V. The Two Rivers Area

The Two Rivers area of the Siskiyou National Forest is the remaining portion of the Siskiyou N.F. not analyzed in the Pacific Powers area. This area is within the Galice and Illinois Valley Ranger Districts, running from the north near Blossom Bar on the Rogue River south along the east slopes of the Oregon Coast Mountain Range and into California along the divide between the Illinois River and Klamath River, and on east to the divide between the Illinois River and Applegate River drainages.

This provides a relatively self-contained roads analysis unit on the north, west, and east sides of the area (see Map V-1). The Six Rivers and Klamath National Forests are to the south and there are numerous road connections into those areas.

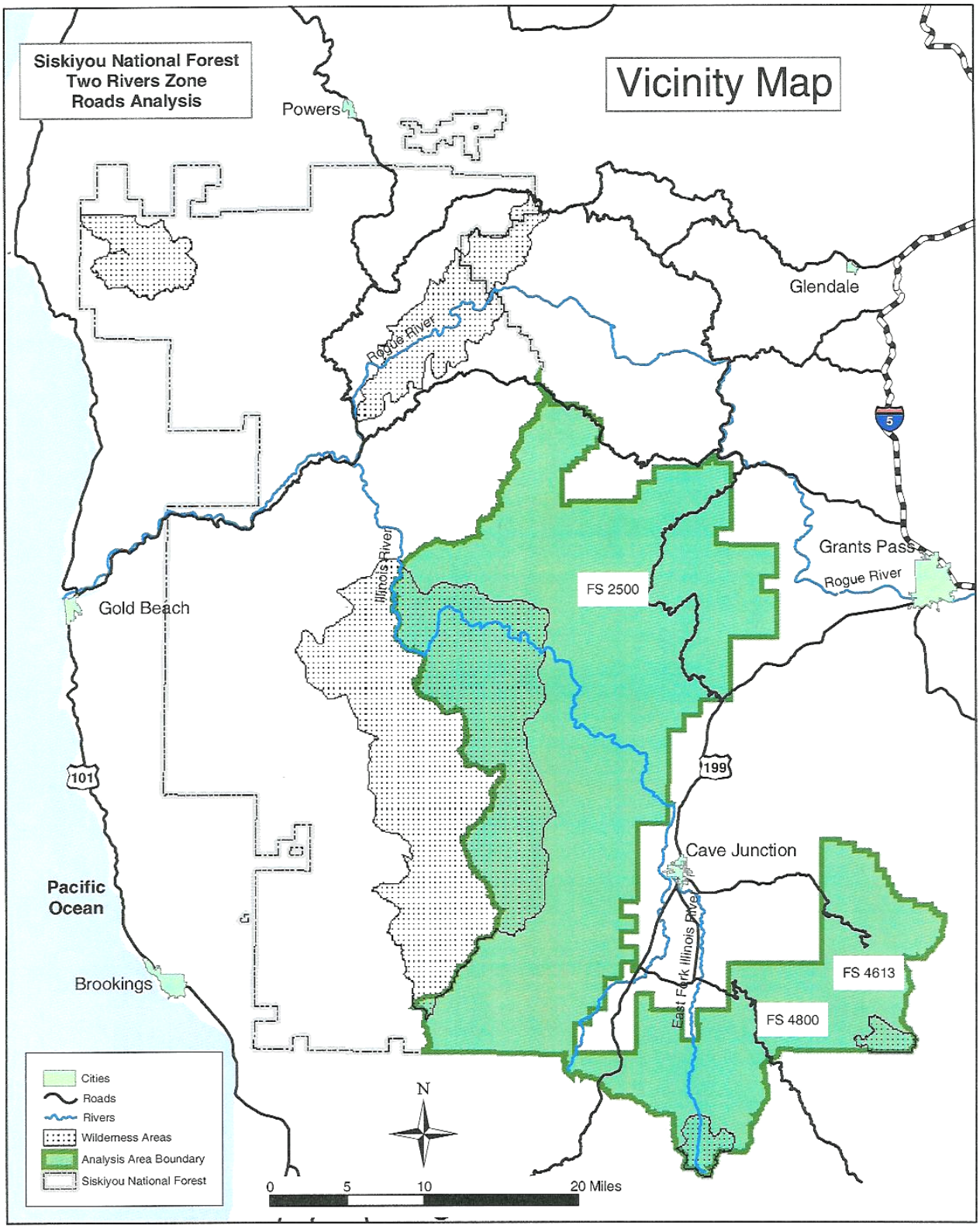
A. Background and Historical Context

The earliest trails in the region originated from use by Native Americans. Trails linked villages, resource procurement areas, and neighboring groups. Many trails followed ridgelines, rivers and stream corridors. Burning practices by Native Americans provided additional open country for travel. Travel routes may have changed over time as subsistence-settlement systems co-evolved with changing vegetation and climatic conditions, and as groups moved from mobile hunting and gathering systems to more specialized sedentary economies.

The first Euro-Americans to travel through the region were an extension of the fur trapping trades that previously explored the Rocky Mountains. Peter Ogden explored the Rogue and Applegate Valleys in the 1820s, most likely following Indian trails. The discovery of gold in the early 1850s brought an influx of rogues and adventurers to the region. Initially, miners used Indian trails to transport supplies, often by pack strings. The first mining trail into the Illinois Valley was opened in 1851, bringing people from Trinidad, California, and over the Siskiyou Mountains from above present day Happy Camp, California. A second trail, the Cold Springs Mountain Trail, was first used in 1853 and originated in Crescent City, California and traversed the Elk Camp Ridge to Oregon Mountain before entering the Illinois Valley. However, this trail was not adaptable to wagon or stage travel.

To better facilitate access to gold fields, a new route was surveyed that incorporated parts of the Cold Springs Mountain Trail. Originally called the Pioneer Road, the McGrew Trail opened in 1858 and later became a wagon road, transporting miners and supplies from the coast to the Sailors Diggings in the Waldo area. The Turnpike Road Company built this road at a cost of $80,000. Records indicate that during the summer months, traffic reached a peak of 500 mules a week. Three stages each week, various horsemen, foot traffic, and privately owned wagons often created traffic jams. However, the route was difficult, conditions harsh, and maintenance costs were high.

MAP V-1. Two Rivers Area - Vicinity Map



In the 1880s, the Wimer Deep Gravel Mine Company constructed the Wimer Road to facilitate travel between Grants Pass and Crescent City. Completed in 1882, this road was the primary route to the Illinois Valley until the construction of the Redwood Highway. The Wimer Road basically follows the route of Forest Road 4014. Settler migration also contributed to transportation development in this area. By 1846, the Applegate Wagon Trail brought settlers through the Rogue Valley and Grants Pass area en route to the Willamette Valley. Interstate 5 closely follows the original Applegate Trail.

Around 1915, an auto tour route between Grants Pass and Crescent City was opened. This 12-foot wide road was really only a widened pathway cleared of vegetation. However, by the 1920s, a flurry of modern road construction was underway. In 1922, Highway 46 was built to access Oregon Caves National Monument; previous access had been along the Grayback Road and up through the Pepper Camp area. By 1923, the Redwood Highway (Highway 199) was completed in its current alignment with an improved road surface.

The Siskiyou National Forest was established in 1906. The first administrative trails utilized existing Indian and miner trails. Rangers needed trails to fight fire, maintain telephone lines and to access lookouts, camps, guard stations and timber stands. By 1937, the Forest had over 150 maintained trails. Some of these trails are in use today, but many were replaced by roads or otherwise lost from the system.

Early Forest Service roads served many of the same purposes as the pre-existing trails: to protect forests from wildfire, carry out administrative work, access timber, and serve local communities and homesteaders. On the Two Rivers Zone, road construction began in the 1920s and 1930s. For example, in 1925, about four miles of road were built in the east fork Illinois River watershed. A number of roads were constructed using the labor of the Civilian Conservation Corps (CCC). Most roads were built segment by segment over time. Forest Road 25, located on the Galice Ranger District, is a good example of a road that evolved over decades. The road to Swede Basin was built in the 1920s to access private timberlands, the northern end of the Taylor Creek Road constructed in 1955, and the central Upper Briggs and Big Pine areas accessed in the 1960s. During World War II, roads were built to access valuable mineral deposits; examples include the Chetco Pass Road to Sourdough Flat, the Chrome Ridge Road, the "Oaks" at Sourdough Camp, and many others. A number of roads were built to access fire lookouts, including Tennessee Mountain, Onion Mountain, and Sanger Peak.

