Appendix E

Roads Analysis Process (RAP)

E. Roads Analysis Process

Sequoia National Forest and
Giant Sequoia National Monument
Roads Analysis Process
September 16, 2003
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Background

In January 2001 the Roads Policy decision was signed, which changed portions of Forest Service Manual (FSM) 7700 and recommended use of Roads Analysis: Informing Decisions about Managing the National Forest Transportation System (FS-643)[1]. According to FSM 7712.1 a Roads Analysis is: "Conducted by an interdisciplinary team, the science-based roads analysis process provides Responsible Officials with critical information needed to identify and manage a minimum road system that is safe and responsive to public needs and desires, is affordable and efficient, has minimal adverse effects on ecological processes and ecosystem health, diversity, and productivity of the land, and is in balance with available funding for needed management actions."

According to FSM 7712.11 Outcomes, the final products will be "a report and accompanying maps that document the information and analysis methods used to identify social and environmental opportunities, problems, risks, and priorities for future road management. The report documents the key findings of the analysis and contains graphical, tabular, and geo-spatial displays of the transportation system options, including a minimum road system. It is important that the roads analysis identify access needs and opportunities that are based on current budget levels and realistic projections of future funding."

The 2001 Sierra Nevada Forest Plan Amendment (SNFPA) adds a point of potential confusion to this process. Under SNFPA, analyses can be conducted at the river basin, watershed, landscape and project levels (SNFPA Appendix T). Under the Roads Policy analyses can be conducted at the forest, watershed and project levels. The Roads Policy includes identification of needed and unneeded roads at the watershed and project scales (FSM 7712.13c). Under SNFPA, river basin and watershed analyses would include an assessment of maintenance level (ML) 3, 4 and 5 roads. This information would be incorporated into landscape analyses. The assessment of ML 1 and 2 roads would occur at the landscape and project level (SNFPA Appendix T pp.T-3, T-4 and T-7). The Sequoia National Forest Road Analysis Process, a "forest level RAP" in terms of FSM 7712.13b, is equivalent to a portion of a "watershed level analysis" in terms of SNFPA (SNFPA

[1] USDA Forest Service, 1999. Roads Analysis: Informing decisions about Management the National Forest Transportation System. Misc. Rep. FS-643. Washington, D.C.

Appendix T, p. T4). Portions of the Sequoia RAP were conducted at a quasi-landscape level due to the need to include all classified roads within the Giant Sequoia National Monument (GSNM) planning area. Additional RAPs at more site-specific levels will still need to be conducted as part of the ecosystem analysis process throughout Sequoia National Forest and GSNM in accordance with the FSM7712 and SNFPA guidelines (SNFPA Appendix T).

This RAP for the Sequoia National Forest and GSNM follows the six-step process recommended in FS-643, and was completed in two phases. The first phase of this report informed the GSNM planning effort and decisions, which are at the programmatic level of the National Environmental Policy Act (NEPA). The GSNM RAP can be found as Appendix E of the Final Environmental Impact Statement for Giant Sequoia National Monument. The second phase includes the GSNM RAP report and adds the remainder of the forest road information to complete the Forest-wide RAP. This forest-wide report contains factual information concerning the transportation system but does not make road management decisions. Road management decisions will be informed by the appropriate scale of road analysis and disclosed in an appropriate NEPA document (FSM 7712.11) The RAP is not a NEPA document; it only provides information on the existing condition of the road system. The core interdisciplinary team included:

- Marianne Emmendorfer, Team Leader and Hume Lake District Planner;
- Norman Carpenter, Forest Assistant Recreation Officer;
- Robin Galloway, Tule River and Hot Springs District Zone Wildlife Biologist;
- John Grenz, Forest Transportation Engineer;
- Margie Clack, Cannell Meadow and Greenhorn District Zone Public Affairs Officer;
- Cherie Klein, Hume Lake District Geographic Information System and Database Manager;
- John Exline, Line Officer Representative (Hume Lake District Ranger).

Many other Forest Service personnel on Sequoia National Forest and GSNM were instrumental in creating, editing, evaluating and analyzing the road-related materials at various steps throughout this process.

Existing Transportation System

In accordance with FS-643 the miscellaneous report guiding the RAP, the interdisciplinary team reviewed the existing road system within the Sequoia National Forest and GSNM. Current forest plan direction (including transportation management) is also discussed and compared with the existing road system on the forest and monument (FS-643 pp.22-23).

The Sequoia National Forest transportation system consists of roads and trails for people to access various destinations across the forest. The existing road system is a hierarchical set of classified roads over which the Forest Service has maintenance jurisdiction (See Maps 1-3: “Classified Road System by Maintenance Level” in Appendix B). There are also several State Highways and County Roads over which the Forest Service does not have maintenance jurisdiction. Many user-created roads exist that the Forest Service does not maintain. These roads may be eliminated if they are found to be of little or no general

public benefit, or are not needed for resource maintenance or administrative uses (See road definitions in Appendix A-Glossary).

