of the Quosatana watershed is designated Late-Successional Reserve (LSR). This area makes up the southern portion of the larger Northwest Coast LSR. The eastern boundary of the Northwest Coast LSR is the known inland extent for the range of the marbled murrelet.

The late-successional habitat in the watershed provides important nesting habitat for the threatened northern spotted owl and marbled murrelet. About 54% of the late-successional habitat in the watershed has been harvested since 1958. The amount of late-successional habitat that is interior habitat has been reduced from the historic level (prior to timber harvest) of approximately 66% to the existing level of 13%.

Pioneer successional habitat (grass/forb/low shrub) in the watershed is found in recent (less than 10 years old) clearcut areas, meadows, open serpentine areas and brushfield areas. About 7% of the watershed is currently in the grass/forb/low shrub condition. The existing clearcut areas that are functioning as grass/forb/low shrub habitat will grow out of this condition within the next five years. The meadow habitat is being encroached by trees and impacted by trespass horses.

The remainder of the watershed is in early to mid-successional habitat which typically is smaller diameter trees in a closed canopy condition. Approximately 46% of the watershed is in this condition.

The special and unique areas in the watershed include meadows (509 acres), lakes and ponds (13 acres), rock bluffs (70 acres), wildlife areas (8 acres) and geologic interest areas. Lakes and ponds, rock bluffs, and wildlife areas in the watershed are maintaining their current sizes. Meadows are being encroached by Douglas-fir trees.

The following threatened species have been observed in the watershed: bald eagle, northern spotted owl and marbled murrelet. The following sensitive species have been documented to occur in the watershed: Pacific big-eared bat, red-legged frog, California mountain kingsnake and Del Norte salamander. Habitat for the following sensitive species occurs in the watershed: northwestern pond turtle, white-footed vole and wolverine.

What is the historic and existing late-successional habitat in the watershed?

Historic levels (pre-1850 to 1950) of late-successional forest have fluctuated over time due to climatic changes and human influence (Atzet, et.al. 1993). The Regional Ecosystem Approximation Report (USDA, 1993) estimated historic levels of late-successional habitat between 45 and 75 percent for the Lower Rogue Basin.

It is estimated 72 percent of the Quosatana watershed provided late-successional habitat in the 1950s, prior to any timber harvest. Of this, 66 percent was interior forest habitat and was mostly contiguous. Blocks of interior late-successional forest habitat ranged up to 8,777 acres.

About 39 percent of the Quosatana watershed is presently in late-successional forest. Of this, 13 percent is interior forest habitat. However, the interior forest habitat is not contiguous. Blocks of interior late-successional habitat range up to 947 acres. These levels are currently near the low end of the natural range of variability and is a result of past timber harvest. The larger contiguous stands of late-successional forest remaining in the watershed are ecologically important.

Figure 9: Distribution of interior late-successional forest blocks within the Quosatana watershed.

	Pre-harvest (1950's)		Existing	
Block Size in Acres	Number of Blocks	Acres	Number of Blocks	Acres
0-50	5	52	25	257
51-100	2	141	2	141
101-300	0	0	1	183
301-500	0	0	0	0
501-700	0	0	0	0
701-900	0	0	1	868
> 900	1	8777	1	947

Connection between blocks of late-successional forest within and outside the watershed is critical to ecosystem health and stability. Many authors have discussed the significance of corridors which maintain habitat connectivity across the landscape and facilitate wildlife and plant movement from wilderness or between forest patches across managed landscapes (For a sample: Harris 1984; Noss and Harris 1986; Simberloff and Cox 1987; Noss 1987; Lehmkuhl and Ruggiero, in press). Late-successional forest habitat connections at least 1,000 feet wide are necessary to retain the middle 200 feet in a condition not affected by the deleterious "edge effect." Microclimate effects from edge extend "two tree lengths" or approximately 400 feet into the forest interior, which is a guideline for the Pacific Northwest (Harris 1984; Franklin and Forman 1987). The preliminary results of current research (Spies et al. 1990) generally support this approximate distance.

Seven late-successional habitat connections have been identified in the Quosatana watershed. These areas connect with late-successional habitat in the Rogue River corridor, the Lawson basin, the Hunter Creek basin and the Pistol River basin. Habitat connection with the Kalmiopsis Wilderness is accomplished most directly with the Lawson Basin connection, and secondarily with Rogue River and Pistol River Basin connections.

Habitat connections are situated in riparian habitat, as well as along mid-slopes and ridges. Existing habitat connections in the Quosatana watershed contain stands in several successional stages. It is not known how significant a barrier early seral stands present to forest interior species, particularly smaller mammals and amphibians.

The National Forest Management Act (36 CFR 219.19) requires the maintenance of viable populations well distributed throughout their current geographic range. Designation of Late-Successional Reserves (ROD, 1994) has been employed to accomplish this distribution. 52% of the watershed has been designated Late-Successional Reserve (LSR). Another 12% of the watershed will be managed towards a late-successional habitat condition through other land allocations.

Information Needs: Determine which stands need to be pre-commercially and commercially thinned to improve late-successional habitat.

Management Opportunities: Potential late-successional habitat can be improved by thinning managed and natural stands of potential habitat. About 850 acres of precommercial thinning and release of managed stands in LSR can be done in the next 5 to 10 years. About 140 of these acres could fill gaps in the core habitat area in the center of the watershed. The following managed stands are priority for pre-commercial thinning and/or release: 3015-527 (including riparian area); 3015-560; 3019-430; 3015-264/265; 3015-354; 3019-099; 3019-042; 3019-065,078,079,080.

The highest priority for commercial thinning to improve late-successional habitat are those stands that are mid-seral habitat within stands of existing large late-successional habitat blocks and mid-seral stands in habitat connections. The next priority are those stands that are mid-seral habitat in the LSR that will contribute to the landscape pattern of future late-successional forest habitat. There are about 125 acres which currently meet the above criteria. Additional surveys need to be completed to determine if other stands could benefit from commercial thinning in the future.

What are the special and unique habitats in the watershed and how are they changing?

During the past ten years a number of important but relatively small Special Wildlife Sites on the Forest have been identified as unique wildlife habitats and small botanical sites (Siskiyou LMRP, page IV-113). A total of 600 acres has been designated in the Quosatana watershed. This includes 12 meadows totalling 508 acres, 11 rock sites (cliffs, caves, talus) totalling 70 acres, 3 lakes and ponds totalling 14 acres, and 2 small wildlife areas totalling 8 acres. These sites constitute important components of overall wildlife habitat diversity and botanical values within the watershed.

Open meadow areas are being reduced in size by tree encroachment. Open serpentine areas are also being encroached by trees. Historically, fires helped in maintaining these meadow and serpentine areas in early seral habitat. In the last few decades with the suppression of fires, the grasses and brush have become overgrown with tree species. The meadows and serpentine areas in the Quosatana watershed are also being impacted by trespass horses. Lakes and ponds and rock sites are maintaining their current size.

1940 aerial photos are used as a reference condition for these special and unique habitats. The amount of encroachment to meadows and serpentine areas can be determined using these photos. Siskiyou LRMP direction provides for restoration work which returns these areas to a size which approximates 1940 conditions.

Information Needs: Inventories of the meadows and serpentine areas need to be completed to determine species composition, amount of encroachment, the best methods to remove the encroachment, and the best methods to improve or restore native grasses and other species. The Signal Point serpentine areas need to be surveyed to determine if they meet Management Area 9 (Special Wildlife Site) criteria.

Management Opportunities: Trespass horses should be removed from these areas. Trees encroaching on meadows and serpentine areas should be cut, cut and removed, or girdled. Prescribed fire should be used with or without the above treatment to return these areas to an open and early seral habitat condition similar to what existed in 1940. Priority locations for restoration work include Woodruff Meadow, Fritsche and Shea Meadows, and other open meadows and serpentine areas throughout the watershed.

What is the relative abundance and distribution of the species of concern that are important in the watershed (e.g., threatened or endangered species, special status species, species emphasized in other plans)? What is the distribution and character of their habitats?

Proposed endangered, threatened and sensitive (PETS) species

Bald eagle, northern spotted owl and marbled murrelet, which are listed threatened species, have all been observed in the watershed. Bald eagles have been sighted around Quosatana Creek at its confluence with the Rogue River, as well as in the upper reaches of Quosatana Creek. The Quosatana watershed is within foraging range of an active eagle nest. Marbled murrelets are have been detected in approximately nine stands of late-successional Douglas-fir forests in the watershed. These habitats provide the structural characteristics required by the murrelets for cover, roosting, nest sites, and protection from weather and predation. Behaviors observed infer nesting in the area.

The Quosatana Creek drainage contains a portion of five northern spotted owl median home range territories (1.3-mile radius around a nest or activity center; USDI Fish and Wildlife Service, April 10, 1991). Of the five territories, one nest is within the Quosatana drainage, and the remaining one nest and 3 activity centers are within 1.3 miles of the Quosatana drainage. Northern spotted owls are strongly associated with late-successsional Douglas-fir forests.

The Quosatana watershed meets the 50-11-40 rule regarding northern spotted owl dispersal habitat (Quosatana/Bradford Draft Environmental Impact Statement (DEIS, page III-23) All habitat in the late-successional seral stage was assumed to be spotted owl habitat. Thus, 39 percent (6,320 acres) of the Quosatana watershed was classified as spotted owl habitat. Eighty-four percent (5,320 acres) of this habitat is in management areas with no programmed timber harvest.

Figure 10.

Management Area	Mature Seral Stage Acres
05 (Unique Interest)	217
07 (Supplemental Resource)	392
08 (LSR)	4,302
09 (Special Wildlife)	48
11 (Class II streams)	134
11 (Class III & IV streams)	247
14 (Matrix)	980

The ROD designated 64 percent of the watershed to be managed towards a late-successional habitat condition (Management Areas 05, 07, 08, 09 and 11). The remainder of the watershed is matrix (20 percent) or private ownership (16 percent).

Sensitive species of Pacific big-eared bat, red-legged frog, California mountain kingsnake and Del Norte salamander have been documented to occur in the watershed. Habitat for sensitive species of northwestern pond turtle, white-footed vole and wolverine also occurs in the area.

One cave in the watershed contains a colony of Pacific western big-eared bats. This is the only known colony on the Siskiyou National Forest. There have been 16 sightings of red-legged frogs in this watershed. There have only been 24 sightings on the Ranger District and 46 on the Forest. Red-legged frogs use ponds, creeks, and seasonally standing water for feeding, breeding and rearing habitat. Del Norte salamanders have been found in the rock talus in coniferous forests in the Quosatana watershed at 11 locations.