The 1950s and 1960s saw a flurry of road construction on the Two Rivers Zone, primarily in support of timber management, that continued into the early 1980s. Road building began in major drainages as the demand for commercial wood production increased. By the 1960s, an arterial and collector transportation system provided access to the lower reaches of most major drainages. Timber sale receipts (purchaser credit) paid for road construction that provided access for fire fighting, administrative work, and recreation. By the 1970s, the trend for a multiple use road system lead to higher design standards to accommodate mixed user travel patterns. Through the 1970s and 1980s, shorter spur roads reflected the use of long span cable yarding systems. By the early 1990s, the Forest's east side transportation system was basically completed.

B. Current Situation

1. Road Density

Table V-1, shows the approximate total number of miles of classified road-by-road ownership in the Two Rivers Zone. Road miles were used to determine road density. Classified roads are needed for long-term motor vehicle access; this includes state, county, private, and National Forest system roads, as well as other Forest Service authorized roads. This table represents all classified roads in the Two Rivers Zone. These roads are shown on Map V-2.

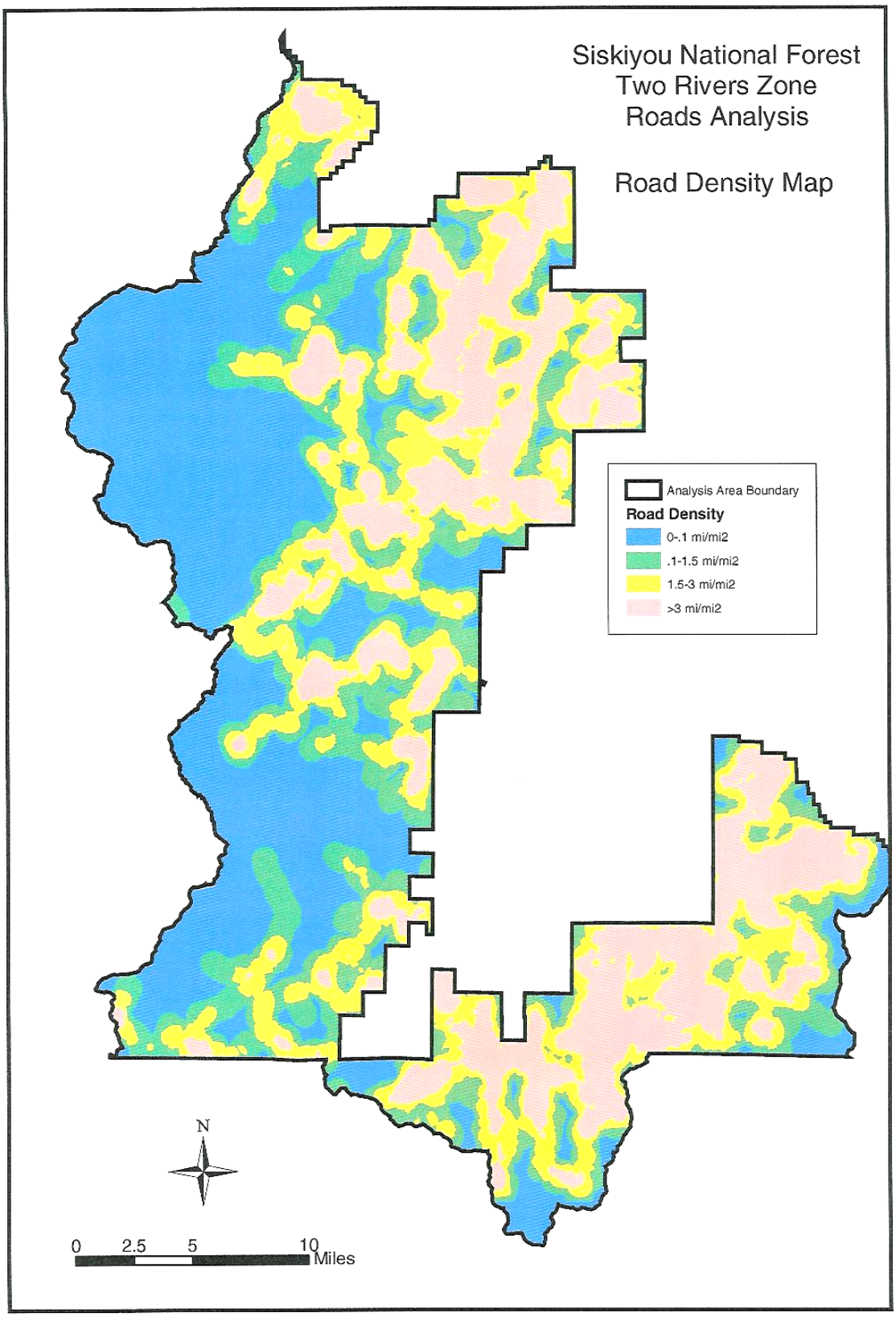
Table V-1. Total Miles Used to Calculate Road Density

Road Ownership	Total Miles
Forest Service (Classified)	1,118
State	18
BLM	12
Private	2
Total	1,150

Unclassified roads are not managed as part of the Forest's transportation system. Therefore, these roads do not receive any maintenance. These roads include unplanned roads, abandoned travel ways, and off-road vehicle tracks over 50 inches that have not been designated and managed as a trail, and roads that were once under permit or other authorization and were not decommissioned upon authorization termination.

The Two Rivers Zone is in the process of locating and mapping these roads. Furthermore, an on-going road condition survey of these unclassified roads will help prioritize restoration needs. Unclassified roads will be decommissioned or converted to a classified road or trail, depending on their access values and management needs. Unclassified roads are not reflected in road density information above. Unless otherwise stated, all roads discussed in the following analysis are classified roads.

MAP V-2. Road Density - Two Rivers Area



2. Road Statistics

The Two Rivers Zone Roads Analysis Area is based on watershed, not District, boundaries. Therefore, portions of the Galice Ranger District were covered in the Pacific-Powers roads analysis. Road statistics are based on the Forest roads (INFRA structure) database. The INFRA database is continually updated as the road status changes and new information is obtained. As a result, there may be discrepancies between the roads analyses on the Forest as information or roads change and the analyses are not run concurrently.

There are 2,765 miles of Forest Service classified roads on the Siskiyou National Forest, 1,118 of which (40%) are located on the Two Rivers Zone. On the Two Rivers Zone, 88% of the roads are currently open to vehicle traffic depending on weather and seasonal restrictions. Eleven percent of these roads are Maintenance Level 3, 4, and 5 roads (maintained for standard passenger cars).

A road system is a function of land stewardship needs and management objectives. Forest Service policy is to maintain these classified roads to their Maintenance Level as prescribed by the Road Management Objectives (RMOs). RMOs establish the specific, intended purpose of an individual road based on management objectives and access needs as outlined in the Forest Plan and project level decisions.

RMOs specify road location, design, method of construction and maintenance needed to achieve resource objectives for the area accessed by the road. RMOs are also the basis for road inventory, signing and mapping, and rules and regulations that apply to road use. RMOs are dynamic, changing with management needs.

Figure V-1. Road Mileage by Maintenance Level, including Decommissioned Miles

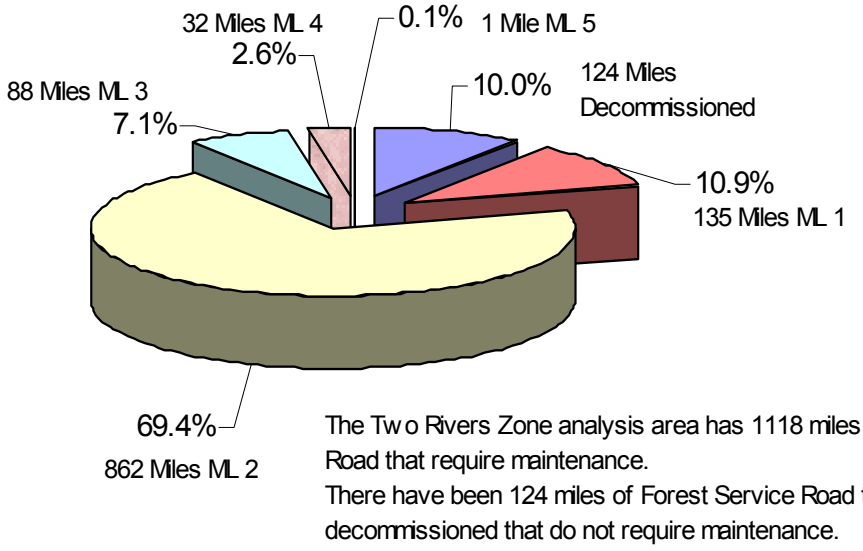


Figure V-2 shows three major surface types that impact resources and road maintenance. A few miles of road are surfaced with improved native material (pit run), or bituminous surface treatment (BST). Improved native material was grouped with Crushed Aggregate and BST, with asphalt for statistical purposes. The higher Maintenance Level roads and roads with the most traffic (collectors and arterials) are surfaced with asphalt or crushed aggregate, while the less traveled, single point dead end roads (locals) have aggregate or native material surfaces. Native material is the most vulnerable to erosion, rutting, and sedimentation.