Background of Sequoia National Forest Road System

The Forest road system is a by-product of over 150 years of natural resource exploration and use. Some roads were originally travel routes used by Native Americans in prehistoric times, or were established by early settlers, sheepherders or cattle ranchers in the mid to late 1800s as evidenced by the locations of prehistoric and historic cultural resource sites. Other historic roads were created for the purpose of resource utilization. The Hume Lake Ranger District, for example, has a variety of roads that were developed from log chutes or skid trails created during the logging era of the late 1800s to early 1900s. Some historic travel routes on the Forest followed stream courses and were not engineered for long-term use or with an eye toward resource management in the terms used today. Several of the historic routes were not designed to any engineering standard, though in the past several years some have been evaluated and reconstructed to meet current standards.

Many roads were developed through more contemporary Forest Service resource management activities (1950s to present day). These roads were designed and constructed to reach certain areas for long-term resource management (recreation sites, timber management, fuels management, etc.). A majority of these roads were developed for timber sale access. The timber roads tend to be short in length and constructed mid-slope (tractor logging) or on ridge tops (tractor and cable logging). The ridge top and mid-slope roads are generally well removed from the riparian areas and not as prone to damaging the surrounding resources as the older, user-created roads.

The majority of roads across the forest were constructed between the years of 1950 and 1980. Most of these roads were built to access forested areas to help meet the country's growing need for wood fiber. These roads were also designed to higher standards to provide for a diversity of long term uses, including public access. Timber harvest levels have declined sharply since 1993 when the California Spotted Owl Sierran Province Interim Guidelines were implemented. Harvest levels have declined further since the April 2000 presidential proclamation establishing the Giant Sequoia National Monument and the January 2001 Sierra Nevada Forest Plan Amendment. Since the early 1990s public use of the roads has increased about three percent[2] per year. Pleasure driving is the single largest recreational use of National Forest System lands, constituting 36 percent of all recreational use in 1996. In summer, recreational drivers on the National Forests account for 13.6 million vehicle-miles per day. The outlook is for recreational road use to grow by an additional 64 percent by the year 2045.[3]

Most National Forest visitors travel on the classified Forest Road System. These roads provide access for millions of national and international tourists annually. Many of these roads are connected to the State and County Roads. Forest roads serve such needs as:

[2] Historic traffic count figures on the Sequoia National Forest and in Fresno, Tulare and Kern Counties.
[3] 1998 Report of the Forest Service Performance Highlights of the Natural Resource Agenda.

recreation, fire protection and suppression, commercial uses, grazing, university research, private property access, mining, vegetation management, and insect and disease control[4].

Sequoia National Forest and Giant Sequoia National Monument can be accessed through several points of entry. State Highway (SH) 180, State Route 245, County Roads 265 and 469, SH 198 and the General's Highway (NPS/FS Road) provide access to the northern portion of the monument. State Highway 190 east of Porterville, County Roads J 37, SM 276, SM 220, SM 50, SM 56, SM 99, M 3, M 9 and M 109 travel to and through the central and southern portions of the monument. SM 107 (Western Divide) travels north to south through this portion of the monument beginning at the termini of SH 190 and going south near the junction of roads SM 50 and 99 (See Maps 1-3 in Appendix B).

The remainder of the forest can be entered via several routes. In the northern portion only Trimmer Springs Road (M 2) north of Pine Flat Reservoir provides additional access beyond the routes that also enter the monument. The southern portion of the forest can be accessed via State Highways 155 and 178, and County Roads SM 114, SM 128, SM 146, SM 148, SM 152, SM 214, SM 218, SM 465, SM 483, SM 485, SM 495, SM 501, SM 521, SM 539, SM 589, J 41, Horse Canyon Road and Chimney Peak Road.

The Forest road system, as a whole, is not specifically designed to provide comfortable travel by passenger cars, as are many State and County roads. The Forest road system was designed, and is signed as a low volume road system. An estimated 39 percent of the road system is passable to passenger cars (ML3-5), 29 percent is passable only to high clearance vehicles (ML2) and 32 percent is listed as closed to vehicles (ML1). The roads are authorized for the administration and use of National Forest System lands. Generally they are open to public use but at the discretion of the Secretary of Agriculture. The Forest Service may restrict or control the use of these roads to meet specific management direction (USDA Forest Service, Forest Service Manual Section 7731).

The Forest Service has five different traffic management strategies. They are: encourage, accept, discourage, eliminate and prohibit. Encourage strategy directs forest visitors to important destinations via desirable routes. Accept strategy provides a route marker at the entrance. The discourage strategy informs potential users of road conditions that may detract from the experience they seek when visiting a national forest. Eliminate and prohibit strategies are used to close roads to vehicular traffic with the use of physical barriers or regulatory signs and orders (USDA Forest Service, FSH 7709.59-25.31).[5]

"Road Decommissioning" is defined as activities that result in the stabilization and restoration of unneeded roads to a more natural state (FSM 7703.2(1)). Decommissioning is generally the most effective method to close roads to vehicular traffic and promote rehabilitation. Approximately one to eight miles of road have been decommissioned per year throughout Sequoia National Forest in the past five years. Roads previously selected for decommissioning were identified through site- specific analyses of negative impacts to natural resources, or lack of public and administrative use. This broad scale RAP is

[4] Cordell, Ken, et al, 1999-2000 National Survey on Recreation and the Environment, USDA Forest Service and the University of Tennessee, Knoxville, Tennessee.
[5] Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 446

helping determine criteria to identify potential management opportunities including decommissioning. At the landscape or project scale an additional RAP will help determine potential roads to decommission that are causing negative impacts to natural or cultural resources, or are rarely used for administrative or public purposes.