Several species of sensitive plants have been documented in the watershed including *Bensoniella oregana, Carex gigas, Poa piperi, Salix delnortensis, Arctostaphylos hispidula*, and *Triteleia hendersonii var. leachiae*.

Indicator Species

Bald Eagle and Osprey - Bald eagle occurrence has been described above. Osprey are active and nest near the mouth of Quosatana Creek just outside of the Quosatana watershed. Osprey represent other species, such as river otter, which use the Forest's riverine habitat. The Riparian Reserve Management areas within the watershed, along with the Aquatic Conservation Strategy (ROD, 1994) should improve the habitat quality for these species.

Northern Spotted Owl - As an indicator species, the Northern spotted owl represents over 150 other wildlife species which use late-successional forest habitat for all or part of their life cycles (Guenther and Kucera, 1978; Brown, 1985). Spotted owls are strongly associated with dense mature and late-successional Douglas-fir forests. These habitats provide the structural characteristics required by the owls for food, cover, nest sites, and protection from weather and predation.

Pileated Woodpecker and Pine Marten - Pileated woodpeckers and pine marten represent the composite needs of over 160 wildlife species which utilize mature forest (Guenther and Kucera 1978, Brown 1985). Designation of Late-Successional Reserves will provide long-term habitat for these species and the species they represent.

Woodpeckers - The composite snag needs of woodpeckers represent all wildlife species that use cavities for nesting or denning (Siskiyou LRMP FEIS, pages III-104, III-105). On the Forest, and most likely in Quosatana, there are over 75 species which use snag habitat (Guenther and Kucera 1978, Brown 1985). Siskiyou Forest Standard and Guideline 4-13a states that habitat capability of woodpeckers should be continually maintained in areas managed for timber production at not less than 60 percent of potential population levels. Five trees per acre (green trees and snags) need to be retained after harvest in order to provide for 60 percent woodpecker habitat capability over time. Up to 50% of these trees may be existing snags (recently dead, less than five years). Currently there are 3.0 snags per acre in the Quosatana watershed which meets 78% habitat capability. This meets Siskiyou LRMP requirements.

Elk and Deer - Elk and deer use all successional stages to meet their habitat needs for cover, forage, and reproduction. Natural or created openings provide the majority of the feeding habitat, which is assumed to be the most restrictive habitat component in this area (Siskiyou LRMP FEIS, pages III-106, III-107). Elk and deer represent more than 180 wildlife species that need young successional stages to meet all or some of their requirements (Guenther and Kucera 1978, Brown 1985).

Three elk herds utilize portions of the Quosatana watershed. At the headwaters of Kimball Creek, a small herd of six to eight animals occupies habitat on both National Forest and private lands on both sides of the Kimball Hill Road. Another herd of six to eight animals resides in the area between Frog Lake and Quosatana Butte. On the east side of the Quosatana watershed, approximately eight elk utilize habitat in the vicinity of Wildhorse Prairie and Quosatana Creek. Forage habitat consists of serpentine meadows and timber harvest areas (Middlebrook, 1992).

The presence of naturally occurring serpentine meadows within the Quosatana watershed provide favorable forage sites. However, two bands of trespass horses have displaced elk in the Kimball Creek and Signal Buttes areas from many favorable forage sites. These horses should be removed to reduce and/or eliminate competition for forage vegetation.

Elk habitat was evaluated using a model developed for application in Western Oregon. The model was based on the interactions of four variables: size and spacing of forage and cover, road density, cover quality, and forage quality (Wisdom et. al., 1986).

Figure 11. Acres of each type of habitat estimated for the Quosatana watershed.

Habitat Type	Acres	% of Watershed
Optimal Cover	7,384	39
Thermal Cover	3,617	19
Hiding Cover	3,748	35
Forage	1,313	07

Optimal cover modifies ambient climate, allows escape from human harassment, and provides forage. Thermal cover functions similarly to optimal cover, but does not provide forage. Hiding cover allows elk to escape human disturbances. The quality of forage is as important as the amount of forage available. There are 58 miles of roads in the Quosatana watershed. Motor vehicle access allows human disturbance which reduces elk use of habitat adjacent to roads

The elk habitat effectiveness model gave an overall score of 0.49 on a scale of 0 to 1.00, with 1.00 being optimal. A score of 0.49 indicates that the habitat present in the Quosatana area is capable of supporting a viable population of elk. The four component values were: sizing and spacing of forage and cover areas, 0.79; density of roads open to motorized vehicles, 0.45; cover quality, 0.64; and forage quality, 0.26. The lowest value was forage quality which makes it the most restrictive habitat component.

Wildhorse Ridge area in the Quosatana and Lawson watersheds has been designated as a restocking release site for Roosevelt elk by the Oregon Department of Fish and Wildlife. The amount and quality of habitat was surveyed in August 1994 by John Toman (ODFW) and Mike Miller (USFS) to determine an estimated amount of elk that could be stocked and maintained in the area. It was estimated that 40 to 70 elk could be released to revitalize the existing populations. Historically, the two watersheds maintained larger elk herds than those that currently exist.

Deer are found throughout the watershed, though a current estimate of their population is unavailable. Deer use newly harvested areas and meadows for foraging. They also feed on acorns from oak trees throughout the area and use riparian areas during fawning season and summer. The majority of meadows below 3,000 feet in elevation are heavily used by deer and elk during the wet seasons when conditions are best for grass and forb growth.

Information Needs: Pacific Meridian Research (PMR) vegetation data needs to be ground verified to ensure validity. The correlation between certain vegetation types, seral stages and wildlife use of those habitats need to be verified. This can be completed by continuing to do surveys for presence of indicator and PETS species.

Management Opportunities: Habitat conditions for spotted owls can be improved by developing potential habitat stands. Priority areas include those that will contribute to the development of large blocks of interior late-successional habitat. Known sensitive plant sites need to protected and maintained. Disturbance to sensitive species sites and/or individuals should be minimized. Murrelet habitat (large limbs) within stands can be developed. Spotted owl structure within stands can be developed. Forage seeding could be used where timber harvest occurs to enhance the forage value for elk. Roads could be closed to vehicular travel to improve the road density value for elk. Trespass horses should be removed. Encroaching trees in open meadows and serpentine areas can be cut and removed or girdled. These habitat types can be burned to remove encroachment and benefit native species.

What are the locations and risks of spread of noxious weeds?

Seven noxious weed species currently inhabit the watershed. Noxious weed populations have likely increased as the road mileage in the watershed increased. Most populations are currently restricted to disturbed areas including roadsides, disturbed woodlands, landing sites, and streambeds. Gorse, meadow knapweed, and scotch broom are beginning to appear in Quosatana and their aggressive nature threatens to destroy native plant communities. Gorse and broom may become safety hazards. Canada thistle, bull thistle, and tansy ragwort are established in the watershed and pose a lesser threat because they have already long occupied many of the watershed's disturbed sites. Star thistle has not yet found in the watershed but has been found on areas bordering the watershed making it a potential problem.

Figure 12. The following list provides more detailed information on which species of weeds inhabit which roads.

Roads	Weed Species
3313	three gorse sites, scotch broom
Junction of 3313 and 3313 100	scotch broom and meadow knapweed
3313.020	landing colonized by scotch broom
3313.100	several roadside individuals and small colonies of broom and gorse
3313.104	scotch broom
3313.150	small colony Scotch broom on landing
3313 151	gorse site
3318	new gorse sites reported in vicinity
3318.250	scotch broom

__Management Opportunities:__ Treatment of infested areas is needed to reduce, control and/or eliminate the further spread of these plants in the watershed. Treatment opportunities include cutting, pulling or burning noxious weeds, closing roads, cleaning heavy construction machinery before and after work at construction sites, using only "clean" fill material, and using only certified weed-free hay. Reduction of soil disturbance (i.e. ripping roads) in weed infested areas will help control populations. Control methods are limited for thistles and tansy because of their wide distribution. Biological control of tansy ragwort will help control that population.

What risk does each road in the watershed present in spreading *Phytophthora lateralis*?

Port-Orford-cedar occurs mostly in riparian areas and wet serpentine sites in the watershed. *Phytophthora lateralis* is a root disease spread by water-borne spores which is deadly to Port-Orford-cedar. The disease is extensive and most mainstems are infested. Since the disease was introduced 20 to 30 years ago, spread has slowed, but there is still a risk of spread to areas that have not been previously infected.

See Figure 13 in the Appendix for a ranking of the roads in the Quosatana Watershed in terms of high, moderate and low risk of spread of *Phytophthora lateralis*. The criteria for the ranking is also listed. Roads 3318.270, 3313.102/103, 3680 and 1703 four-wheel-drive spurs received a high risk of spread ranking.

Roads 3313.110, 3313.116/118, 3313.130 and 3318.057, 3318.270 currently have seasonal or year-round closures in place. Sanitation of small Port-Orford-cedar (less than 8" diameter) has been completed within 25 to 50 feet of Roads 3313, 3313.100, 3313.150, 3318, and 3318.300.

__Information Needs:__ Appropriate sites and levels of stocking need to be determined for riparian planting of disease-resistant Port-Orford-cedar and other species.

__Management Opportunities:__ The following prevention techniques can be used to minimize the spread of *Phytophthora lateralis*: cutting Port-Orford-cedar from the edges of the roads; closure of roads to motorized vehicles; cleaning equipment before any operations; restrict high risk uses to dry season only; use uninfested water in firefighting and other activities; place a lift of rock on infested road sites where appropriate; plant disease-resistant trees in low-risk riparian sites and upland sites; continue public education regarding the importance of road closures; and, enforcement of closures

The following specific measures need to be completed: tank trap barriers need to be improved on roads 3313.100, .130, and placed on road 3318.270; and sanitation needs to be completed on roads 33, 3313.117, 3680.260, and 3318.308/309.

What risk does white pine blister rust present in the watershed?

White pine blister rust occurs in lower quantities than the adjacent Lawson and Pistol watersheds. However, high stand density in sugar pine sites is increasing the risk of stress and introduction of bark beetles and blister rust. The disease is most extensive at sites that collect high amounts of summer fog. In Quosatana, these areas include upslope and ridgetop areas, serpentine white pine sites with high stand density, and the westside of Wildhorse Ridge.

Information Needs: Individual site surveys need to be completed prior to determining site specific prevention techniques.

Management Opportunities: Possible prevention techniques include reducing stand density through thinning and/or burning, and planting disease-resistant trees.

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

There is evidence of both prehistoric and historic fires in the watershed that were caused by lightning or were human-caused. These fires in combination with the soils of the watershed have had a significant influence on the vegetative diversity and wildlife distribution of the area for thousands of years.