Figure V-2. Forest Road Surface Types

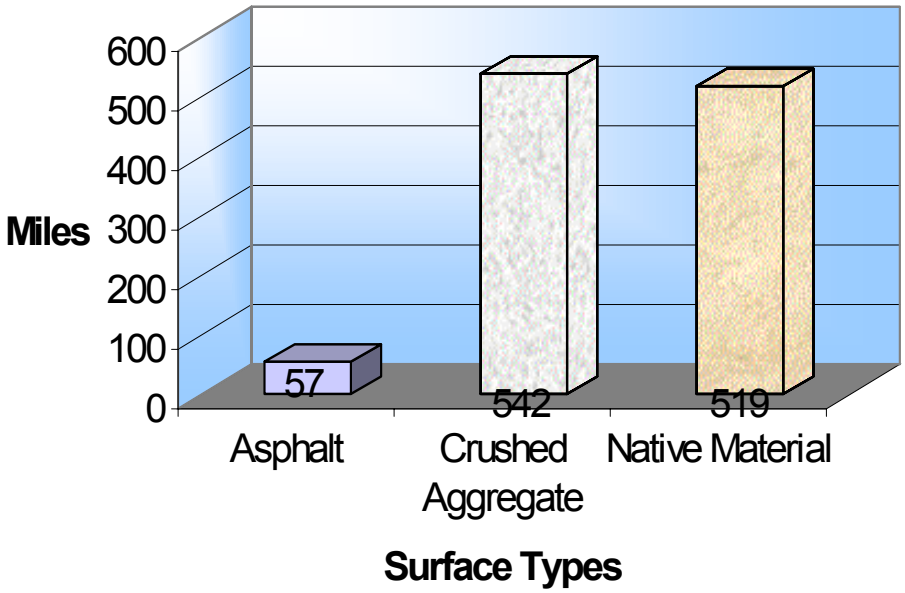


Figure V-3 shows the history of road building in the Two Rivers Zone. Notably, most road building occurred between the 1950s and 1980s for timber harvest.

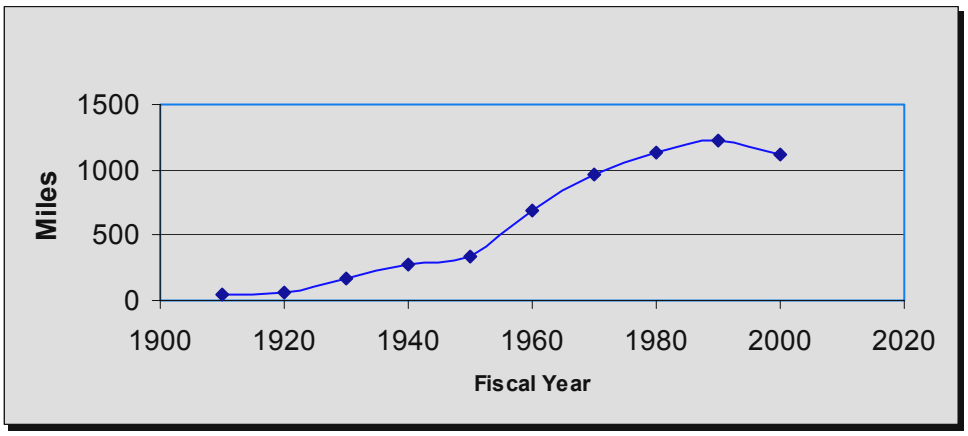
Starting in the 1990s, road miles have declined on the Forest through decommissioning, which is the process of treating an unneeded road for drainage and resource concerns and returning it to a more natural state, after which the road is removed from the Forest network. Congressional funding and Regional direction supported this targeted decline in Forest Service system roads.

Currently, the decline in the road inventory is not as drastic as it was in the 1990s, and is guided by available funding. The road system changes in response to management need. Road changes may include:

- Road closure
- Increasing the maintenance level
- Reducing the maintenance level
- Decommissioning
- Converting a road to a trail.

Allocated maintenance funds are primarily used for standard maintenance such as ditch and culvert cleaning, slide removal, surface blading, clearing for sight distance and sign/gate upkeep.

Figure V-3. Road Building History



In addition to congressionally allocated road maintenance funds, the timber industry supports Forest roads through maintenance clauses in the timber sale contract and through funding from collected timber receipts. These funds are targeted for use within the timber sale boundary for "improvement activities needed to protect and improve the future productivity of the renewable resources of forest lands on timber sale areas. Activities include sale area improvement operations, maintenance and construction for reforestation, timber stand improvement, range, wildlife and fish habitat, soil and watershed, and recreation." Forest Service Handbook 2409.19, 2000 Code, 01, Renewable Resource Uses for Knutson-Vandenberg (K-V) Fund.

Timber harvest dramatically declined with the enactment of the NW Forest Plan in the 1990s, which amended the Siskiyou Forest Plan. The NW Forest Plan reduced by approximately 80% the Probable Sale Quantity (PSQ) of timber on the Forest. Due to litigation, the Forest has not been able to meet the present Allowable Sale Quantities (ASQ).

Figure V-4 4a and V-4b illustrates the decline in timber funds for road maintenance. NFRD is congressionally allocated road maintenance funding and CWFS is funding gained through collected timber receipts. The first chart represents the Two Rivers Zone, and the second, the decline on the Siskiyou Forest as a whole.

Figure V-4a. Road Maintenance Funding-Two Rivers Zone

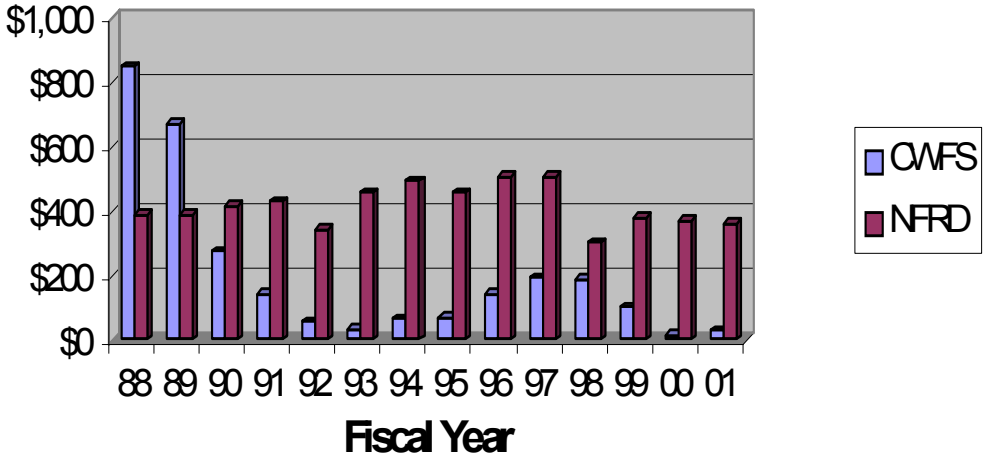
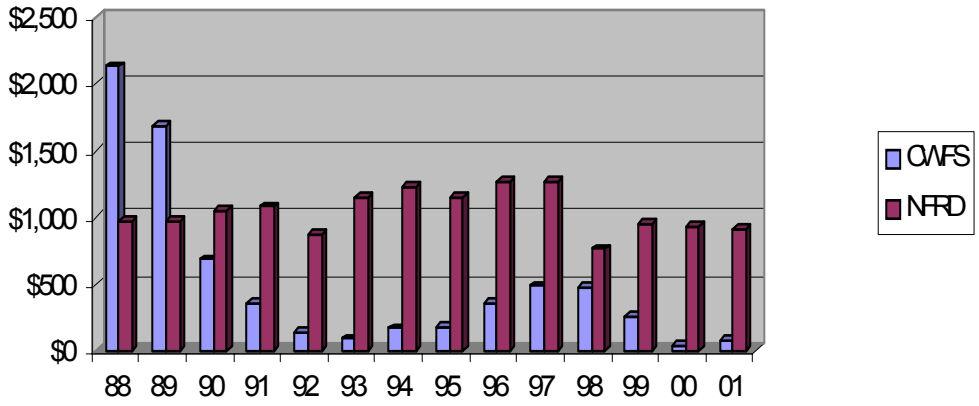


Figure V-4b. Road Maintenance Funding-Siskiyou National Forest



3. Existing Uses

Current road usage falls under three general categories: commercial, recreational, and administrative.