Annually, newly constructed or acquired roads are added and some roads, if decommissioned, are removed from the Forest Transportation Atlas (FTA) (See Appendix A for definition). Newly constructed roads are typically short, of local designation and related to a single need such as accessing new recreation opportunities, or serving privately owned property surrounded by National Forest System land. Other existing roads are often acquired through land acquisitions (purchases or exchanges). Typically, less than one mile of roadway is acquired or constructed within the Sequoia National Forest annually.

The Sequoia National Forest (SQF) and GSNM area has many routes or wheel tracks that are not included in the Forest road system. These roads are termed “unclassified.” They have evolved in different ways; some were constructed as temporary roads as part of past timber harvest projects and were not decommissioned at the end of the sale, while others are user-defined roads or paths and generally are considered a non-authorized use. These roads are not inventoried or maintained. They may be a source of environmental damage.

The Roads Policy requires forest scale RAPs to be completed by January 2003. The first step the Forest has taken is to inventory all the unclassified roads within the next ten years, determine whether the route is causing resource damage and if there is an administrative or public access need that warrants adding it to the road or trail system. The Forest Service has three main options to manage these roads once an analysis, at the appropriate scale, is complete: decommissioning, adding to the trail system, or adding them to the Forest Transportation Atlas and classified road system. If added to the Atlas, the goal is to maintain the roads at an assigned maintenance level to meet current and expected forest demands.

The Sequoia National Forest has approximately 1,620 miles of classified road. Within the Forest, the GSNM has approximately 900 miles of classified road (Table 1). Forest roads are defined as a road wholly or partially within, or adjacent to, and serving the National Forest System and necessary for the protection, administration, and use of the National Forest System and the use and development of its resources (Title 23, US Code, Section 101; FSM 7705 – Definitions). The roads can be classified in different ways, generally by maintenance level or by functional class. These road classification systems identify road management objectives6 which:

- Establish the specific intended purpose of a road based on management needs as determined through land and resource management planning;
- Contain operation and maintenance criteria for existing roads; and
- Contain design criteria and operation and maintenance criteria for new roads.

[6] Road Analysis: Informing Decisions about Managing the National Forest Transportation System, USDA Forest Service, FS-643, August 1999, p.12

Table 1 displays the miles of road by maintenance level objective within both the SQF and GSNM. The maintenance level describes the maintenance required for a particular type of road and the level of service the user can expect. Maintenance levels vary from one (1): roads closed to the public, to five (5): a higher standard, paved facility according to Forest Service Handbook 7709.58. Maintenance levels 3 through 5 are accessible to passenger cars. Appendix A contains further descriptions on maintenance levels.

Table 1: Maintenance levels for roads within the Forest and GSNM

Maintenance Level (Objective)	Miles in Sequoia National Forest	Miles in GSNM*
1	517	359
2	479	280
3	325	144
4	200	69
5	100	47
Total Miles =	**1621**	**899**

*The miles within the GSNM are a subset of the Sequoia National Forest miles.

A functional classification system is also used to classify National Forest System Roads: arterials, collectors and locals (Table 2)**.** Total road miles in the SQF and GSNM using this classification system are presented in Table 3. Arterial roads are the main roads, which traverse the forest and connect to major State highways or county roads. They may be paved and are designed for slightly higher-speed travel. Collector roads connect arterial roads to the local roads. Local roads are at the termini of the collector roads and tend to be constructed to a lower standard and serve a small segment of land. Generally on Sequoia National Forest Arterials translate to ML 4-5, Collectors translate to ML 3 and Locals translate to ML 1-2.

Table 2: Road Classifications in Current Use

Functional Class	Traffic Service Level*	Maintenance Level
Arterial: Provides service to large land areas. Connects with other arterials or public highways	A: Free flowing, mixed traffic; stable, smooth surface; provides safe service to all traffic.	Level 5 Passenger vehicles- Dust free; possibly paved.
	B: Congested during heavy traffic, slower speeds and periodic dust; accommodates any legal-size load or vehicle.	Level 4 Passenger vehicles- Smooth surface.
Collector: Serves smaller land areas than arterials. Connects arterials to local roads or terminal facilities.	C: Interrupted traffic flow, limited passing facilities, may not accommodate some vehicles. Low design speeds. Unstable surface under certain traffic or weather.	Level 3 Passenger vehicles- surface not smooth. Level 2 High-clearance vehicles.
	D: Traffic flow is slow and may be blocked by management activities.	
Local: Single purpose road. Connects terminal facilities with collectors or arterials.	Two-way traffic is difficult, backing may be required. Rough and irregular surface. Accommodates high clearance vehicles. Single purpose facility.	Level 1 Closed more than 1 year.

*Traffic Service Level (TSL) describes a road's significant traffic characteristics and operating conditions. These levels are identified as a result of transportation planning activities (FSH 7709.56, Ch. 4).