The general topography and vegetation of the watershed is similar to the Lawson watershed to the east. One primary distinction between the two watersheds is the climate. The Quosatana watershed receives a much greater influence of marine air than do areas to the east. This is due to its proximity to the ocean and a high ridge (Wildhorse Ridge) preventing the moister marine air from moving to east. Besides this fact, the watershed receives similar types of climatological events that influence fire occurrence and behavior, such as lightning and east wind events. It appears that stand replacement fire events are less frequent in the Quosatana watershed in comparison to the Lawson watershed.

During pre-historic times and up until the 1930's and 1940's, fire was allowed to burn in an unchecked manner. Weather and natural terrain features were the only things that affected the spread of wildfire. Native Americans used fire during pre-historic times to enhance forage for game which they hunted and to stimulate the growth of plant species used both for food and to make baskets. It is likely that open meadows were maintained in this fashion. It is also likely that tanoak stands, whether pure or intermixed with large conifers, also received similar treatments.

Recorded fire history shows a number of human-caused fires from 1910 to 1917. Eight fires burned approximately 4350 acres in the Quosatana watershed. One of these fires burned along the south face of the Rogue River, burning most of the Bill Moore Creek watershed, all of the Bradford Creek watershed and approximately 3300 acres of the Quosatana watershed. This was the largest recorded fire event in the area. Two other fires burned approximately 575 acres in the late 1920's and 1930's. Since that time both lightning and human-caused fires have been suppressed at very small sizes. Records indicate that there have been only four lightning fires since about 1910. A variety of burn intensities resulted from these fires, ranging from low intensity ground fires which killed very few large trees to high intensity fires which constituted a stand replacement event.

Interpretation of 1940 aerial photographs indicate that approximately 41% of the watershed has been burned by stand replacement events. These fires probably occurred between 80 to 200 years ago with some of these areas being burned again by fires occurring in the historical period.

This fire history affected the seral stages of the watershed before timber harvest began in the 1950's. Ridgetop Douglas-fir stands along the eastern and northwest rim likely originated from these stand replacement fires and and were maintained by frequent moderate intensity underburning that inhibited tanoak. The scattered brushfields east of Quosatana Creek were likely created by fires of high intensity. The serpentine sites west of Quosatana Creek show evidence of lower intensity fires that maintained openings.

The greatest number of recent recorded fire events was with the use of prescribed fire for slash disposal after timber harvest. Approximately 19% (3100 acres) of the Quosatana watershed has been burned for this purpose.

Fire cycles west of the Cascade mountains are estimated to be considerably longer than those east of the Cascades, particularly northeastern Oregon. The effects that fire exclusion has had on current forest conditions in northeastern Oregon can be used as an example of what may occur in southwestern Oregon, but on a much longer timescale.

With the exception of the prescribed fire, the majority of stands in the watershed have evolved for the last 50 years without fire. Areas that were historically and pre-historically burned for human needs are being encroached by surrounding vegetation. Unique native plant species, dependent on the return of fire, are receiving competition from non-native and sometimes noxious vegetation.

During this fire suppression period, fuels on the forest floor have accumulated. Continued suppression may cause an "unnatural" build up of fuels, resulting in a greater proportion of high-intensity fires when an area finally burns. The natural cycle of fire in the watershed is over 300 years. As a result, the watershed is not yet out of balance with that cycle. However, the stage is being set for extreme fire behavior and stand replacement events if fire continues to be excluded from the watershed.

The watershed is comprised of land allocations where pre-planned suppression strategies and acre objectives are set to control fires at 30 acres or less 90% of the time. In addition, about 16% of the watershed is in private land holdings. Private land owners generally want fires suppressed at the smallest size possible. Private land holdings are protected by Coos Forest Protective Association. Under a reciprocal mutual aid agreement, Forest Service firefighting resources share in protecting these lands utilizing "the closest forces" concept.

Fifty-two percent of the watershed is allocated Late-Successional Reserve (LSR). The standards and guidelines for this allocation emphasize the prevention of loss due to large-scale fires particularly stand replacement disturbances. It is possible that if a fire occurs in the next decade, and weather and fuel conditions are such that the fire burns with a lower intensity, the forest could benefit from the event and the values associated with LSR will remain intact. However, if such fires are suppressed at early stages, these types of benefits would be precluded. If several decades of fuel build-up on the forest floor is allowed to occur and a major wildfire event occurs under extreme weather conditions, then a stand replacement disturbance is likely to be the result.

Information Needs: Determine if fire exclusion has contributed to the degradation of certain plant species and unique habitats. Identify areas and habitats where the return of fire would provide a benefit, and what intensities would provide that benefit

Management Opportunities: Prescribed fire can be used to achieve the resource objectives of special and unique habitats, Late-Successional Reserve and other land allocations. Fire management plans will need to be completed to determine conditions where prescribed fire will be used. Private land holdings will need to be accounted for in these management plans.

What areas are available for land exchange that would benefit unique habitats in the watershed?

The current landowner of Fritsche Cabin Meadows has contacted the Forest Service and is potentially interested in negotiating a land exchange for this property. This site is 320 acres and is located on the central eastern boundary between Quosatana Creek and Bradford Creek. The Fritsche Cabin Meadows as well as the other meadows in the Quosatana watershed provide excellent forage for big game and habitat for native grasses and sensitive plant and animal species. These meadows probably originated during a dry period 3500 to 1500 years ago and have been maintained by fires since. Currently the meadow is are being encroached by trees and being invaded by non-native grasses. Private ownership may not emphasize native diversity objectives and it would be desirable to ensure this location was maintained as unique meadow habitat.

No other meadows and unique habitats currently in private ownership have been identified for land exchange, however it would be desirable to obtain these areas if they would become available and funding allowed. This would increase the native landscape diversity of watershed. An alternative is to encourage private owners to manage for native diversity.

Another priority for land exchange is those lands have potential Late-Successional Reserve characteristics. This is especially important where there is intermingled private and National Forest ownership and there is potential to improve the distribution and quality of the Late-Successional Reserve

SOCIAL ASPECTS

The following characterization and key questions were developed to describe the past, present and potential future human uses of the Quosatana Creek watershed.

Cultural Characterization

The watershed is characterized as a dynamic landscape whose main influences are Quosatana Creek and the Rogue River. The interactions between natural and human forces have shaped the human use of the area in the past. Flat, open land, preferred for human use, is limited within the watershed. Prehistorically, the stream and river corridors were used as resource procurement areas dealing with shell and anadromous fishes. Upland areas were also seasonally used as procurement areas and as travel routes. In historic times, the lure of mineral wealth or land to settle attracted people to this difficult terrain.

The land provides plant and animal resources which have influenced human use in this area. The large variety of vegetative types found within the watershed is dependent upon the various land types, soils, elevation, aspect and the effects of past fires on any given area. Diverse economic and edible plant products, each occupying its specific niche, can be found in the general area. The mountains provide a home to various large and small mammals, and the Rogue River and its major tributaries such as Quosatana Creek are rich fisheries.

The prehistory and history of the watershed 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.

The Quosatana watershed contains both prehistoric and historic sites which represent every cultural milestone in the local history. Middle Archaic to historic contact period prehistoric sites, early settlements, mining, and early Forest Service sites can all be found within the watershed. Depression Era sites can also be found in the general vicinity of the watershed.

What were the prehistoric uses of the watershed?

Quosatana: an Athapaskan word meaning "up on the rock, upon the rock, or on the rock" (L. Bommelyn, personal communication).

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.

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 Mikonotunne (also called the Ma-can-o-tins) In 1854 Parrish attempted a census of the native peoples and compiled a map of their approximate territories. According to this map, the Mikonotunne occupied the area surrounding the Rogue River from Lobster Creek to a point up river from Wakeup Rilea Creek. Their main village was located at the mouth of Lobster Creek and was reported to contain 145 individuals. They were bordered on either side by other Athapaskan speaking bands. The upland extent of the band's territories is unknown.

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. 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.

Although a limited number of prehistoric sites have been found within the watershed, those sites and isolated finds 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, sites where the procurement of raw materials for the production of stone tools was the focus of activity, religious sites related to the vision quest and trade and travel routes.

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.

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. By the end of the Rogue Indian Wars in 1856, the remaining population of aboriginal people, with the exception of the Tolowa people, had been removed to the Grand Rhonde (grand round) and/or the Siletz reservations. Some individuals escaped relocation or were allowed to return to their homelands, mainly because of intermarriage with the white settlers. However, 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 and the Smith River rancheria. 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 Spanish explorers. The earliest recorded contact between the coastal natives and Europeans is noted in the log of Captain George Vancover 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, appeared in southwestern Oregon. Russian traders and whaling ships of various nations also had contact with the native people on this portion of 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 this area 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 of the watershed likely occurred at this time.

Mining within the watershed lasted from the end of the nineteenth century through the 1940's. It is one of the most visible of the historic activities which occurred in the watershed. Evidence of mining or prospecting for gold, nickel and chrome all can be found within the drainage. During World War I and again in the years preceding World War II, the Federal Government began offering incentives for mining strategic minerals such as chrome. Although temporary in nature, this industrial development was significant in the history of the watershed. A mining district was established in the Signal Buttes area and the associated activities and impacts of mining are still visible today. Other cabins and associated mining features can be found throughout the watershed.

Following or accompanying the prospectors were the early settlers. The removal of the native inhabitants opened the area to settlement. The early settlers and miners often would build their houses on the same river or stream terraces that had provided homes for the native inhabitants.

The remoteness, difficult access and the absence of grazing land in the Quosatana watershed precluded extensive development. Homesteads exist within the watershed demonstrating the subsistence based lifestyle of the early settlers. Most people 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 and remain 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.

The Siskiyou National Forest was established on October 5, 1906. Sites which represent early Forest Service administration are common within the watershed. Henry Haefner, an early forester in the area states, "In 1909 the National Forest area was about as the indians had left it. Nothing of importance had 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."

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 trail, lookouts, camps and telephone lines were constructed within the watershed during the first three decades of this Forest's history

An important component of the historic fabric of the watershed is the trail system. These transportation corridors were the first travel routes within the watershed. Many of these paths followed older aboriginal routes "Chief" Elwin Frye identified the Wildhorse Ridge Trail (once a portion of trail #1170) as an Indian travel route. Frye was a packer for the Forest Service and the grandchild of early Rogue River settlers John and Adeline Billings. Adeline, also known as Kov-rhom-nic-ef-sho-pete or Krum-ket-tika ("a flower growing in any place") was a Shasta Indian from Scotts River in California. The Wildhorse Ridge Trail was a portion of the route which this pioneering couple used when emigrating from the Klamath River to the Rogue River (Atwood, 1978).