Commercial - This usually consists of non-Forest Service personnel conducting commercial activities on National Forest land. Commercial uses include, but are not limited to:

- Harvesting special forest products
- Outfitter/Guide operations
- Mining
- Log haul
- Hauling common materials such as rock
- Firewood cutting.

Other permitted road uses include maintenance of communication towers and transmitters, private land access, and transportation of livestock for grazing.

Recreation - includes using Forest roads for recreational driving or to access trails, campsites, interpretive sites, heritage sites, waterways, or areas with solitude or other aesthetic value.

A few examples of highly visited recreation sites include the entrances to the Kalmiopsis Wilderness, Briggs Valley, Bolan Lake and Spalding Pond. Many enjoy driving for visual pleasure and drive the Bear Camp Road, which parallels the Wild and Scenic Rogue River, Illinois River Road, Taylor Creek Road, and the Chrome Ridge Road. Others enjoy the greater challenge of driving a primitive road such as the Sourdough, Wimer, Pearsoll Peak, and the McGrew Roads. Many visitors drive roads for hunting, fishing, and other sport activities. A few Forest roads are also used for general transportation to and from local communities and homes.

Administrative - Forest Service employees rely on the Forest road system for quick and safe transportation to their work sites. Forest roads support the administration of a variety of commercial permits. Administrative access is important to resource protection, including firefighting, recreation management, vegetation management, and other Forest monitoring. Other agencies that use Forest Service roads for administration of their lands or responsibilities include the Bureau of Land Management and the Oregon Department of Fish and Wildlife.

C. Issues and Factors

1. Environmental Costs

a. Aquatic Environment

The aquatic environmental factors for the Two Rivers Zone Roads Analysis are:

- Sediment Delivery
- Large Wood Delivery
- Listed and Sensitive Fish Passage through Road Crossings
- Key Watershed Status

Several example map products (Maps VI- 1, 2, 3, 4, 5, 6 in the Recommendations chapter) are included in this document, which show the results of intersecting the factors associated with Environmental Costs and Road Benefits. Road Benefits, as represented in the Geographic Information System (GIS), with the classified road system. Using ARCVIEW (software for Desk Top GIS, and mapping), factors intersecting roads may be seen individually or in a variety of combinations that best meet the needs of the project interdisciplinary team. Road segments are analyzed within sub-watersheds (6^{th} field Hydrological Unit Code (HUC), and are identified by road number. A road that leaves one sub-watershed and enters an adjacent sub-watershed is considered a new road segment. Example results are also available in Tables VI-1 and 2 (Recommendations chapter) and are located immediately after the example maps. Maps and Tables for all roads are available in GIS, but are too bulky to include in this report.

1) Sediment Delivery

Geology- The Two Rivers Zone of the Siskiyou National Forest has a complex geologic history. Ancient metamorphosed marine sediments and volcanic rocks of the Klamath geologic province underlie most of the Galice and Illinois Valley Ranger Districts.

The Klamath province is made up of 'exotic' terrains that were once oceanic crust and volcanic island arcs. The Josephine ophiolite suite represents a layered rock sequence created in oceanic spreading centers near subduction zones. These were carried eastward by the movement of tectonic plates and subjected to extreme pressures as the pieces were accreted under the existing continental edge. The bedrock was then intruded by granitic magmas, adding heat to the intense pressures of the metamorphic process. Faults, shear, and fracture zones are typically areas of concentrated groundwater, more deeply weathered bedrock, and deeper soils. They are often related to the large, ancient, inactive or only periodically active landslide forms.

Slope Stability- Erosion and sedimentation are natural, on-going processes that involve both mass-wasting (landslides) and surface erosion. These processes can be influenced or accelerated by roads. Roads produce fine sediments from both the road surface and entire road prism (cut slopes and fills), and deliver that sediment to drainages stream channels through ditches and culverts. The amount of sediment produced is related to factors such as maintenance, traffic levels, road gradient, surfacing material and soil and parent material. Landslides can be initiated or accelerated by road construction, which destabilizes slopes by undercutting or loading the slope with fill material.

Midslope roads can divert ground or surface water and concentrate flow to unstable slopes initiating slope and fill failures. Failures at stream crossings can produce debris flows in saturated, poorly consolidated sediment and fills. Debris flows can scour slopes and stream channels for long distances from the initial landslide. Indirectly, increased sedimentation can alter channel morphology and function; for example, stream flow may be diverted and a landslide toe slope undercut, causing stream bank failures downstream. Roads can alter a watershed's response to rain and snowmelt, affecting flow duration and extent. Road density is a good preliminary measure of the overall impact of a road network to a watershed.

The road system may directly affect large wood and sediment delivery, fish habitat, fish migration patterns, and aquatic habitat conditions. Roads and stream crossings may change the mechanism by which wood and sediment reach streams, and can change fish migration patterns. Roads paralleling or bisecting stream channels and adjacent riparian zones occupy space where vegetation once grew, thus removing sources of large wood and increasing the likelihood of additional sediment delivery to stream channels.

Most large wood is delivered to the stream network by directly falling into a stream channel, as part of a debris flow down a channel, or by a landslide. The contribution zone for trees is principally within one site tree height (approximately 150 feet) of a stream channel, or from an area prone to slope failure that delivers large wood to a channel. In a forested environment, large wood delivery by all the above transportation methods influences fish habitat. In streams, large wood helps habitat and hydrologic function; it sorts diverse stream substrate sizes, creates riffles and pools, forms depositional bars, builds floodplains with diverse topography, and influences other aquatic and riparian habitat components. However, sediment delivery from roads contains little or no wood. The loss of stream channel roughness and the increase in sediment (fine and coarse) will simplify aquatic insect and fish habitat, cause channel widening, to mention a few negative impacts.

Roads tend to extend the natural drainage network of both surface and subsurface water flows, mainly by redirecting these flows via ditches either to a different point in a watershed or into an adjacent drainage. Newly-constructed cut banks can disrupt subsurface flows creating one or more new springs and/or seeps. A natural break in slope on a hill slope to a steeper gradient can force subsurface flows to change flow gradient or to form a spring or seep. Often, where road segments were located at the slope break, the cut bank forced subsurface water to surface higher on the slope as a spring or seep, which may then be diverted down a road ditch.

Under conditions where the road intercepts a meadow, bog, landslide or slump, earth flow, fault zone, etc, newly-created springs and seeps can be widespread and/or blanket one or more cut banks. Flows can vary proportional to the seasonal conditions: wet years proportionally increase redirected flows; while dry years proportionally decrease redirected flow quantities.

The results of redirecting surface and subsurface hydrology can be complex and multi-stage changes that can ultimately affect channel stability (usually of first, second, and sometimes third order streams), and fisheries and wildlife habitat, populations, and distribution. This is a topic that has been covered qualitatively in research and professional papers, yet appears to be lacking quantitative study.

Direct changes can include reduced flows in a stream channel and greater flows in an adjacent drainage, higher or lower peak flows and changes in the timing of peak flows, reduced or increased summer flows, a reduction in the size of a wetland or meadow, conversion from a wet meadow to a dry meadow, meadow encroachment by trees, and changes in the distribution, timing and/or quantities sediment transported by surface flows.

Cumulative effects and exponential increases in sediment delivery can occur when roads impact a single stream channel in several locations. For each watershed, stream miles were divided by road miles within one site tree height. Number of crossings per stream mile was also used to rate road-related aquatic risk. For this analysis, all perennial and intermittent streams on the 1:24.000 GIS layer were evaluated.

There are two aquatic road segment factors for sediment delivery. They are as follows:

Number of stream crossings by road mile as an environmental cost is rated as:
Low – <2 stream crossings per road mile.
Medium – 2 to 4 stream crossings per road mile.
High – >4 stream crossings per road mile.

***Percent of a road segment in areas with high erosion or landslide potential is rated as*:**
Low – <5% of a road segment is in areas with high erosion or landslide potential.
Medium – 5% to 10% of a road segment is in areas with high erosion or landslide potential.
High – >10% of a road segment is in areas with high erosion or landslide potential.
Note: This sediment delivery factor is also a large wood delivery factor.