Table 3: Functional Classifications of Roads in the SQF and GSNM[7]

Functional Class	Miles in Sequoia National Forest	Miles in GSNM*
Arterial	300	116
Collector	325	144
Local	996	639
Total Miles =	1621	899

*The miles within the GSNM are a subset of the Sequoia National Forest miles.

Costs and Funding for Road Construction, Maintenance, and Decommissioning:

National Forest System roads must receive a certain minimal amount of annual maintenance to safely accommodate their intended use. If the minimal needed maintenance activities do not occur these activities are termed deferred maintenance (See Appendix A for definition). Deferred maintenance can adversely affect the roads functionality and drainage capability, which can lead to sediment transport to waterways.

To properly keep up the Forest Road System, the engineering road maintenance group has historically maintained the roads on a 20-year cycle. For example, each year, five (5)

[7] This data and the maintenance level information **(Table 1)** were taken from the Forest Transportation Atlas and Transportation Inventory System database.

percent of ML1 roads must be fully maintained (5% of 520 miles equals 26 miles). The estimated cost figures, per mile used in Table 4 are from the 2002 Electronic Road Log Data Base (ERL). USDA Forest Service Regions 4, 5 (Pacific Southwest) and 6 calculate their annual and deferred road maintenance costs using these ERL figures. Table 4 displays annual road maintenance costs assuming all Sequoia National Forest roads are maintained to standard and on a scheduled cycle. Costs to adequately maintain the road system on a 20-year cycle exceed the 2002 budgetary allowance by $780,000 as displayed in the table.

In recent years, annual road maintenance budgets have not been sufficient to accomplish minimal maintenance activities on the Sequoia National Forest road system (See Table 4). Only approximately 28 percent of the Sequoia National Forest road system was partially maintained in fiscal year 2001.

Table 4: 2002 Road Work Activity Costs to Maintain Five-Percent of Sequoia National Forest Roads

Road Activity	Cost/Mile	Road Miles	Total Cost
Decommissioning	$12,500	2	$25,000
Maintenance Level 1	$6,655	26	$17,3030
Maintenance Level 2	$9,2922	24	$223,080
Maintenance Level 3	$19,475	17	$331,075
Maintenance Levels 4-5	$61,070	15	$916,050
Total Annual cost to Maintain Road System			$1,668,235
Annual Road Maintenance Budget (for entire forest)			$888,000
Annual Shortfall for Road Maintenance (for entire forest)			($780,235)

In past decades, commercial users (typically timber purchasers) maintained a substantial portion of the National Forest Road System throughout the Sierra Nevadas, including Sequoia National Forest, during timber sale activities. With the decrease in timber sales, however, fewer roads are being maintained to standard.[8] Table 5 below displays the road maintenance program funding for the Sequoia National Forest from 1988 through 1999. Long-term trends for road funding, adjusted for inflation, gradually began decreasing during the early 1990s. By the late 1990s road maintenance funding was about half the amount available in the late 1980s and early 1990s (Table 5). This reduction is due to both the loss of timber sale activity and reductions in road maintenance budget allocations. The effect of decreasing road maintenance allocations was worsened by the decrease in timber sale receipts during the same time period.

[8] Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 446

Table 5: Budget allocations for Road Construction, Reconstruction, Decommissioning and Maintenance for Sequoia National Forest, 1988-1999 (in Thousands of 1995 Dollars)[9]

National Forest	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Sequoia	1455	1571	1639	1453	1412	1111	738	793	779	877	792	912

The current road maintenance funding received on Sequoia National Forest and within the GSNM is used to repair the most pressing safety-related road problems. As a result, none of the roads are being maintained to their standard or within the maintenance cycle at this time. Currently, there is a backlog of needed road maintenance work, which is referred to as "deferred maintenance."[10] In 2001, the deferred maintenance for the Sequoia National Forest classified road system (including roads, bridges and culverts) was estimated as $23,705,900, comprised of the following categories:

- 12% for health and safety (clearing along roadsides, repairing potholes, replacing signs, etc.)
- 39% for resource protection (installing additional water bars, rolling dips and overside drains to prevent or reduce sediment from entering streams, installing larger culverts and open bottom arch culverts for aquatic species passage, closing roads to protect sensitive plant species and to encourage animal migration)
- 49% for the Forest Service mission (providing proper safe access on ML 1 and 2 roads for fire protection and vegetation management)

The resources needed to maintain the entire National Forest System road network are significant. The Forest Service has estimated that, at best, the agency has received approximately 20 percent of the actual funding needed for annual maintenance of this network. The resulting management response has been to defer certain maintenance-related items to a later time and not accomplish some much-needed capital improvements on the network. In recent years, the Forest Service has actively assessed the condition of its road network. The network is in a deteriorating condition due to increased use and the continued deferral of maintenance and capital improvement needs. Roads are becoming unusable through lack of maintenance, are causing resource damage or are no longer needed or desired for administrative or public access. These increasingly unusable roads are candidates for decommissioning after the appropriate site-specific NEPA procedures. It has been projected that at current funding levels, the agency will continue to lose access to the national forests and grasslands. The increasing loss of available access to all publics is demonstrated in the fact that between 1990 and 1998, over 9,000 miles of road became unavailable for passenger car use.[11] Specifically for SQF and GSNM, the current funding is only enough to maintain the ML 4 and 5 roads and a portion of the ML3 roads to standard (See Tables 4 and 8, respectively).