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 Forests history, the trail systems were improved and expanded. Today many Forest roads, such as Forest Road #3318 on the eastern edge of the watershed, follow these historic trail routes. Other remnants of this trail system form a portion of todays recreational trail system.

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 (CCC), 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 and a measure of financial relief for men and their families. The watershed contains little evidence of the work performed by the CCC. However, to the northeast of the watershed the Agness-Illahe Road and the Agness-Powers Road were two major projects undertaken by CCC crews. Also in the local area are the Gold Beach and Agness Ranger Stations, two premiere examples of Civilian Conservation Corps constructions. The former is listed on the National Register of Historic Places.

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.

Does the watershed contain any culturally significant traditional use areas?

There is no evidence which suggests that the area within the watershed is presently used for traditional activities by local Indian groups. The three local recognized tribes consulted (Tolowa, Karuk, Takelma/Siletz) did not provide any additional information regarding traditional use in the watershed.

<u>Information Needs:</u> The complete status and number of cultural sites in the watershed are unknown. Formal site evaluations of many sites have not been conducted.

<u>Management Opportunities:</u> Cultural resource surveys will precede all ground disturbing projects. All sites discovered will be documented and added to the Forest inventory. The significance of inventoried sites shall be evaluated for eligibility for the National Register of Historic Places. Suitable cultural resource properties may be interpreted for recreational use and educational benefit of the general public. There is an opportunity for partnership with the three recognized tribes in the development of recreational and educational programs.

What are the major recreational uses and where do they occur in the watershed?

Roading and timber harvest has had the most effect on the watershed from a social and recreational perspective. Prior to road building and timber harvest, the area was limited in access to open meadows and prairies, ridgelines, trails, and probably the lower mile or two of Quosatana Creek itself. There was much more late-successional forest habitat than there is today. Hunting, fishing, firewood procurement, and gathering of other forest products were probably the primary recreational pursuits in the watershed. During the period of road building and timber harvest (1960 - 1990), motorized access to the area grew and consequently so did the use associated with motorized activity. This is still true today where activities based on motorized access and activities adjacent to roads predominates. The Recreation Opportunity Spectrum (ROS) classification for the entire watershed is Roaded Natural.

There are three areas capable of providing roaded recreation opportunities within the watershed. These are in the vicinity of: (1) Wildhorse Ridge, at the southern to eastern end of the watershed; (2) Quosatana Creek, in the middle to western area of the watershed; and (3) Kimball Hill/Frog Lake, on the western boundary. Recreation settings in these areas are affected by past management.

The primary recreation uses in the watershed are road-related dispersed use. These activities include motorized sightseeing, exploration, hunting, and camping. Road-related winter use includes hunting, Christmas tree cutting, noncommercial collecting of special forest products, and limited sledding, skiing, and snowmobiling. Recreational use is light, there is an estimated annual use of 1400 to 1500 Recreation Visitor Days (RVDs). A RVD is one person using the areas in a 12-hour period. There has been an increase in the amount of snow-related motorized and non-motorized use. This occurs primarily on the roads and meadows along the ridges of watershed. There are no developed camping or picnic sites within the watershed.

Forest Road 3313 is the primary transportation route through the watershed. Secondary roads include 3313.100, 3313.150, 3313.260, and 3318.300. Other spur roads of short distances make up the rest of the roaded access opportunities for dispersed recreation. Most of the dispersed recreational activities listed above take place along or directly adjacent to these roads. Because use of the roads for scenic drives, hunting, auto tours, exploration, and other mobile uses is dispersed, no specific location for these activities is readily identifiable.

Off-road dispersed opportunities occur primarily in the creek bottoms and alluvial benches, on the prairies and buttes, and on a non-system trail in the watershed. Signal Butte has off-road access to the top for use as an electronic site. Campers, hunters and sightseers also use these access roads when possible. Most of the prairies in the watershed are located along the ridgelines on the east and western boundaries. Fritsche Meadow, Signal Buttes Meadows, Woodruff Meadow, Wagontire Meadow and other smaller meadows are used primarily for camping and hunting, and OHV/ATV use which is prohibited.

There are also unroaded recreation opportunities, primarily in the core of the watershed. This unroaded portion is described in detail in Appendix C (Roadless Areas) of the Siskiyou LRMP FEIS under the designation of Quosatana (No. 6177). An important asset of an unroaded area is the opportunity for solitude and semi-primitive recreation experiences. With highly broken topography and dense vegetation covering most of the unroaded area, the natural screening of both sight and sound provides ample opportunity for these types of experiences.

Hiking occurs on a limited basis. There are no forest system trails in the watershed. There is a non-system trail that goes from Road 3680 to the top of Quosatana Butte. There is interest for trails in the area and the Quosatana/Bradford DEIS (page II-40) listed two potential trail construction opportunities.

Big game hunting is one of the most visible activities in the watershed area. It accounts for the majority of the fall traffic. On the last weekend of Deer Season in 1991, over 125 vehicles were observed passing through the junction of the Hunter Creek Road and the Quosatana Creek Road over a two-day period Deer, black bear, cougar, bobcat, upland birds and elk are hunted.

Recreation caused impacts

In the lower two miles of Quosatana Creek recreationists have cut riparian vegetation, moved gravels of the stream bed to facilitate travel, and caused some bank erosion in areas. Recreationists have been seen fishing in the lower mainstem, even though it is against ODFW regulations.

OHV and ATV use in meadows and prairies has caused erosion and surface damage. Signal Butte, Woodruff Meadow, and other smaller meadows display evidence of this resource damage. Erosion and road damage from OHV and ATV use is evident on some secondary and spur roads including barricaded roads.

Road-related dispersed use has the potential to cause impacts, including non-point source pollution (oil and gas leaks) from vehicles, as well as human waste, grey water, and litter at some of the dispersed recreation areas. Other human-related damage that has occurred include, but is not limited to, vandalism to signs, facilities, and other resources.

Recreation trends

Recreation trends shown in the 1993 Oregon SCORP Survey indicate that demand for dispersed recreation use of various types is increasing. The predominant activities that households are participating in, listed in rank order, are sightseeing/pleasure driving (69.3%), swimming (58.7%), boat fishing (40.6%), tent camping (39.1%), and nature study and wildlife viewing (38.5%). Demand for recreation opportunities in this watershed are expected to remain the same or gradually increase from current levels. SCORP also indicates a demand for trails is increasing, although more emphasis is for accessible trails for the disabled, trails in or near or connecting to urban areas, trails that are closer to home for all users, and trails for equestrian users. Also, emphasis is for trail maintenance or reconstruction over new construction (1995 Oregon Recreational Trails Plan). Locally, there has been an increased interest in accessible trails and equestrian use, but there is a greater demand for trails for day hikes and ATV trails. There has also been an increased amount of requests for mountain bike trails.

As mentioned before, the main causes of change between historical and current recreational and social uses in the watershed was increased roading and timber harvest. It appears this trend has leveled off and is on the decline. Fish and wildlife protection, Port-Orford-cedar protection, road-related watershed restoration opportunities, and declining road maintenance funds all indicate that there will be less roads in the watershed in the future than there are now. Consequently, road-related dispersed recreation opportunities will decline, even though demand is expected to remain the same or gradually increase.

The implications are that while demand for dispersed road-related recreation opportunities increases and actual opportunities decrease, some segments of the public may be unhappy with any proposals that close roads. In some cases this could lead to vandalism to signs and property, violations of gate closures and a general dislike of federal authority.

Information Needs: Current data on recreation use, types, seasons, numbers of people, areas of interest and opportunities for partnership.

Management Opportunities: There is an opportunity to provide information and education materials on the appropriate use of undeveloped and dispersed areas, pack-out garbage and waste, and to prevent fishing in prohibited areas. Also, develop and provide information and on-site education of unique sites, such as meadows.

Rehabilitate areas that have already been damaged due to recreation use. If necessary, roads may need to be closed or have restricted access to protect sensitive areas. The following areas need to be evaluated and monitored for excessive damage and possible mitigation

- Access to lower Quosatana Creek from the 33 road
- Access to Signal Buttes.
- Access to Lower Frog Lake.
- Access to and on to Woodruff Meadow in SE 1/4 of Section 9.
- Access to and on to Wagontire meadow area in Section 17.
- Access to and on to the small meadow in NE 1/4 of Section 29.

Develop recreation opportunities, access, and facilities according to appropriateness, need, and user demand. Trails listed for potential development in the Quosatana/Bradford DEIS (p. II-40) include Frog Lake Interpretive Trail and Quosatana Butte Trail. Seek partnerships in recreation development, appropriate uses for closed roads and volunteers for trail maintenance and construction.

What areas are appropriate for electronic sites in the watershed?

Signal Buttes is currently used by two parties for radio communications. It is located in the Southwest corner of the watershed and was designated in September, 1992 as an electronic site. This is the only place in the watershed that is known to be acceptable as an electronic site.

The site is on serpentine soils and is accessed by a dirt road. The road is partially in the Quosatana watershed and mostly in the Hunter Creek watershed. This road is used by four-wheel drive recreation vehicles. It accesses two trails and a hunting camp, although the use is light. The road also provides access for numerous mining claims although none are active. This road is badly rutted, although the erosion does not affect fish bearing streams. Small meadows have been impacted by users who access the area via this road. There are dead Port-Orford-cedar (POC) along the route.

Information Needs: A site plan for the electronics site needs to be completed. A travel and access plan for the overall Signal Buttes area needs to be completed. The amount of the various types of recreational use could be determined. A plan for POC root disease control and risk management needs to be completed. A restoration plan for the access road needs to be completed.

Management Opportunities: There is an opportunity to remove old equipment from the electronic site through special use administration. There is an opportunity to determine the future number of users and development standards of the facilities through a site plan. Sanitization and other control measures for POC root disease control can be implemented. The access road is in high need of erosion control measures and rehabilitation. The type of restoration will require coordination with the special use permittees and may affect recreationists. Road access may need to be controlled, modified, or converted to trails.

What commodities can be produced from the Quosatana Creek watershed?

Timber

Timber harvest has occurred on 6,112 acres in the watershed, 3,460 acres on National Forest and 2,652 acres on private land. Most of the remaining late-successional habitat occurs in land designated as Late-Successional Reserve (ROD, 1994).

The following broad opportunities for timber harvest exist in the Quosatana watershed: 500 acres of commercial thinning in matrix, 250 acres of regeneration harvest in matrix, and 500 acres of commercial thinning in Late-Successional Reserve (LSR). Site-specific information would have to be obtained before specific recommendations could be made for harvest in these stands.