There are four aquatic sub-watershed factors for sediment delivery as follows:

Percent of stream network with roads within one site tree is rated as:
Low – <7% of stream network with roads within one site tree.
Medium – 7% to 15% of stream network with roads within one site tree.
High – >15% of stream network with roads within one site tree.

Number of stream crossings by watershed stream mile is rated as:
Low – <1 stream crossing per watershed stream mile.
Medium – 1 to 3 stream crossings per watershed stream mile.
High – >3 stream crossings per watershed stream mile.

Miles of road per square mile of watershed in areas with high erosion or landslide potential are rated as:
Low – <1 mile of road in areas with high erosion or landslide potential.
Medium – 1 to 2 miles of road in areas with high erosion or landslide potential.
High – >2 miles of road in areas with high erosion or landslide potential.

Road density (road miles per square mile of watershed) is rated as:
Low – 0 to 1.5 miles of road per square mile of watershed.
Medium – 1.5 to 3 miles of road per square mile of watershed.
High – >3 miles of road per square mile of watershed.

Erosion Potential- Erosion potential was analyzed using existing information with limited field verification. A soil erosion layer in GIS was used to determine areas of severe erosion potential. The analysis of erosion potential was based on generalized descriptions and groupings of soil complexes and parent material. The resulting maps and reports are useful for broad comparisons of erosion potential between sub-watersheds and for hazard assessment, but not for site-specific planning. Individual soil polygons, geologic maps, and field verification of rock and soil type are necessary to assign stability and erosion potential at the project planning scale.

2) Large Wood Delivery

Some of the measures used to assess road effects on sediment delivery also apply to large wood delivery, e.g. percent of the stream system having roads within one site tree of the stream. Some ratings for sediment delivery also measure decreased delivery of large woody material.

Percent of road segment within one site tree as an environmental cost is rated as:
Low - <5% of the road segment is within one site tree of a stream channel.
Medium – 5% - 10% of the road segment is within one site tree of a stream channel.
High - >10% of the road segment is within one site tree of a stream channel.

Percent of a road segment in areas with high erosion or landslide potential is a sediment delivery factor that is also a large wood delivery factor.

3) Listed and Sensitive Fish Passage

Stream crossings affect fish passage and migration. Bridges and natural bottom structures have little or no effect on either upstream or downstream fish migration; however culverts can interrupt juvenile and adult upstream migration through prohibitive jump heights and excessive water velocities in the pipe and long swimming distances without adequate light. Aquatic habitat connectivity allows fish to access areas with more favorable spawning conditions, optimum water temperatures, and stream reaches with preferred aquatic habitat features, (e.g. deep pools and adequate hiding cover).

Listed and sensitive fish species are species of concern listed under the Endangered Species Act (ESA) or identified on the Pacific Northwest Region (Region 6) Sensitive Species list. Coho salmon (*Oncorhynchus kisutch*) and occupied and historic Coho salmon habitat (critical habitat) are listed as threatened under the ESA. Coastal cutthroat trout (*Oncorhynchus clarki*), Chinook salmon (*Oncorhynchus tshawytscha)* and steelhead trout (*Oncorhynchus mykiss)* are on the Region 6, Regional Forester's Sensitive Species List. For this analysis, "fish bearing streams" are streams with listed or sensitive fish species.

Listed and sensitive fish passage as an environmental cost is rated as:
Low - <1 crossing per road mile in fish bearing streams.
Medium - 1-2 crossings per road mile in fish bearing streams.
High - >2 crossings per road mile in fish bearing streams.

4) Key Watershed

The key watershed designation is part of the Aquatic Conservation Strategy (ACS) in the Northwest Forest Plan (NWFP). These watersheds or sub-watersheds were designated by scientists as core areas of aquatic/riparian habitat integral to depressed anadromous fish population recovery.

The Two Rivers Zone has six key watersheds: Sucker Creek, Silver Creek, Indigo Creek, East Fork Illinois River, North Fork Smith River and Taylor Creek. Briggs Creek was identified as a high priority watershed for restoration by a Forest team in addition to some of the key watersheds above. Briggs Creek will be given equal emphasis and scoring for this analysis with the other key watersheds.

The road system within a key watershed is of special concern. The ACS contains a guideline for no net increase in total road miles within these watersheds, and an emphasis is placed on reducing the road miles in areas with high erosion and high sediment delivery potential.

Key Watershed environmental cost is rated as:
Low - Non-key watersheds or sub-watersheds without high fisheries values.
High - Key Watersheds *or* those with high fisheries values (Briggs Creek).
There is no "Medium" rating for this factor.

Table V-1. Summary of All Aquatic Environmental Cost Factors

	Description of Factor	Type of Factor: Sediment, Large Wood, or Other	Environmental Cost		
			Low	Medium	High
Road Segment Factors	Number of stream crossings by road mile	Sediment Delivery	<2 crossings/ road mile	2 to 4 crossings/ road mile	>4 crossings/ road mile
	Percent of a road segment in areas with high erosion or landslide potential	Sediment & Large Wood Delivery	<5%	5% to 10%	>10%
	Number of crossings/road mile in fish bearing streams	Listed & Sensitive Fish Passage	<1 crossing/ road mile	1 to 2 crossings/ road mile	>2 crossings/ road mile
	Within or outside Key Watershed or Briggs Creek	Key Watershed	Within Key Watershed	No medium rating	Outside Key Watershed
	Percent of road segment within one site tree of a channel	Large Wood Delivery	<5%	5% to 10%	>10%
Sub-watershed Factors	Percent of stream network with roads within one site tree	Sediment Delivery	<7%	7% to 15%	>15%
	Number of stream crossings by stream mile	Sediment Delivery	<1	1 to 3	>3
			Crossing(s)/ stream mile		
	Miles of road per square mile of watershed in areas with high erosion or landslide potential	Sediment Delivery	<1 mile/ sq. mile	1 to 2 miles/ sq. mile	>2 miles/ sq. mile
	Road density (road miles per square mile of watershed)	Sediment Delivery	0 to 1.5 miles/sq. mile	1.5 to 3 miles/sq. mile	>3 miles/sq. mile

b. Botanical Environment

The Two Rivers Zone makes up a portion of the Klamath-Siskiyou Eco-region, an area bordered by the Coast Range to the west, the Cascades to the east, Roseburg, Oregon to the north and the Yolla Bolly range to the south in NW California. This eco-region is well known for its high number of endemic plant species (restricted to a particular locality or region), many of which are restricted to serpentine habitats. The Klamath-Siskiyou Mountains have the largest serpentine/peridotite outcroppings in North America. Smith and Sawyer's 1988 study of NW California and SW Oregon found 281endemic taxa within this region. Due to the unique interplay between a number of factors including geology, geography, and climate, this area has a rich botanic diversity and high botanic importance (Smith and Sawyer 1988).

Ultra-mafic (serpentine and peridotite) bedrock originated from deep oceanic crust material, which makes for a soil with an unusual mineral and chemical make-up. Ultra-mafic soils are high in heavy metals like iron, nickel, chromium, and cobalt, have low calcium to magnesium ratios (fertile soils have just the opposite), and are low in both nitrogen and phosphorus (both are main components of fertilizers). These soil/rock characteristics hinder the processes essential to living organisms, and as a result, serpentine landscapes are contrast markedly with adjacent non-serpentine areas by being open; the nutrient levels simply cannot support high density forests. The distinctive chemistry of ultra-mafic soils has resulted in plant speciation, as plants evolved mechanisms that facilitated their survival in this unique and harsh habitat (i.e., *Thlaspi montanum* var. *siskiyouense* is a nickel hyper accumulator). Serpentine, then, significantly contributes to the plant diversity of this region.

The geologic history of this region resulted in varied rock types with patchy distributions. These two factors (varied rock type and patchy distribution) resulted in significant speciation, contributing to the overall botanical richness of the area. This developed as adjacent pieces of land often had different rock/mineral make-ups. The resultant soils differed as well, often forming very different plant communities. Additionally, the distribution of ultra-mafic across the landscape functioned like islands due to their patchy distribution, which led to speciation. Plant species endemic to serpentine were isolated from other populations of the same species, and in time, began to separate morphologically into distinct taxa. Patchy distributions of granites, laterites, diorites, and gabbro interspersed with the ultra-mafics also contribute to plant species diversity.