[9] Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 447
[10] Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 447
[11] Administrative National Forest System Roads – Deferred Maintenance and Capital Improvement, Oct. 19, 2001.

In terms of resource protection, most drainage structures on Sequoia National Forest system roads were designed for a 25-year storm event. Most of the structures on the arterial and collector roads were designed for a 50-year storm. Direction in the 2001 Sierra Nevada Forest Plan Amendment is to replace all culverts with a 100-year storm design, as they are replaced. This culvert replacement direction is part of the deferred maintenance cost estimate. The larger size culverts should also improve unimpeded passage of aquatic organisms because this large of a structure should more closely simulate the existing streambed and stream width.

Road Locations in terms of Important Physical and Biological Features

The current road system traverses a diversity of physical and biological features within Sequoia National Forest and GSNM. During the Ordovician and Cretaceous Period, shallow seas occupied the area that now comprises the Sierra Nevada Mountains. In the Triassic and late Cretaceous periods molten granitic rock began to intrude. Most of the sediment eroded away, and the area was uplifted by a series of faults along its east side to form the mountain range. Today, several geologic features from these remnant processes typify the Forest. These include granite domes and glacial formations usually located at the highest elevations, generally above 7,500 feet. These areas generally have shallow, granite-based soils. Upland basins and meadow systems occur between 4,500 and 8,000 feet elevation. These contain shallow to fairly deep soils in the meadow-dominated areas. Many steep river canyons exist which are predominately carved from marble and/or granite formations. The Kings River gorge is the second deepest canyon known in North America. The canyon areas are prone to landslides due to the steep terrain and periodic sloughing of rock. The upland areas and creek confluences contribute to the alluvial fans that form in foothill and savannah areas from sea level to 4,000 feet.

Geologic features, historic travel routes, recreation demand, and the need for resource utilization have played a significant role in where roads have been located on the Forest. Roads have evolved over time or been constructed in areas with unstable geologic features including landslides, very steep terrain and faults. Road placement, in some instances, has altered the integrity of aquatic and terrestrial habitats utilized by a variety of species. Some roads, for example, were developed from historic foot or wagon trails into roadways. As a result, some roads are in close proximity to streams. These roads may parallel a stream for one or more miles and cross the stream at multiple locations. These crossings provide a mechanism for large inputs of sediment to enter the stream system that may alter channel morphology and affect aquatic species habitat, especially if the road is poorly maintained.

Some watersheds contain a series of parallel ridges (i.e. Eshom area), which have resulted in a high road density per square mile as people have accessed each sub-watershed for various uses. High road density may contribute to illegal game harvest, road related mortality, increased predation due to lack of hiding cover, increased fragmentation of habitat, and altered habitat use. These factors have the potential to lower habitat suitability for wildlife in general, and in some instances, may negatively influence the presence and persistence of rare or sensitive aquatic and terrestrial wildlife species of concern. Roads may also influence rare botanical species or communities on the forest

through road maintenance activity or illegal road use. The road density, location and condition factors can also contribute to the introduction and spread of noxious weeds.

The Sequoia National Forest is identified as the southern extent of Pacific fisher, American marten and great gray owl in the State. It is also nesting and foraging habitat for California condor, Northern goshawk and California spotted owl. There is also habitat for several aquatic species including foothill yellow-legged frogs, mountain yellow-legged frogs, and Western pond turtles. Historically there have been wolverine, Sierra Nevada red fox and California red-legged frogs, for which habitat may exist.

The GSNM encompasses a portion of the largest concentration of giant sequoias in the world. Several of the groves are accessible to the public by roads and some include recreation sites. Road types providing grove access by vehicles range from Maintenance Level 1 to 5. Approximately half of the groves were logged in the mid to late 1800s while under private ownership and many of the old railroad beds and skidways have become classified as roads.

There are six botanical areas established within Sequoia National Forest. Table 6 lists the botanical areas, their acreage and the Ranger District on which they can be found.

Table 6: Botanical Areas within Sequoia National Forest

Botanical Area	Acres	Ranger District
Bodfish Piute Cypress	310	Greenhorn Ranger District
Inspiration Point	270	Greenhorn Ranger District
Ernest C. Twisselmann	860	Cannell Meadow Ranger District
Bald Mountain	440	Cannell Meadow Ranger District
Baker Point	780	Hot Springs Ranger District
Slate Mountain	490	Tule River Ranger District

Another botanical area was proposed under the 1990 Sequoia National Forest Mediated Settlement Agreement and is associated with Freeman Creek Sequoia Grove on Tule River Ranger District. Also a research natural area for Jeffrey Pine was established for Church Dome encompassing 1,380 acres within Dome Land Wilderness on Cannell Meadow Ranger District.

Use Patterns

Historically, the main uses of the road system have been tied to commodities including grazing, timber production, and hunting. The various Native American communities have used the roads to access plant gathering sites, and for cultural or spiritual purposes. There has been an increased desire by people to go to the forests and mountains for various social and spiritual pursuits.[12] These include the need for solitude, getting away from the valley heat, fog, seeing snow, exploration, picnicking, camping, driving for pleasure (including 4 wheel driving, using Off Highway Vehicles and Over Snow Vehicles), hiking and cultural activities including rites at sacred places.