Commercial thinning in LSR would only occur if it would improve the stand's ability to develop late-successional habitat characteristics at an earlier date. Treatment of dense stands or single-structure mid-seral stands next to older forest or 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 late-seral stands. Brushfield conversion could occur in dense hardwood stands on the eastern side of the watershed in matrix or LSR that do not conflict with objectives for stand diversity within the watershed.

There is an opportunity to salvage dead Port-Orford-cedar in Riparian Reserves where the amount of large wood is at the high end of the natural range of variability. Other riparian processes and resources would have to be protected and the Aquatic Conservation Strategy objectives (ROD, 1994) would have to be met. Roadside hazard trees exist and may need to be harvested for public safety. Priority areas for salvage include roads 3313.100 and 3313.130. 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 minimal impacts to the resource. Products include: azalea transplants; cedar posts, poles, and bolts; a variety of mushrooms; ferns; Christmas trees; burls; brush; boughs; beargrass; alder; and firewood. Only a few specific concentrated areas for harvest have been identified. Bough collection has recently been coordinated with roadside cedar removal. More bough harvest opportunity will occur as Port-Orford-cedar becomes more established in the older plantations.

Priority locations for collection include areas close to roads and markets (mostly west side of Quosatana Creek) without high risk to Port-Orford-cedar. This is mostly on the west side of Quosatana Creek and Roads 3313.080 and 3680.260. Incense cedar can be found on Roads 3318.300 and 3318.304. The Coos-Curry Powerline Corridor has been identified as a potential area where concentrated harvest of special forest products could occur.

Mining

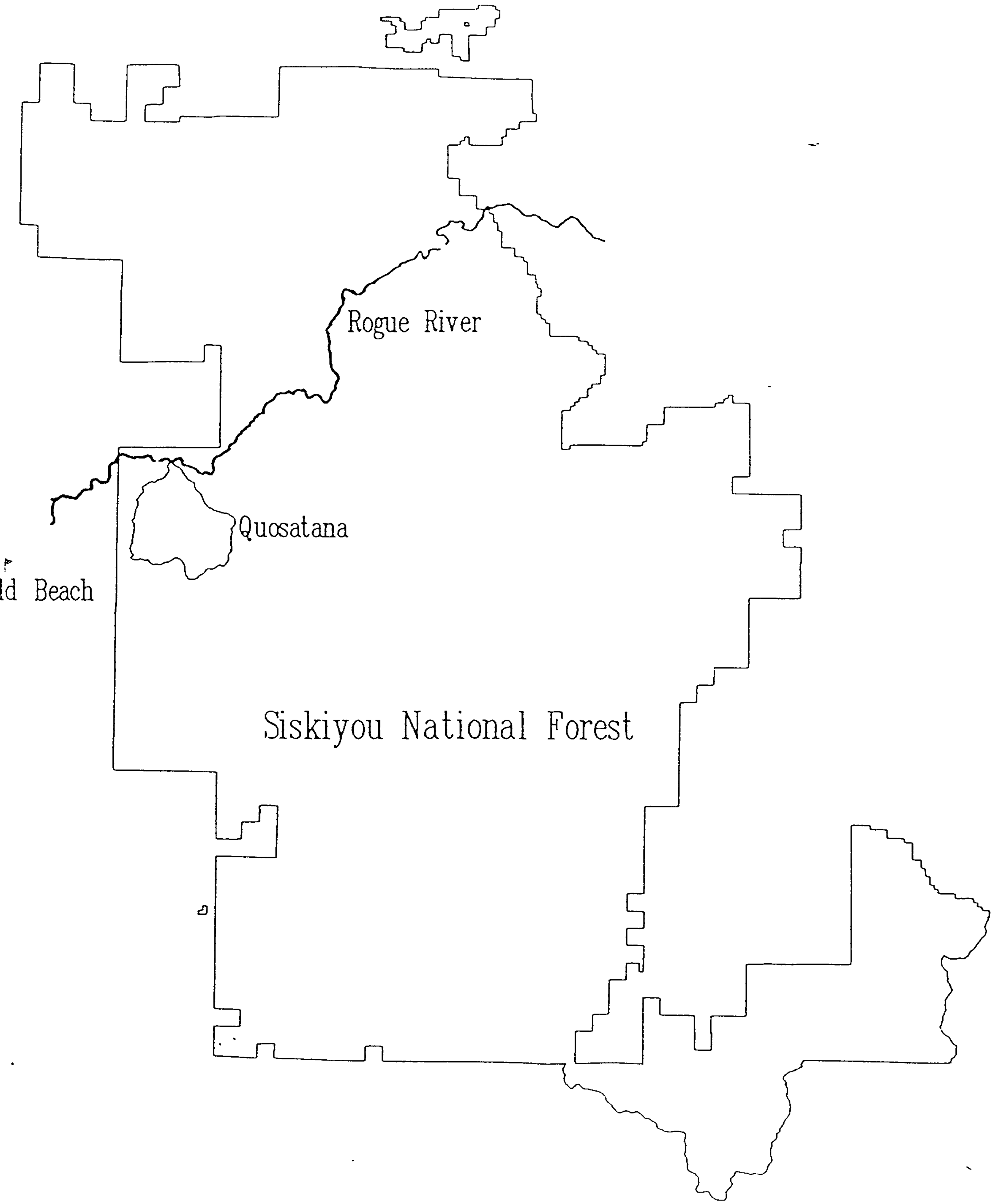
The Curry County Geologic Map (Ramp, 1977) shows there were no active mines within the Quosatana watershed. Exploration for precious metals has occurred in the past and as recently as the last five years. In the early 1990's one company had extensive claims within the watershed. These were apparently unproductive and all of their claims have lapsed. Future mining possibilities are unknown and would be dependent on market conditions. The only mineral resources that have been developed within the watershed are several rock quarries that are used by the Forest Service.

Grazing

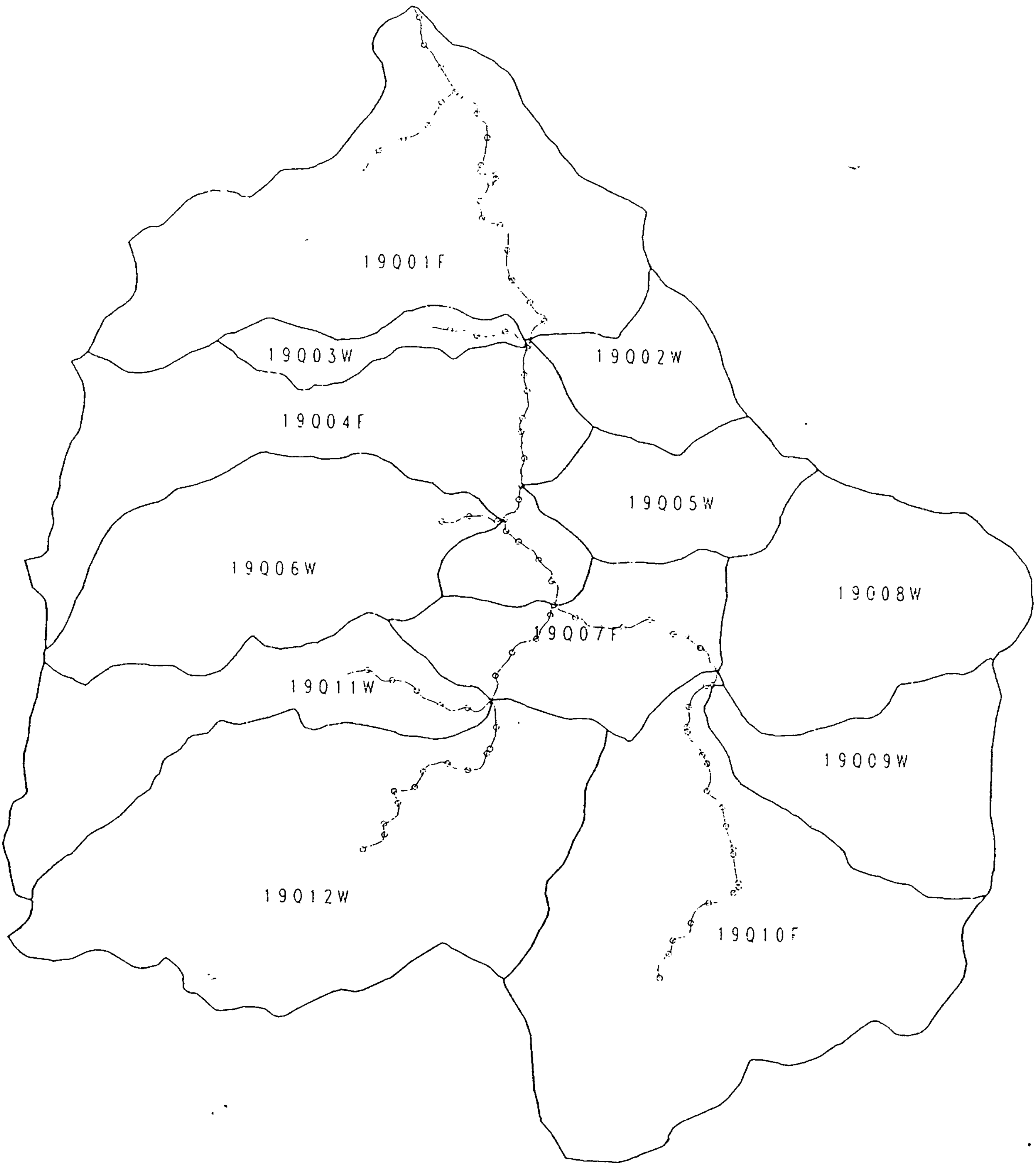
The Quosatana Watershed has been grazed since the 1800's, first permitted by the Forest Service in 1924 as the Wildhorse-Quosatana Range Allotment. The Kimball Hill and Signal Buttes portion of the Wildhorse-Quosatana allotment was not added until 1950. Although the exact date is unknown, some time between 1965 and 1974 the allotment was vacated. In 1974, Robert Knox received a trial allotment for the Signal Buttes portion of the watershed (called the Kimball Hill Allotment). This same allotment was permitted for 30 cow/calf pair from June 15 to September 15 through 1994, at which time the existing Term Grazing Permit expired. The Forest Service is currently updating the Allotment Management Plan.

The 2103 acre allotment is part of three watersheds: Quosatana, Jim Hunt, and Hunter Creek. Approximately 3.03 miles (16,000 feet) of perennial stream occur within Signal Buttes Grazing Allotment. These streams include Jim Hunt Creek (6,500 feet), North Fork Hunter Creek (4,000 feet), and three small tributaries to Hunter Creek (totaling 5,500 feet). None of the perennial streams are part of the Quosatana Watershed.