Geography is another factor that contributes to the high species diversity found in this area. The east-west orientation of the Klamath-Siskiyou Mountains links the California and Oregon coastal ranges with the Cascade-Sierra cordillera. This linkage facilitates the migration of plant species and also species diversity. Migration promotes speciation due to the number of small, isolated species populations near the limits of their range.

The Biscuit fire burned 500,000 acres in southern Oregon and northern California in the summer and autumn of 2002. Sixty-three percent of this acreage had a canopy mortality of greater than 50%, with forty-nine percent having a canopy mortality of greater than 75%.

These areas have undergone substantial change and the variation in patterns of light/shading and humidity. Herbaceous and understory species are expected to differ, sometimes considerably. Some T, E, S populations will benefit from these changes and others that require more shade may be negatively affected. In general, these species are fire adapted and in some cases fire suppression is thought to account, at least in part, for their rareness. Thirty-one percent of the Siskiyou National Forest botanical areas (forest-wide) burned.

The fire and its resultant changes in vegetation (reduction in canopy cover, reduction in understory, exposure to bare mineral soils, etc) will bring about new infestations in invasive weeds and increase the size of populations that already are in existence. In addition, the more "open" characteristic of the forest will attract more off-road vehicles in areas where this activity is not desirable.

Important botanic areas of high priority on the Two Rivers Zone include:

- Fens – a unique habitat on this Forest and the Klamath-Siskiyou Eco-region
- Forest designated Botanic Management Areas (MA-4 in the Forest Plan)
- Ultramafic habitats with many federally listed or sensitive plant species
- Threatened or endangered species population sites
- Old growth and Late Successional Reserves (LSRs), which provide habitat for Survey and Manage (S&M) vascular and non-vascular species
- Meadows
- Invasive weed sites

1) Fens

Fens represent one of the most distinctive plant communities of the Siskiyou Mountains in SW Oregon with a high density of associated Forest Service designated sensitive plants. Fens are areas with perennial water (surface or subsurface), and have particular plants associated with them. In contrast to bogs, they do not have low pH. *Darlingtonia californica*, known as the California pitcher plant or the cobra lily, inhabits fens. Most Darlingtonia fens are found on ultramafic soils and provide primary habitat for a number of Forest Service "Sensitive" plants including the Waldo gentian (*Gentiana setigera*), Oregon willow-herb (*Epilobium oreganum*), large-flowered rush lily (*Hastingsia atropurpurea*), western bog violet (*Viola primulifolia ssp. occidentalis*), and pale sedge (*Carex livida*). Two other Forest Service "Sensitive" sedges, the Siskiyou sedge (*Carex gigas*) and the saw-toothed sedge, (*Carex serratodens*) are often found in association with Darlingtonia fens. A large number of Oregon Natural Heritage Program (ONHP) species are also associated with fen communities on the Siskiyou National Forest. Any disruption to the drainage or alteration of the watercourse would result in detrimental impacts to the fen-dependent plant communities.

Fens as an environmental cost is rated as:
Low – Road is outside a fen and its 1/8-mile buffer.
Medium – Road is within the 1/8-mile botanic area buffer.
High – Road is within a fen.

2) Forest Designated Botanical Areas, including Research Natural Areas (MA-4)

Siskiyou National Forest Botanic Areas were designated based on inventory data from a variety of sources including local botanists, the Oregon Rare and Endangered Species Task Force, the Oregon Natural Heritage Database, herbarium records, and Forest Service field surveys. These areas contain a significant number of endangered, threatened and/or sensitive species. Research Natural Areas were established to preserve examples of significant natural ecosystems and allow for scientific and educational use.

Forest Designated Botanical Areas as an environmental cost is rated as:
Low – Road is outside a MA-4 Forest Designated Botanical Area and its 1/8-mile buffer.
Medium – Road is within the 1/8-mile botanic area buffer.
High – Road is within a MA-4 Forest Designated Botanical Area.

3) Ultramafic Habitats

The unique geologic and climatic history SW Oregon and NW California is responsible for the occurrence of a number of rare plants not found elsewhere. Ultramafic (serpentine and peridotite) areas are well correlated with populations of threatened and endangered as well as sensitive plant species (PETS). Because a large percentage of the Two Rivers Zone has ultramafic soils, areas with both ultramafic soils and high densities of PETS species were the focus of this analysis.

Ultramafic habitats as an environmental cost are rated as:
Low – Road is outside ultramafic habitat and its 1/8-mile buffer.
Medium – Road is within the 1/8-mile botanic area buffer.
High – Road is within ultramafic habitat.

4) Threatened or Endangered Species Population Sites

This category encompasses those PETS (rare) species that are not found on ultramafic soils. PETS species are federally listed as in danger of becoming extinct. Roads create visibility and access that can run counter to management direction that should ensure that the attention of road users is not drawn to these species.

Threatened or Endangered Species population sites are rated as:
Low – Road is a PETS site and its 1/8-mile buffer.
Medium – Road is within the 1/8-mile botanic area buffer.
High – Road is within a PETS site.

5) Old Growth/Late-Successional Reserves - Survey & Manage (S&M) Species Habitat

A variety of habitats over time and space provide viability for a range of species including those associated with late seral stages, such as old growth that may be classified as Late-Successional Reserve in the Siskiyou Forest Plan. Late-successional reserves are designed to provide functional late seral habitat, including long term dispersal and migratory pathways and to allow for the growth of younger forests to meet those characteristics. Roads affect landscape structure by creating fragmented patches, which further increase the edge effect and decrease interior habitat. This reduces available habitat for those species sensitive to an increase in the amount of forest edge.

Old growth/Late Successional Reserves containing Survey and Manage (S&M) species habitat are rated as:
Low – Road is outside old growth/Late Successional Reserve and its 1/8-mile buffer.
Medium – Road is within the 1/8-mile botanic area buffer.
High – Road is within old growth/Late Successional Reserve.

6) Meadows

Meadows represent a limited habitat type on the Two Rivers Zone. Roads present an especially significant risk to rare plant species dependent on meadows given the habitat destruction that can occur if vehicles travel on meadows, especially when the soil is wet.

Meadows as an environmental cost are rated as:
Low – Meadow is neither visible nor within ¼ mile of the road.
Medium – Meadow is within ¼ mile of, but not visible from the road.
High – Meadow is visible from the road.

7) Invasive Weed Species

Roads present one of the primary causes of undesirable, exotic plant expansion through weed seed transportation. The maintenance of road ditches as a part of routine road maintenance, the attachment of invasive weed seed to the tires of vehicles, clothing, and tread of footwear, and the attachment of seed and vegetative propagules to pets are some of the ways that invasive weed species can be introduced or dispersed via roads.

Invasive weed species as an environmental cost is rated as:
Low – Road is outside weed population sites.
High – Road is within a weed population site.
There is no "Medium" rating for this factor.

The following table summarizes the environmental costs of roads to the botanic areas discussed above, a 1/8-mile buffer is assumed to border all botanic areas except for meadows and weed sites. In practice, buffering unique habitats is an important conservation tool. Visibility and access from the road can be significantly reduced, thus reducing negative habitat or plant population impacts and future management costs.

Table V-2. Summary of All Botanic Environmental Cost Factors

Botanic Area	Environmental Cost		
	Low	Medium	High
Fens	Roads are outside the botanic area and its 1/8-mile buffer	Roads are within the 1/8-mile botanic area buffer	Roads are within the botanic area
Forest designated special botanic areas (MA-4)			
Ultramafic sites with high densities of rare plants			
Non-ultramafic areas with high densities of rare plants			
Old growth or LSRs with S&M species habitat			
Meadows	Meadow is neither visible nor within ¼ mile of the road	Meadow is within ¼ mile of, but not visible from the road	Meadow is visible from the road
Invasive weed sites	Road is outside weed population sites	N/A	Road is within a weed population site

c. Port-Orford-Cedar (POC)

Managing POC to prevent the spread of *Phytophthora lateralis,* a devastating root disease, from infested to non-infested stands directly affects how the Forest administers and implements other forest projects. Observing fungicide protocol and washing equipment and tools that have been used in infested stands delays projects and creates higher operating costs for the Forest and contractors. Although prevention costs are high, these procedures help reduce the disease spread to uninfected POC stands. POC is a highly valued indigenous tree species and healthy stands are of paramount importance within its endemic range.

In a Forest policy letter dated November 8, 2000, the Forest Supervisor established direction to prevent the import of POC disease to uninfected road systems and to prevent disease export from roads in the midst of infected POC.