[12] Cordell, et al.

According to the Forest Recreation Officers, forest use patterns have been changing over the past 10 to 20 years. More people are coming on a daily basis to recreate than for the commodity uses. More extended families are visiting designated day use and camping areas, whereas more individuals are visiting backcountry areas. There is more diversity in the desires of the visiting public, which include amenities such as flush toilets and showers at campgrounds, more roads suitable for travel by passenger vehicles (sedans), and the desire for more solitude. About one million new immigrants arrive in the United States of America each year, and about 81 percent of forest visitors are from urban areas according to the National Survey on Recreation and the Environment. Many of these new visitors to National Forests have different expectations or little understanding of a land ethic in terms of public land stewardship.[13]

The Sequoia National Forest had an active traffic surveillance-monitoring program collecting data on 80 roads from 1977 to 1982. Kern, Tulare and Fresno counties and the state of California (Caltrans) continue to monitor their traffic yearly. According to Tulare County, traffic has grown an average of three percent per year for the last decade. To make the figures in Table 7 relevant to each other, the 1994 and 1982 road counts were inflated to the year 2001 assuming that the use of these roads would increase at the same rate as the county roads. Table 7 displays projected traffic volumes on the state highways, county roads and major Forest Roads entering or passing through the Forest and/or monument. Additional traffic data on collector and local roads within the monument and forest is on file at the Forest Headquarters in Porterville. The data on Forest and county roads was only collected during the summer months and is hence referred to as SADT (Seasonal Average Daily Traffic). Caltrans data is entitled ADT (Average Daily Traffic), as it is monitored for an entire year.

[13] Ibid.

TABLE 7: Traffic Surveillance Projections on Roads entering the Forest or Monument

Road	Average Daily Traffic (ADT) 1994 Survey	Seasonal Average Daily Traffic (SADT) 1982 Survey	Average Daily Traffic (ADT) 2001 Survey
13S09 (Ten Mile) – Hume Lake*		580	
14S02 (Burton Pass) – Hume Lake*		61	
14S11 (Horse Corral) – Hume Lake*		461	
21S50 (North Road) – Tule River*		135	
21S94 (Crawford) - Tule River/Hot Springs*		28	
22S05 (Sherman Pass) – Cannell Meadow		113	
22S82 (Lloyd Meadow) – Tule River/Hot Springs*		284	
23S05 (Capinero) - Hot Springs*		82	
23S16 (Sugar Loaf) – Hot Springs*		172	
24S15 (Portuguese Meadow) – Hot Springs		72	
27S02 (Piute) - Greenhorn		38	
28S06 (Breckenridge) – Greenhorn		18	
SH 155 (Greenhorn Summit)			290
SH 180 (Park Boundary)*			2300
SH 190 (Quaking Aspen)*			420
SH 245 (Junction with SH 180)*			550
SH 178			3800
SM 50 (Between Johnsondale and SM 107)*	307		
SM 99 (Johnsondale)*	566		
SM 107 (At south end near SM 50)*	271		

*These roads enter the GSNM.

Of note are specific roads with high amounts of average daily traffic. State highway 178 has the highest rate of any route accessing the forest or monument. It is the main access route between Bakersfield and the Kern Valley. This route is used daily by commuters living in the Kern Valley and working in Bakersfield. It is also a main access route for people living in the southern San Joaquin Valley and Los Angeles basin areas to reach Lake Isabella for recreation. The next highest ADT is for state highway 180 and the SADT for Forest Road 13S09. These roads provide access to Sequoia and Kings Canyon National Parks and Hume Lake Christian Camp (the largest Christian camp in the nation) as well as the northern portion of GSNM. Also, highway 180 is the recommended route for all tour bus traffic entering Sequoia and Kings Canyon National Parks.

Based on current trends, future demand for recreation access is expected to continue to grow while access needs for commodity production is expected to be lower than in the

past. Funds to maintain the current road system using current sources are expected to decrease (Table 5). New road construction is expected to be limited in scope.

The National Survey on Recreation and the Environment 200014 shows surveyed user priorities for Forest Management in descending order:

Manage for Protection (Avg. 74.0 percent)

- Protect streams and other sources of clean water
- Provide habitat and protection for abundant wildlife and fish
- Protect rare, unique or endangered plant and animal species

Manage for Amenities (Avg. 61.6 percent)

- Maintain national forests for future generations to use and enjoy
- Provide quiet, natural spaces for personal renewal
- Use and manage forest areas in ways that leave them natural in appearance
- Provide information and educational services about forests, their management and the natural life in them

Manage for Outputs (Avg. 38.1 percent)

- Provide access, facilities and services for outdoor recreation
- Emphasize planting and management of trees for an abundant timber supply
- Provide access to raw materials and products for local industries and communities
- Provide roads, accommodations and services to help local tourism businesses
- Provide permits to ranchers for livestock grazing (i.e. cattle and sheep)