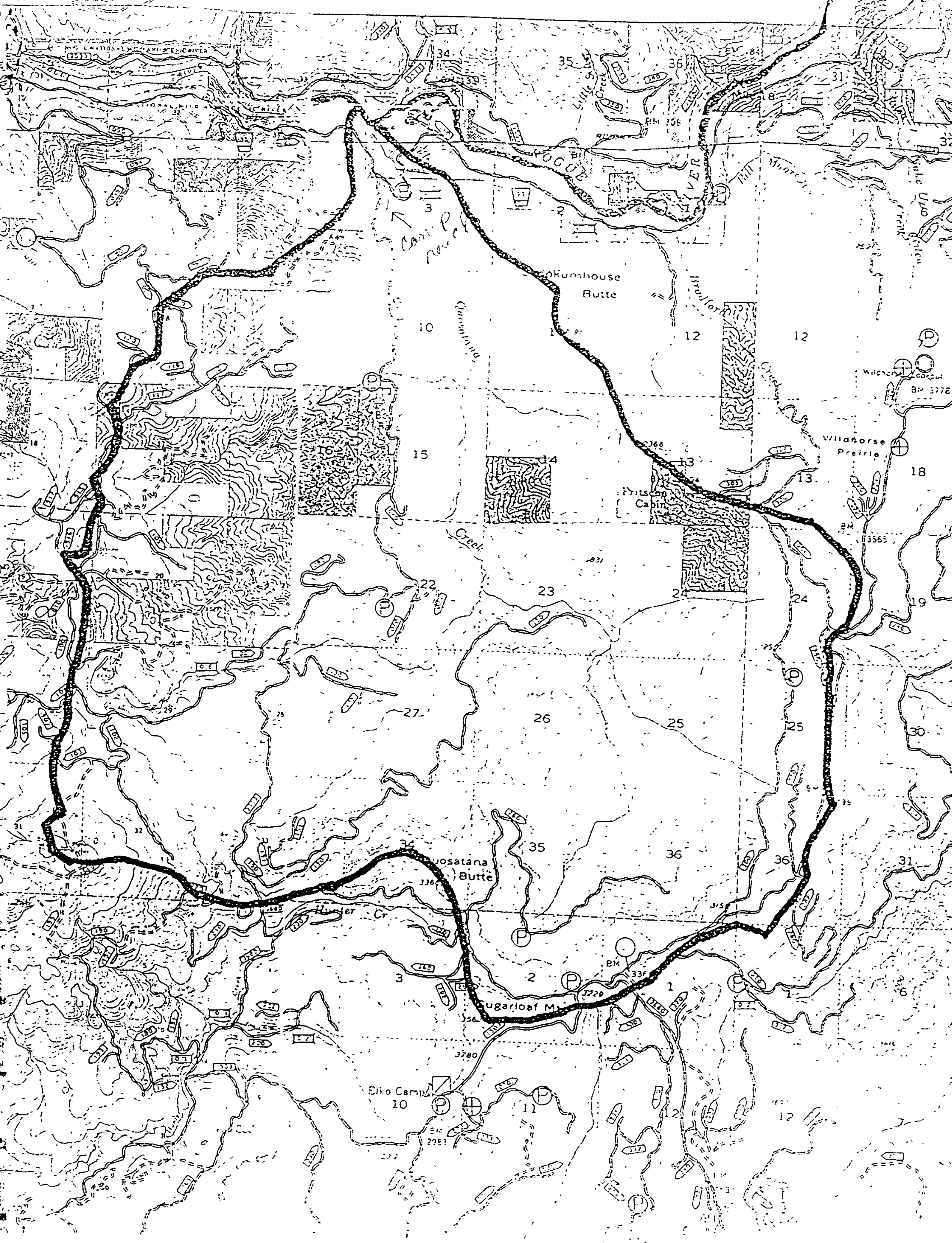
Vicinity Map



Quosatana Watershed Assessment
Subwatersheds with Streams



QUOSATANA WATERSHED



GIS Maps and Reports
Quosatana Watershed Analysis

Maps available from ARC/Info

Vicinity Map

Maps available from UTools (PC Software)

Watershed boundary
Roads, streams and subwatershed
Noxious weeds and roads
Managed stands by decade harvested
Geology by rock type
Watershed terrain in three-dimension (digital elevation model)
Management allocations
Roadless Area
Managed stands with topographical lines
Slope classes
Subwatersheds
Forest canopy cover
Reaches with Fish blockage
Fish Distribution
Harvest opportunities
Silvicultural opportunities
Streams within Managed stands and Private land
Private land with roads
Vegetation Structural stages of Managed stands
Vegetation Structural stages
Managed stands within snow zone
Mature/Non-Mature Vegetation within LSR
Vegetation Structural stages in 1940
Plant Series

Paradox data tables (PC Software)

UTMS, elevation, percent slope, aspect in degrees, stream classes, subwatersheds, managed stands, roads, vegetation, late successional reserves, meadows, rivers, species, canopy closure, size structure, wildlife sites, geology by rock type, acres, miles, vegetation structural stages, management areas, and EIS Seral Stage for each pixel.
UTMS, subwatershed, 1940 vegetation, managed stands by year of harvest, acres, stream reaches, fish distribution, roadless area and managed stands by decade of harvest for each pixel.
UTMS, subwatershed, PMR polygon, TRI cell key, canopy cover, size structure, canopy size structure class, forest species class, region species class, non tree class, acres, vegetation structural stages, managed stands, late successional reserves and management areas for each pixel.

UTools Reports:

Acres of Private land
Acres of Management allocations
Acres of subwatersheds
Miles of stream classes by subwatershed
Acres of structural stages by subwatershed
Acres of managed stands by subwatershed with % harvested
Acres harvested by decade and by year
Acres of mature structural stage in LSR
Acres of mature structural stage within Riparian Reserve
Acres of Riparian Reserve
Road density by subwatershed
Road miles by slope classes

FISHERIES APPENDIX

Rogue River Basin Characterization

Upper Rogue River and Tributary Segments - Fisheries Resources

Headwater Streams

The stream valleys in these upper headwater segments are characterized as bedrock canyons, colluvial canyons and some moderate slope-bound valleys. Exceptions to this steep profile are found on the high lava plains below Crater Lake and extending south to the Klamath River divide at Howard Prairie Reservoir and some high glacial valleys in the upper Illinois River watershed. The headwater stream profiles generally tend to have steep gradients and are characterized as erosional or transportational with regard to sediment. Large wood can trap and store some sediment in these types of streams.

Key habitat features here are very cold water important to salmonid fish, sediment sources for spawning gravel and boulders important for refuge and cover, and input of photosynthetic materials for aquatic insect production there and downstream. Key aquatic species are stoneflies, caddisflies, mayflies, steelhead trout (where access from the ocean is possible), resident trout (rainbow and cutthroat), eastern brook trout (native east of the Rocky Mtns.), non-salmonid fish such as sculpins, and crayfish. These headwater streams including the North, South and Middle Forks of the Rogue River are important to the downstream anadromous fishery because of the high quality water produced. Spring chinook salmon and summer steelhead are only present in river systems with high-elevation snowpack and ample summer stream flow regimes.

Central Valley Streams

The Applegate River confluences with the Rogue River in the central valley segment of the Rogue River which is characterized as alluvial and alluvial fan-influenced valleys. This geomorphology exists in the Illinois, Applegate, mainstem Rogue River and several of the larger tributaries -Elk Creek, Bear Ck., Little Butte Creek, etc.. These central segments contain the two major towns of Medford and Grants Pass and most of the farm land in the basin. These stream segments are flat in gradient, tend to have wide stream valleys, capable of much meandering across the valley to interact with adjacent hillslopes and are depositional with regard to sediment and large wood material.

If these central valley segments were not managed by humans, large wood and flood deposited material would cause major stream channel shifts during flooding. These valley segments in the mainstem Rogue River, Applegate River, Illinois River and larger tributaries contained more wetland and marsh habitat than seen today. Agriculture development to capitalize the rich alluvial soils and irrigation water has simplified this aquatic and riparian habitat that was once very diverse.

Key aquatic and riparian species in these low gradient segments are: chinook and coho salmon, some rainbow and cutthroat trout, fur-bearing animals, and other wetland-dependent species of birds and amphibians. Spawning gravel is abundant in these segments and chinook salmon are particularly dependent on these areas. Where this habitat has been altered these species tend to inhabit the upstream portions these segments, often on National Forest or BLM land. Elevated summer stream temperatures, simplified habitat and water withdrawals have rendered much of this habitat unusable by salmonids and other aquatic/riparian species.

Lower River Segment

The Applegate River is a relatively wide alluvial valley from Star Gulch to its confluence with the Rogue River. This discussion pertains to the lower Rogue River below the confluence of the Applegate River. The lower section of the river is characterized as a gorge, primarily bedrock canyon valley, with a profusion of sharp ridges and steep tributary canyons. This river segment is of steeper gradient than the central valley segments of the river system and tend to transport sediment and large wood to the estuary and ocean. This portion of the river serves as a highway for all the anadromous fish species to reach interior Rogue River streams for spawning and rearing

Key fish species that inhabit the lower river are sturgeon, fall chinook salmon, migratory coastal cutthroat trout, winter steelhead and summer steelhead "half-pounders", and juvenile trout and salmon residing or travelling to the ocean. Much of the freshwater life cycle of fall chinook, spring chinook and summer steelhead is spent in the mainstream Rogue River. Coho salmon and winter steelhead are generally more dependant on tributary stream habitat and tend to stay in these habitats for one full year or more. Coastal cutthroat trout are known to be resident, fluvial, and sea-run.

The major sub-basins of the Rogue River are:

- Illinois River - 628,500 acres
- Applegate River - 491,000 acres (contains Little Applegate River - 72,100 acres)
- Bear Creek - 218,000 acres
- Little Butte Creek - 230,000 acres
- Upper Rogue - 800,000 acres
  (North, South and Middle Fks. of Rogue River plus Elk and Trail Cks.)
  Middle Rogue - 603,500
  (Grave Creek, Galice Creek, facing drainages to L. Butte Ck) Creek)
- Lower Rogue - 322,000 acres
  (Gold Beach upstream to Grave Creek with facing drainages)

Climate

The climate of the Rogue River basin varies because of the basin's steep topography and interception of moisture from the Pacific Ocean. Lower temperatures and more precipitation occur on the west slope of the Cascades and in the mountains of the Coast Range. The valleys between these slopes are generally drier with high summer temperatures. Annual precipitation is high on the coast (100+ inches near Gold Beach) and low in interior valleys (19 inches at Medford). Snowfall is prevalent at Crater Lake with an average of more that 500 inches. Stream flow at the mouth of the Rogue River can vary from under 1,000 CFS in the record drought years of 1931-1940 (before Lost Creek and Applegate Lake flood control projects) to >500,000 CFS in the December, 1964 flood event. During the dry summer most of the stream flow is attributable to the high mountain snowpack areas in the Cascade and Siskiyou Mountains.