Current GIS products are available identifying POC stands as well as *Phytophthora lateralis* areas within stands. This factor intersected the road layer with POC stands.

There are a number of roads in the Two Rivers Zone that are closed with a gate in order to reduce the risk of contamination by *Phytophthora lateralis*. Most of the gated roads are closed seasonally, usually from October to May. A few of the roads are in a different status that can range from closed year-round indefinitely or for a period of three years (i.e., road 4201142) to currently open, or open as needed. A road with a closed gate cannot be legitimately entered unless the party has a permit or other authorization from the Two Rivers District Ranger. This is a mandatory requirement for miners, private land owners, contractors, recreationists lodging overnight at a lookout, and other road users, including Forest Service employees seeking access for administrative purposes.

An interagency Port-Orford-cedar Supplemental EIS team consisting of BLM and Forest Service employees is currently working on a supplemental EIS titled "*Management of Port-Orford-Cedar in Southwest Oregon*". The Proposed Action incorporates direction for more road closures and greater use of specific road maintenance practices to reduce the risk of contamination by *Phytophthora lateralis.* [Reference: *Management of Port-Orford-Cedar in Southwest Oregon*, *Draft Supplemental Environmental Impact Statement, Coos Bay, Medford, and Roseburg Bureau of Land Management Districts and the Siskiyou National Forest in Southwest Oregon, June 2003*].

Port-Orford-Cedar environmental cost ratings:
Low – Road does not access Port Orford cedar stands.
High – Road accesses Port-Orford cedar stands.
There is no "Medium" rating for this factor

d. Terrestrial Wildlife

A few special wildlife sites need (or would significantly benefit from) protection from road related disturbances. These sites include peregrine falcon nesting sites and meadows. The rating for this factor is listed below but mapping for visibility is not available.

Wildlife sites are rated as:

Low – Site is neither visible nor within ¼ mile of the road.
Medium – Site is within ¼ mile of, but not visible from the road.
High – Site is visible from the road.

2. Road Benefits

a. Recreation

Roads play a critical role in the ability of the National Forest to provide opportunities for public recreation and they are essential for the support of tourism here in southwest Oregon.

Recreation opportunities can be broadly characterized as developed recreation opportunities and dispersed recreation opportunities. Roads providing access to these opportunities will be evaluated upon the level of use for recreation. Level of use has been developed informally through visual observation, historical records, evaluation of expected trends based upon demand information presented in the 2003 Statewide Comprehensive Recreation Plan (SCORP). Additionally, roads that provide administrative access for maintenance of trails will be favorably evaluated, where that access substantially improves management efficiency.

1) Developed Recreation

Developed recreation takes place in created environments. Campgrounds, trailheads, picnic sites, and recreational rentals are examples of developed recreation sites. There are 18 developed camping and picnic sites located within the Galice and Illinois Valley Ranger Districts, as well as maintained trailheads throughout. Because of the investment in these developed sites and their consistent level of use, roads accessing all developed sites are ranked as high.

2) Dispersed Recreation

Dispersed recreation takes place in more natural environments. Primitive camping, boating, swimming, hiking, wildlife and plant viewing, hunting, and driving for pleasure are among the most common dispersed recreation activities on the Galice and Illinois Valley Ranger Districts. Some other, less popular dispersed activities include firewood cutting, fishing, history and nature study, orienteering, gold panning, and non-commercial mineral location are also primarily dependant upon road access to the National Forest.

Most forest recreation is dependent upon roads for adequate access. The dispersed activities of driving for pleasure and hunting appear to be the most dependent upon an adequate, comprehensive network of roads. These activities have been historically popular and it is projected that participation will continue at high levels.

The rating for recreation road access benefit is defined as:

Low – All roads not identified as medium or high.

Medium – Popular loop routes providing access to a concentration of dispersed use areas.

High – Roads accessing developed recreation sites, including trailheads.
Roads forming scenic connections between communities or major paved routes.
Roads providing access to popular dispersed destinations.
Roads offering access to historically popular hunting grounds.

b. Heritage Sites with Recreational Access Needs

Heritage resources are the physical remains of sites, structures and districts that reflect historic or prehistoric use of forest resources on lands now designated as National Forests. These sites are evaluated using National Historic Preservation Act criteria and sites with significant properties are nominated to the National Register of Historic Places. Forest Plan direction requires that these eligible sites be maintained and adverse effects mitigated. Heritage sites not included in this analysis are those accessed solely by trail. The degree of benefit to these sites provided by roads is based on level of demand to access these sites:

Heritage sites with recreational access needs are rated as:

Low- Site appeal reflects a lower demand for recreation access

Medium – Site appeal reflects a moderate demand for recreation access

High – Site appeal reflects a higher demand for recreation access

Table V-5. Heritage Recreation Site Ratings

Site Name	Access Road	Rating	Comments
Onion Mountain Lookout	2500-056	H	Rental
Pearsoll Peak Lookout	4103-087	M	Currently a free rental; needs EA to implement proposed rent
Bolan Mountain Lookout	4812-535	H	Rental
Store Gulch Guard Station	4103	N/A	Proposed interpretive site
Cedar Guard Station	Highway 46	N/A	Proposed interpretive site/rental

c. Vegetation Management

1) Timber Management

Access to National Forest lands has a direct effect on implementation and administrative costs of vegetation management. Most Forest roads were originally planned to provide access to timber harvest stands and adjacent areas. Roads issues for the Two Rivers Zone pertain to several types of timber stand and meadow management treatments.

Many presale activities such as survey, layout, marking, and cruising utilize existing road systems. Post sale operations (slash disposal, reforestation, and crop tree release) use new roads that were built to access harvest areas. In addition, wildlife habitat improvements, including stand culturing activities, are performed utilizing developed access routes.

Matrix lands are expected to provide short and long-term timber needs. Most Matrix lands are currently roaded. Access to these areas should be maintained for monitoring, silvicultural treatment, and resource protection. Currently, fiber outputs typically have lower value than in past decades. Low value products are more efficiently removed with roads in place, making the current investment in roads relatively more important.

Early successional stands exist within the Late Successional Reserves (LSR) due to natural disturbances such as wildfire or timber harvest. Managed stands within LSRs are often early seral stands. A goal for LSRs is to create later successional stands dominated by larger diameter trees. Young stand density management can maintain or accelerate diameter growth and create stands that are more resistant to stand replacement fire, insect, or disease events.

Managed stands that need commercial thinning to promote restoration of mature and old growth forest habitat include stands that should be treated within 10 years (regeneration harvested before 1970). High priority stands are those below 4000' elevation and medium priority, those above 4000'.

Timber stand access benefits are rated as:

Low – Roads that access areas either unavailable for land treatment activities, or unscheduled for commodity production, silvicultural treatments, or restoration activities.

Medium – All roads in Late Successional Reserve, or within one mile of early to mid seral stands that are not also managed stands; or managed stands that were generated between 1969 and 1995 and the elevation is less than 4000 feet; or managed stands with regeneration harvest that were generated prior to 1970 and are above 4000 feet in elevation.

High – All roads accessing Matrix lands. All roads within one mile of managed stands with regeneration harvest in Late Successional Reserves that were generated before 1970 that are less than 4000 feet in elevation.

2) Deciduous Oak Savannah/woodland

Roads provide access to help maintain and restore wildlife habitats of concern. Roads can also negatively impact wildlife; however, a few road closures to protect special wildlife areas can mitigate much of the significant negative impacts.

Habitats of concern are those habitats that are below their historic range of variability on the Two Rivers Zone. These habitats of concern are old-growth forest, interior mature and old growth forest, deciduous oak savanna/woodland, and grasses or forbs in meadows and forest under stories. Activities to maintain and restore habitats of concern emphasize density reduction that restores historic plant species compositions, increases restoration rate of large trees, and reduces fire hazard. Perhaps the highest priority density reduction areas are regeneration harvested stands and areas with an historical abundance of deciduous oaks or ponderosa pines. *Road access is needed to carry out these treatments in stands with trees large enough to have commercial value but that are too small to make helicopter use economically feasible*.

Deciduous oak savannah/woodland as an access benefit is rated as:
Low: All other roads not rated as moderate or high due to value of oak and pine stands.
Moderate: Roads that intersect oak and pine stands that include the same criteria as above, except aspect includes 310 to 115 degrees (moister, cooler aspects).
High: Roads that intersect deciduous oak or ponderosa pine dominated stands including: Low elevation (<4000'); Dry aspect (between 115 and 310 degrees; 50% of the stand consists of poles or small trees; Total canopy closure is greater than 60%.