Unroaded areas

There are several wilderness and inventoried roadless areas within the Forest that are being managed for the unroaded values they contribute to the landscape. Forest-wide there are approximately 23,800 acres of Monarch Wilderness, the 10,500 acre Jennie Lakes Wilderness, 111,146 acres of Golden Trout Wilderness, 24,410 acres of the South Sierra Wilderness, the 94,695 acre Dome Land Wilderness, and 44,000 acres of the Kiavah Wilderness. Approximately 5,000 acres of the Golden Trout Wilderness and approximately 9,000 acres of Monarch Wilderness are also in the GSNM. Inventoried roadless areas within Sequoia National Forest are Moses Mountain, Slate Mountain, Black Mountain, Dennison, Lion Ridge, Rincon and Agnew. Inventoried roadless areas within the GSNM include all or parts of Moses Mountain, Slate Mountain, Black Mountain, Dennison, Lion Ridge, Rincon and Agnew. Approximately half of the Kings River Special Management Area, encompassing 22,450 acres, is also within the GSNM. The unroaded areas are generally important socially both for the visiting public, and for the segment of public that find inventoried roadless and wilderness areas have passive value, i.e. that

[14] Ibid.

these areas are important to be maintained, even though the people may have no intention of visiting.

Benefit, Problem and Risk Assessment

Road Analysis Process evaluation criteria were created based on specific topic areas described in the FS-643 miscellaneous report. These topics include ecosystem functions and processes; aquatic, riparian zones and water quality; terrestrial wildlife; economics; commodity production in terms of timber, minerals and range management, water production, and special forest products; special use permits; general public transportation; administrative uses; protection; road-related and unroaded recreation; passive use values; social issues; and civil rights and environmental justice.

Some topic areas are best evaluated at the more site-specific scale than at the forest scale. Some of the data becomes so diluted at the broad scale that everything appears to have low impacts, when at the more site-specific scale negative impacts can be seen and evaluated. The Sequoia National Forest Road Analysis Process has been conducted at a broad, forest (SNFPA watershed level) scale to identify overall trends (See SNFPA Appendix T and FSM 7712.13 for discussion of scales). In addition to the forest scale RAP, the Roads Policy and FSM 7700 recommend conducting watershed or project level RAPs if necessary.

The evaluation criteria developed for the SQF RAP are (See Appendices C and D for full description of each criterion):

A. Aquatic Risk Factors
    1) Geologic Hazard
    2) Stream Crossing Density
    3) Riparian Zone – Stream Proximity
B. Terrestrial Risk Factors
    1) Heritage Resources
    2) Road Density Effects to Wildlife Habitat
    3) Scenic Resources
C. Access Factors
    1) Private/Non-recreation Public Access
    2) Public Access (Recreation)
    3) Administrative Site Access
    4) Vegetation Management
    5) Fire Protection
D. Social Factors
    1) Lifestyle, Attitudes, Beliefs & Values
    2) Economics

The interdisciplinary team used evaluation criteria to generate an information baseline against which the existing and future road systems can be compared. They then went back through questions to describe the baseline and any apparent benefits, problems or risks of the current road system (FS-643 pp.24-30). The following is a discussion of this analysis

by topic area. Maps addressing the aquatic risk factors, road density effects to wildlife habitat and vegetation management were created as part of the analysis process.

Ecosystem Functions and Processes

There are few roads that are on highly unstable geologic features so this risk is generally moderate to low. The majority of the monument road system is on areas with moderate geo-hazard risk and a few roads are on areas with low geo-hazard risk. The roads identified on the northern portion of GSNM with high geo-hazard risk are generally good potential candidates to decommission because there is little use and recurring resource concerns. The main use of several roads in the northern portion of the GSNM is vegetation management. As the vegetation matures and reaches the desired condition as specified under an appropriate land management plan, the administrative need for the road decreases, which would affect its matrix rating. On the southern portion of the monument over half of the roads rated as high geo-hazard risk areas are also moderately to highly important for access.

Outside the GSNM the geo-hazard is generally moderate to low except in the Erskine Creek drainage. Throughout this drainage the geo-hazard risk is rated high. Several of the roads in Erskine Creek drainage are also highly important for various access needs.

Aquatic, Riparian Zone and Water Quality

This analysis used watershed boundaries (SNFPA 5th field watershed) to evaluate the aquatic resources, so this portion of the RAP was conducted at the watershed scale instead of the forest scale (FSM 7712.13). The analysis showed that perennial and intermittent stream crossings were not necessarily an issue in comparison to the road's proximity to these streams. At the monument and forest scale, the analysis of road stream crossings and road proximity to perennial and intermittent streams gives a good starting point for further analysis at the Landscape level as defined in the 2001 Sierra Nevada Forest Plan Amendment. Perennial and intermittent streams are the primary habitat for fish and other aquatic species rather than ephemeral streams. However, there are a large amount of ephemeral streams on Sequoia National Forest and in the GSNM. The addition of ephemerals into the equation could drastically change the analysis results and show more roads with an elevated risk both in terms of stream crossings and stream proximity.

Throughout the forest and monument, most roads were rated low risk in terms of stream crossing density. A few roads rated moderate and even fewer rated high. Those that did rate high were mainly short roads, less than a mile on average, with one or more stream crossings.

In terms of riparian zone proximity, there was a wider and more balanced range of roads that were high, moderate or low risk. Several of the main administrative and public access routes follow creeks and provide recreation access directly to these stream courses through developed and dispersed recreation sites.