It should be mentioned here that the 1955, 1964 and 1974 flood events were of great importance in reforming stream and river channels in the basin. There are floods on record in the late 1800's that evidently were of higher flow in the main Rogue River. By 1955 there was considerable settlement in the interior and coastal valleys of western Oregon. Agriculture development had channelized many streams and removed instream scour elements like large wood and boulders. Much of the meandering and side channel habitat historically present had been eliminated. Road development in association with timber harvest was occurring in the lower elevations by 1955; many roads were located in the lower stream valleys. Logging practices included placing and leaving log stream crossings, ground-skidding over compactible soils and low standard roads. Anecdotal accounts of debris removal and machine work in stream channels after these floods abound. Long sections of stream-side roads were lost and replaced with rip-rap fortification. The reaction measures to these flood events were perhaps as catastrophic to fish habitat as the floods themselves. A strong bias against large wood in streams and stream meandering persisted from this period to today.

European Arrival - Effect on Water Regimes and Fishery Resource

Humans of European descent arrived in the upper Rogue Valley before 1850, primarily trapping fur-bearers in the extensive marshes and wetlands. Miners followed and activities such as sluicing and hydraulic mining in streams, and burning forests in the summer impacted streams and fish habitat. By the late 1800's fish canneries were operating near the mouth of the river; gill-netting and fish wheels were pervasive and streams were cleared of large wood material to facilitate these activities.

From the 1920's through the 1950's many storage reservoirs were constructed to supplement irrigation withdrawals (Fish Lake, Emmigrant Lake, Agate Lake, Howard Prairie, Hyatt Lake). In the 1970's and 1980's the Lost Creek Dam and Appplegate Dam were constructed for flood control, recreation and to raise summer streams flows for fish and irrigation. Timber harvest and road building were increased in the upslope, steep headwater areas of the Coast Range, Cascade mountains and Siskiyou mountains after World War II. All of those activities had cumulative effects on sediment delivery to streams, summer and winter flows, stream temperatures, range of anadromous salmonids in the basin and other freshwater fish habitat components.

The Rogue River is cited by the Oregon Department of Fish and Wildlife (ODFW) as the most productive anadromous fish basin in the State outside of the Columbia River system. It produces a variety of species from diverse sub-basin environments with quite different geology, flow regime and habitats. The interior valleys were once wetlands and important for coho salmon. Coho spawn and rear in smaller tributaries and off-channel areas of low gradient streams. These riparian habitats have been changed by agricultural activities and water diversions for irrigation. The upper sections of the river have cooler water temperatures and provide habitat suitable for spring chinook and summer steelhead to hold for the summer before spawning. The short facing drainages provide spawning habitat for summer steelhead while winter steelhead tend to spawn and rear in larger tributaries. Chinook, both fall and spring races, tend to spawn and rear in the mainstem or lower segments of tributaries. However, lower Rogue River fall chinook are considered to be tributary spawners.

ODFW has divided the river into three principal segments for separating distinct stocks of anadromous fish. The lower Rogue includes the section from the ocean to Agness, middle Rogue from Agness to Gold Ray dam and upper Rogue from Gold Ray to the headwaters. ODFW lists coho salmon as sensitive throughout the basin, fall chinook salmon are sensitive in the lower Rogue, winter steelhead are sensitive in the Illinois, and summer steelhead are of concern throughout the basin.

Quosatana Creek

The Quosatana Creek watershed occurs in the lower Rogue River and has its confluence with the Rogue approximately 14 miles from the Pacific Ocean. The watershed is approximately 16,381 acres in size. Because Quosatana occurs so close the the Pacific Ocean, there is a strong Pacific marine influence on climate. Quosatana and Lobster Creek (44,000 acres) are the largest watersheds in the lower Rogue River (below the Illinois River), and are important producers of anadromous salmonids.

Quosatana Creek provides habitat for a variety of salmonid fishes. These include: fall chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), winter steelhead and rainbow trout (*O. mykiss*), and both migratory and resident coastal cutthroat trout (*O. clarki*). Other fish that occur in the watershed include: sticklebacks (Family Gasterosteidae), sculpins (Family Cottidae), and redside shiners (Family Cyprinidae).

Riparian Inventories

Hankin and Reeves Riparian Inventories have been conducted in Quosatana Creek, the most recent occurring in 1994. Three "reaches" were identified in the mainstem, and the east and west forks were surveyed to upstream confluences (approximately one mile each). The following is a summary by reach of Quosatana Creek.

Reach 1 begins at the mouth of Quosatana Creek and the confluence of the Rogue River. Reach 1 is approximately 2.5 river miles in length. It can be characterized as a low gradient (1 to 2%) pool/riffle system with a wide valley (greater than 150 feet). Reach 1 has approximately 13 pools per mile with a pool:riffle:glide ratio of 79:18:2 (in percent and rounded, and 1% of the habitat was comprised of side channels). The average residual pool depth in Reach 1 is 4.9 feet, there is a high width to depth ratio of 52.3, and there are 37 pieces of Large Woody Debris (LWD) per mile. Most of the LWD counted during the inventory are "structures" placed by the Forest Service in the early 1980's. Substrates in Reach 1 are dominated by gravel. It is unknown what percentage of fine sediment (2 - 6.4 mm) comprises the bedload in spawning areas. However, during riparian inventories it was noted that spawning gravels in the reach are considered "embedded" (ie. greater than 35% embedded with fine sediment). Reach 1 provides habitat for fall chinook, coho, steelhead, sea-run cutthroat, sculpins, sticklebacks, and redside shiners.

Reach 2 is approximately 1.3 river miles in length. It is steeper in gradient than Reach 1 with an average gradient of 4%, and can be characterized as boulder/cascade system. Reach 2 has 27 pools per mile with a pool:riffle:glide ratio of 57:43:0. The average residual pool depth in Reach 2 is 3.7 feet, width to depth ratio of 19.8 feet, and there are 65 pieces of LWD per mile. Substrates are dominated by cobble and the channel is full of large (car size) boulders. Reach 2 provides habitat for steelhead, coastal cutthroat trout, and sculpins.

Reach 3 is approximately 0.7 river miles in length. It has an average gradient of 2% Reach 3 has 16 pools per mile with a pool:riffle:glide ratio of 58:42 0. The average residual pool depth in Reach 3 is 3.6 feet, width to depth ratio is 16.2, and there are 34 pieces of LWD per mile. Substrates are dominated by gravels and cobbles. Reach 3 ends at the confluence of the east and west forks Reach 3 provides habitat for steelhead, coastal cutthroat, and sculpins

The east fork survey was approximately 1.3 river miles long. The east fork has an average gradient of 4%. There are 28 pools per mile with a pool:riffle:glide ratio of 46:49:4. The average residual pool depth is 3.2 feet, width to depth ratio is 23.9, and there are 97 pieces of LWD per mile. Substrates were dominated by cobbles and gravels. No anadromous barriers were identified in the east fork survey. The east fork provides habitat for steelhead and coastal cutthroat.

The west fork survey was approximately 0.7 river miles long. The west fork has an average gradient of 4%. There are 16 pools per mile with a pool:riffle:glide ratio of 13:83:0 (waterfalls made up the remainder). (It is important to note that even though there appears to be very few pools in the West Fork, there are many pocket pools. This is due to the definition of a pool in the Hankin and Reeves Riparian Inventory. In order for a habitat unit to be considered, it must be longer than it is wide.) The West Fork is predominantly "cascade" which is considered a "riffle" in the Hankin and Reeves Riparian Inventory. The pocket pools within this cascade would have to be longer than wide in order to be counted. The average residual pool depth is 3.3 feet, width to depth ratio is 37.3, and there are 88 pieces of LWD per mile. Substrates are dominated by cobbles. An anadromous barrier was identified in the West Fork. The West Fork provides habitat for steelhead and coastal cutthroat.

Reference Spawning Surveys

Figure 6. Peak counts of fall chinook in Quosatana Creek for the spawning survey period of November 1 to January 31.

Year	Adults	Jacks
1974	58	1
1975	41	16
1976	6	4
1977	89	65
1978	238	3
1979	135	3
1980	6	2
1981 - 1985	No information could be located	No information could be located
1986	78	34
1987	48	20
1988	57	6
1989	73	1
1990	9	0
1991	8	3
1992	57	7
1993	1	0
1994	6	4

Figure 7. Coho salmon spawning survey results.

Year	Adults
1989	1
1990	1
1991	13
1992	0
1993	2
1994	0

Figure 8. The following table lists the Carbon to Nitrogen (C:N) ratio for various types of organic matter.

Type of organic matter	C:N ratio *
Douglas-fir wood	1343:1
Douglas-fir needles	97.1
Red alder leaves	23.1
Bigleaf maple leaves	62:1
Vine maple leaves	77:1
Aquatic macrophytes	8:1
Periphyton	11:1 to 1:1

* from Murphy and Meehan 1991

Riparian Processes for Perennial and Fish Bearing streams

Most of the following information on riparian processes was discussed in the FEMAT report (Forest Ecosystem Management Assessment Team) on pages V-26 thru V-28:

Root strength: The upstream head of steep channels and other steep hillslope areas are common initiation sites of debris slides and debris flows. Root strength provided by trees and shrubs contribute to slope stability; and the loss of root strength following tree death by timber harvest or other causes may lead to increased incidence of debris slides and flows.

Large wood delivery to streams: The probability that a falling tree will enter the stream is a function of slope distance from the channel in relation to tree height. Large wood plays an important role in the retention of allochthonous material. On their way from headwaters to the river mouth, organic matter and nutrients are repeatedly transported, retained, metabolized, and exported in a cycling process called "spiralling" (Newbold et al. 1982). To contribute energy to the food web of a stream reach, organic matter must be retained in the channel where it can be processed (Meehan and Murphy 1991).

The management of large wood in riparian areas can have far reaching effects in other ecosystems. For example, large drift wood in the open ocean provides habitat for tuna, and Port-Orford-cedar has been identified in drift wood piles in Hawaii (Maser and Sedell 1994).

Large wood delivery to riparian areas: Large downed logs are recruited into the riparian area from the riparian forests and from upslope forests. Large wood that falls into the moist environment of a riparian area can provide habitat for woodland salamanders and insect life.