Prescribed fire is an important tool in the restoration and maintenance of habitats of concern; roads are critical in the safe, effective and efficient use of prescribed fire.

3) Special Forest Products

Special Forest Products (SFP) includes cutting and removal of firewood, boughs, bear grass, foliage, and mushrooms. This program has grown significantly in the last decade. The two districts covered in the Two Rivers Roads Analysis each have products in demand specific to the individual area. Mushroom harvesting, done mostly on the Illinois Valley District, often has yearly permit sales exceeding $20,000. Based on permit sales for fiscal year 2000, it is estimated there are over 20,000 visitor-use days each year for the two districts combined, specific to the gathering of Special Forest Products.

Seasonal demand for particular products results in differing access needs throughout the year. The mushroom harvest in the Two Rivers Zone runs from October through March with the maximum harvesting extending from December through February. Harvest season for most other products is spring and summer. Late fall is important for products used in wreaths and foliage arrangements.

The area where special forest products are harvested extends throughout the Two Rivers Zone on Matrix and LSR lands. Local (Ranger District) restrictions may establish limits in area, season or amount, such as such as restricting any product removal from Riparian Reserves, seasonal restrictions on POC bough collection, or limiting the amount of SPF collected from a specific area. At the Forest level, the only restrictions are typically on amount removed. Special forest product users utilize certain areas and road systems more heavily than others, which will be the basis for rating each road segment.

Special Forest Products (SFP) as an access benefit is rated as:
Low – Road accesses areas that may receive no more than occasional product interest.
Medium – There is no medium rating for this factor.
High – Road accesses geographical areas known to produce a certain SFP.

d. Access Management

1) Regional Network Roads

Region 6 identified a Regional Road Network for Forest Service roads considered significant for access and travel within the Region. A Regional direction white paper dated 11/24/92 states, "Roads placed on the Network should never be considered for closure unless an emergency situation exists and the closure is temporary." Selection of these roads was based on one or more of the following:

- The public will be encouraged to use the road for access to the National Forest lands.
- The road provides access to large areas of the Forest and/or major recreational areas.
- The road provides important intra or inter-forest access.
- The road provides major access to state or county roads.

In addition, these roads met specific design criteria for surfacing, width, alignment, and grade.

Regional Network Road as an access benefit is rated as:
Low –Road not identified as a Regional Network Road.
Medium – There is no medium rating.
High –Roads identified as a Regional Network Road and needed to maintain transportation in and around the National Forest.

2) Access to Other Federal Lands

A few roads segments on the Two Rivers Zone provide primary access to Bureau of Land Management (BLM) lands. In order to support other agencies' missions, access to these roads should be maintained and are high priority.

***Access to other Federal lands as an access benefit is rated as*:**
Low –Road that doesn't access other Federal lands.
Medium – There is no medium rating.
High –Road that provides access to other Federal lands.

3) Quarry Sites

Quarries are a very valuable resource for road maintenance. Graded and crushed rock is used for surface replacement, spot rocking, and other structural needs such as retaining walls for slope stability. The Two Rivers Zone quarry site maps and chart values are used for rating this factor. Furthermore, surveys in fall 2002 will further investigate these quarry sites for current rock value and possible future development.

Commercially obtained and hauled rock costs, on average, twice as much as rock obtained from a developed Forest quarry. Commercial rock costs approximately $40.00 a cubic yard compared to $20.00 a cubic yard for Forest quarry rock, which translates into a $20,000 cost difference for a mile of rocked road surface.

Quarry Sites as an access benefit is rated as:
Low – Road does not access quarry, or access less desirable sites such as a quarry capable of producing only limited quantities of material, abandoned quarry, or rejected, unclassified or waste site.
Medium – Road accesses active quarry capable of producing lower quality construction rock such as pit run or select borrow which may not meet durability standards.
High – Road accesses active quarry capable of producing high quality crushed rock.

e. Mining

Roads that access mining claims in the Two Rivers Zone are of special concern. According to mining law and the Code of Federal Regulations (36 CFR part 228.12), a claimant has a right to use existing roads or to construct roads in order to access mining claims on Federal Forest System Lands that are open to mineral entry through an approved plan of operation. Existing mining claims' locations will be identified to determine access needs.

Mining as an access benefit is rated as:
Low – Road that accesses lands open to mineral entry that are not currently claimed.
Medium – Road that accesses inactive existing mining claims.
High – Road that accesses active or proposed mining activities.

f. Fire Protection and Suppression

Fire management agencies (Federal, State and local) use the existing transportation system to access National Forest and adjacent and/or inter-mixed ownership lands for wildland fire operations and for hazardous fuels reduction projects. Wildland fire operations include both wildland fire suppression and wildland fire use on Federal lands. Current Federal wildland fire management policies emphasize the protection of communities, and municipal and other high priority watersheds at risk from severe wildland fires. The long-term emphasis is to maintain and restore fire adapted or influenced ecosystems at the landscape scale.

Roads provide access for the primary firefighting resources (ground based engines, and hand crews) to respond to wildland fires. All existing system roads have the potential to reduce response time to a fire, final fire size, and suppression costs. However, some roads are more valuable because of the higher standard access they provide, firefighting sources they access (water sources and fuel breaks), or access to fire facilities (lookouts and weather stations). Roads are also often used as fireline control features, and can affect firefighting strategies, fire size, suppression costs, and potential for wildland fire use for resource benefits.

Hazardous fuels treatments are designed to:
- Reduce the risk of wildland fire to communities and the environment;
- Provide safety to firefighters; and
- Improve ecosystem health.

The focus is on actively managing acres in the wildland-urban interface, and acres outside the wildland-urban interface that are in Condition Classes II or III (have missed two or more natural fire cycles) to reduce hazardous fuels and restore fire-adapted ecosystems. The wildland-urban interface is currently defined as the area mapped as communities at risk by the Oregon Department of Forestry and a one and one-half mile buffer around them.

Combinations of treatments are used in southwest Oregon to restore vegetation and historic fire conditions. Most of these treatments are non-commercial, but integrated vegetation management with timber sales or market-based approaches (selling by-products) to offset costs of hazardous fuels reduction is encouraged wherever feasible and cost effective.

Years of fire exclusion have increased vegetation density and fuel loading, and prescribed fire or wildland fire cannot always be used without first modifying the fuels (pretreatment). These pretreatments include: cutting, hand piling, and hand pile burning of excess vegetation and fuels; mechanical treatments to masticate or crush fuels and vegetation; and small diameter tree removal for by-products. Pretreatments are often followed by prescribed fire use to maintain desirable fire behavior characteristics.

Roads affect hazardous fuels treatment options, access to work areas, travel time to work areas, and access to water sources. Treatments such as small diameter tree removal and commercial timber harvest require well-developed road systems to be feasible or economically viable. Crews also need road access to accomplish hand treatments and prescribed burning. Long walk-ins increase costs and risks with prescribed burning, and reduce the feasibility of accomplishing treatments.

1) Wildland Fire Operations

Roads provide access for ground based wildland fire suppression resources to unwanted fires. They also provide access and control features for wildland fire use. Higher standard roads allow transport and movement of firefighting resources such as dozers on low bed trailers, larger engines, water tenders and crew buses. Wildland fire preparedness and detection related sources and facilities are also integral to the fire management program. Roads provide access to water sources closer to wildland fire origins, and to lookouts and automatic weather stations. Wildland fire operations ratings are based on the importance of road access for firefighting resources, and access to firefighting sources and facilities to support an effective fire management program.

Wildand fire operations ratings:
Low – Road not rated medium or high.
Medium – Road accesses water sources.
High – Road accesses weather stations, lookouts, and/or road is designed for low bed trailers.

2) Hazardous Fuels Reduction

The wildland-urban interface is a priority area for hazardous fuels treatments to reduce the wildland fire risk to communities and to allow fire to take a more natural role in the surrounding forest. Road access allows more treatment options, reduced costs, and reduced risk for prescribed fire use in the wildland-urban interface. There do also exist planned projects in high priority areas outside of the wildland-urban interface to reduce hazardous fuels and/or restore fire-adapted ecosystems. These projects have incurred costs for surveys, planning, NEPA, contracts, and design that maybe lost if road access is changed. Access to these locations is also important to retain.

Hazardous fuels reduction ratings:
Low – Any road not indicated below.
Medium – there is no medium road rating.
High – Road that accesses the wildland-urban interface or planned hazardous fuels treatment projects outside of the wildland-urban interface.