Shade: Effectiveness of streamside forest to provide shade varies with topography, channel orientation, extent of canopy opening above the channel, and forest structure. In the Oregon Coast Range and western Cascade Mountains riparian buffers of 100 feet or more have been reported to provide as much shade as undisturbed late successional/old growth forests.

Most perennial streams in Quosatana Creek have adequate shade. Some perennial streams have been clear cut and will need to recover canopy closure thru time. Ultramafic sites typically have sparse vegetation and do not provide as much shade in the form of large conifers as other areas. In general, stream temperatures in Quosatana Creek are good. Most of the warming occurs in Reach 1 (from the mouth to approximately river mile 2.5) where the valley is wide and there is a north to south orientation.

Riparian microclimate: Streamside and upslope forest affect microclimate and thereby habitat in the riparian environment. Microclimate is likely influenced by widths of both the riparian area and the stream channel. Riparian zones along larger streams consist of two distinct parallel bands of vegetation separated by the stream channel. By contrast, smaller channels are so narrow that a functionally continuous canopy usually exists.

When timber is harvested to the outer limit of the riparian zone, an edge is created that may affect the interior microclimatic conditions of the riparian forest. Removing upland forest from both sides of the riparian zone of a small stream creates two edges, and the effect on microclimatic conditions may be additive, or even synergistic. Thus, buffers may need to be wider to maintain interior climatic conditions than for other riparian functions.

Microclimate effects from edge extend "two tree lengths" or approximately 400 feet into the forest interior, which is a guideline for the Pacific Northwest (Harris 1984; Franklin and Forman 1987). The preliminary results of current research (Spies et al. 1990) generally support this approximate distance.

The importance of fish bearing streams is discussed under the fisheries, hydrology, and geology sections of this watershed analysis. In general, salmonids are affected by both the physical conditions of their habitat, and the energy flow processes occurring in the watershed.

Wildlife habitat: Roderick and Milner (1991) prescribed wildlife protection buffer requirements for wetlands and riparian habitats in Washington. These widths vary from 100 feet to 600 feet depending on the species and habitat usage. Riparian areas function as plant and wildlife habitat connections and dispersal habitat. The key question which discusses late-successional habitat describes the importance of habitat connections. The key question which discusses the relative abundance and distribution of species of concern in the watershed discusses dispersal habitat.

Figure 13. The following table is a ranking of the roads in the Quosatana watershed for risk of spread of *Phytophthora lateralis*. The risk assessment matrix from the interregional Port-Orford-cedar disease control strategy format was considered along with amount of traffic, miles of uninfested stream, risk of disease export, and risk of disease spread within already infested areas.

Road	Risk rating	Ranking	Miles of uninfested stream	Percent POC along road
3318.270	High	1	1.0	0-20
3313.102/103	High	2	0.0	0-40
3680-1703/4WD	High	3	1.0	0-20
3313.100	Moderate	4	0.0	0-40
33	Moderate	5	0.5	0-20
3313	Moderate	6	0.5	0-20
3313.130	Moderate	7	0.0	0-20
3318	Moderate	8	0.5	0-20
3313.150	Moderate	9	0.5	0-20
3318 300	Moderate	10	0.0	0-20
3313.070	Moderate	11	0.0	0-20
3313.110/117	Moderate	12	0.0	0-20
3680.260	Moderate	13	0.0	0-20
3313 116/118	Moderate	14	0.0	0-20
3318.308/309	Moderate	15	0.0	0-20
3680	Moderate	16	0.5	0-5
Section 12 spur	Moderate	17	0.5	0-5
3318.250	Low	18	0.0	0-5
3318.304/305	Low	19	0.0	0-5
3313.020	Low	20	0.0	0-5
3313.040	Low	21	0.0	0-5
3313.080	Low	22	0.0	0-5

Road Restoration Priorities

Figure 14. The following table is a list of roads in the Quosatana Watershed. Each was ranked on the risk of sediment input and proximity to fish-bearing streams. The second table is a priority ranking of roads which could receive maintenance or restoration work as funding allows. This ranking was completed by an interdisciplinary team in October, 1995.

Road #	*Maintenance Level*	*Risk of Sediment*	*Proximity to Fish Stream*	*Comments/Recommendations*
33 (scour)	5	Mod	High	Repair with rip rap or retaining structure
3313100 (3313 to 110 spur)	2	Low	Low	Log stringer bridge needs to be replaced
3313110	2	Mod	Low	Currently blocked with tank trap. Access to culverts via 117 spur.
3313117	2	Mod	Low	Proposed for POC closure. Need treatment if do so (also 110 spur). High public use.
3313116, 3313118	2	Low	Low	Short spurs currently closed
3313102, 3313103	2	Mod (erosion)	Low	103 closed but can be driven on. POC in wetland off 103 (LSR). Could close at jnct 3313100 and 102.
unnumbered spur 3313100 to S.17	2	Low (FS) High (Private)	Mod(resident trout)	NF rd stable. Landing fill on private ready to fail. Contact Lower Rogue Watershed Council.
3313109	2	Mod	Low	Culvert pulled apart last crossing - last .04 mile.
unnumbered spur 3313100 to S.20	2	Low	Low	Currently closed.
unnumbered spur 3313100 to S.19	2	Low	Low	Possible wildlife closure - meadow. Accesses private land in Jim Hunt drainage (not in Quos watershed)
unnumbered spur 3313100 to S 21	2	Low	Low	Road adjacent to meadow. People driving on meadow and rutting it. Road extends into private land
3313111 & assc. spurs	2	Mod	Low	Drainage problems. Accesses 80 acres matrix. Stormproofing possible Draw failure, sediment to Frog Lake
3313	3	Low w/Maint High wo/Maint.	Low	15 major creek crossings in 8 miles. Deep fills, big culverts. Important to keep high maint Ditch work -- gorse sites!!!
3313020, 024, 025	2	Low	Low	Southern access to Woodruff place. 24" culvert was blocked Blockage has been removed (10/95)
3313040	2	Low	Low	Good shape.
3313070	1	Mod	Mod	Slumps at RM 0.3. Pond above it. 1/4 mile past slump - veg in. 071 spur -- no trace.

Road #	Maintenance Level	Risk of Sediment	Proximity to Fish Stream	Comments/Recommendations
3313080	2	Low	Low	.34 miles in - veg in. closed. At RM .5 existing 24" pipe. Flavel bars working. Matrix - opportunity for reconstruction 084,085 do not exist.
3313130, 135	1	Mod	Mod	Matrix and serp. Heli landing. 3313135 - blocked but can drive by. 4-24" pipes. Keep open and keep maint. take waterbar out. If need for POC closure, then need restoration, waterbars and crossdrains.
3313150 (last 0.5 mile)	1	High	High	Alder slump - obliterate.
3313150 (next 2.5 mile portion to Amphi-theatre)	2	Mod	Mod	
3313150 (to intersec-tion w/151)	2	Mod	Low	High to replace culverts. Large gully.
3313151	2	Mod	Low	High to replace culverts. If replaced Moderate potential for sediment. Road accesses matrix. Needs maint/reconst Water ponding. 72" pipe, large fill.
3680 (MP12.5 to 15)	3	Low	Low	High to replace and/or upgrade culverts. If replaced, low potential for sediment.
3680260	2	High	Mod	Accesses lots of matrix. Erosion and plugged pipe at MP 2.22, 24" pipe. Shotgun culverts. Fix stream crossings. 22 culverts, 0 to 5 ft fills.
3680263	1	Low	Mod	Closed. Stable.
3318295	2	Low	Low	Brownie's bluff & spring. Close east end by 310 rd. (Access & Travel Management.)
3318 (jnct Hunter Ck to 304)	3	Low	Low	High need for culvert maint. and replacement.
3318300 (MP 0 to watershed bdry)	2	High	Low	Accesses matrix on uphill side, LSR downhill. 10 pipes are drainage problems, slumps, erosion potential high. Restoration or reconstruct.
3318 (1st spur to S.1)	3	High	Low	0.5 mile 16% grade. Inboard erosion.
3318304	2	High	Low	1.14 miles need upgrade. Narrow road surface. Need stream crossing work, pipes need to be replaced
3318305	2	Low	Low	Fritsche access. Good shape FS. Moderate erosion on private
3318250	2	Low	Low	.53 miles. Accesses matrix. Historic gorse site.
3318262	1	Low	Low	Closed - mound and debris. Dirt spur in matrix.
3318270	1	Low	Low	Seasonal POC closure. Accesses matrix. Crosses 3 streams and 1 dry draw.
3318290	2	Low	Low	Entrance overgrown. No problems.

Ranking of Roads for Maintenance and Restoration

Maintenance (Maint)
Roads needing restoration or repair (R).

Ranking	*Road #*	*Risk of Sediment*	*Proximity to Fish Stream*	*Comments/Recommendations*
1 Maint	3313020	High	Low	Blocked culvert (fixed mid Oct, 95)
2 Maint	3313	Low	High	Low sed with maint., high without maint.
3 Maint	3313150	Mod	Low	Replace culverts. 1st mile to intersection w/151. Maint or reconstruction.
6 Maint	3318300	High	Low	Maint or reconstruction. Quosatana and Bradford.
7 Maint	3680	Low	Low	(MP12.5 to 15) Replace culverts. Maint or reconstruction.
8 Maint	3318	Low	Low	(Jnct Hunter Ck to 304). Replace culverts. Maint or reconstruction.
9 Maint	3313130	Mod	Mod	Maint or reconstruction.
10 Maint	3313100	Low	Low	Log stringer bridge needs to be replaced.
1 R	3313150	High	High	Last mile priority. Two additional miles possible before access to amphitheatre.
2 R	33 (MP13.1)	Mod	High	Repair fill slope with rip rap or retaining structure.
3 R	3680260	High	Mod	Stormproof 1.4 miles
4 R	3318304	High	Low	Stormproof 3.4 miles
5 R	3318 spur 1	High	Low	Acess to Section 1. Stormproof 0.2 miles.
6 R	3313070	Mod	Mod	Stormproof 0.5 miles.
7 R	3313111	Mod	Low	And associated spurs. Stormproof 1.5 miles.
8 R	3313151	Mod	Low	Replace culverts. Maint and reconstruction. If additional funding is available could add in the 1st portion of the 150 to this project. Also replacing culvets.
9 R	3313109	Mod	Low	Last .04. POC closure?
10 R	3313103	Mod	Low	Combined w/102
11 R	3323102	Mod	Low	
12 R	3313117	Mod	Low	POC closure?

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Appendices