Prior to developing future road projects, the stream crossing density and stream proximity evaluations will need to be conducted as part of the roads analysis at the more detailed landscape scale as described by SNFPA Appendix T.

Terrestrial Wildlife

The analysis showed that along the major travel corridors, there is higher potential of habitat loss. This loss is mainly in the form of fragmentation, i.e. roads creating breaks in suitable habitat. Overall the monument road system has a moderate risk to wildlife habitat, and the non-monument road system has a low to moderate risk to wildlife habitat. Specific locations that are main recreation destinations tend to be heavily roaded and are therefore moderate to high-risk areas in terms of wildlife habitat loss. Wildlife research has shown ML 3 roads tend to have the highest impacts to wildlife because they are maintained for higher speed use, and are still a narrow corridor that wildlife will regularly cross.[15]

There are several roads that have objective and operational maintenance levels recorded in the Forest Transportation Atlas, which are known to exist at a completely different maintenance level on the ground. As a result, the evaluation criteria weighting on ML 3 roads as the highest risk to wildlife should be reviewed at the SNFPA landscape and project levels, and RAP watershed and project levels to ensure that the roads on site are correctly identified in the Forest Transportation Atlas. Prior to starting a watershed-scale RAP, inventories of all classified and unclassified roads in that watershed will be conducted and any previously unmapped roads would be mapped (FSM 7712.14). Condition surveys, especially for ML 3 roads, and correcting the ML and the road management objectives (RMO) in the appropriate databases could be done at that time. The Atlas could also be updated at that time.

Economics

Over 61 percent of the forest road system (71 percent of monument road system) is in lower maintenance level roads (ML 1-2) with corresponding lower costs of maintenance. The lower the maintenance level number, the less it generally costs to maintain, and there are fewer requirements to make these roads accessible for passenger cars. In the forest and monument, respectively, approximately 52 to 55 percent of the Local roads from Table 3 are Maintenance Level (ML) 1, and 48 to 45 percent are ML 2. Over half of the local roads on the forest and monument have the least cost to maintain of all the system roads. Approximately 30 percent of the roads within the forest and GSNM have moderate to very high maintenance costs due to their objective maintenance levels. These are the level 3, 4 and 5 roads that are required by public laws to be maintained to a minimum safe standard.[16]

[15] Thomas, J.W., H. Black Jr., R. J. Scherzinger and R. J. Pedersen. 1979. Deer and Elk, Chapter 8, IN: Wildlife Habitats in Managed Forests the Blue Mountains of Oregon and Washington. Jack Ward Thomas Technical Editor. Agricultural Handbook No. 553. U.S. Department of Agriculture, Forest Service. Sept. 1979.
[16] Highway Safety Act of 1966 (PL 89-564).

Given the current road funding sources, it is not feasible to maintain the current forest or monument road system to standard under the current and expected budget allocations as shown in Table 8 (Derived from Tables 3 and 4 on pages 5-6 of this document).

Table 8: 2001 Road Work Activity Costs to Maintain Five Percent of Forest or GSNM Roads

Road Activity	Cost per Mile	Forest Road Maintenance Target (Miles)	Forest Road Maint. Cost	GSNM* Road Maintenance Target (Miles)	GSNM* Road Maint. Cost
Maintenance Level 1	$6,655	26	$173,030	18	$119,790
Maintenance Level 2	$9,292	24	$223,008	14	$130,088
Maintenance Level 3	$19,475	17	$331,075	7	$136,325
Maintenance Level 4-5	$61,070	15	$916,050	6	$366,420
Total annual cost to maintain road system			$1,643,163		$752,623
Annual forest-wide road maintenance budget			$491,300		$491,300
Annual short fall for road maintenance			($1,151,863)		($261,323)

*The miles with the GSNM are a subset of the Sequoia National Forest miles.

As shown above, the current annual road maintenance budget is only sufficient to cover the anticipated maintenance needs on 54 percent of the ML 4 and 5 roads forest-wide. This means that the remaining ML 1, 2 and 3 roads would receive **no** annual maintenance. Only 28 percent of the GSNM road system was partially maintained (minimal maintenance performed) in fiscal year 2001. The amount of deferred maintenance is expected to continue to increase, and the lower standard roads (ML 1-3) will degrade quicker because they are native surfaced and lack adequate maintenance. This table assumes that the individual roads would be maintained to full maintenance standards and requirements. The forest is annually maintaining several roads to a partial standard. On ML 3-5 roads, the focus is on major safety items and the other, deferred maintenance items are delayed.

Funding sources to maintain roads are limited. As discussed earlier, the reduction in timber sales has greatly reduced road maintenance funds from timber sale receipts. There are no recreation fees available to supplement the annual maintenance funds, and there is no prospect of recreation fees becoming available in the near future. Gas Tax funds may become available from the Federal Highway Administration to improve and maintain some of the Public Forest Service Roads (PFSR) within the forest and monument. Public Forest Service Roads are generally ML 3-5 roads that are subject to the Highway Safety Act (some of the roads identified in Table 7 are potential PFSRs). Two examples of potential PFSRs are Sherman Pass Road (22S05) and Tenmile Road (13S09). Sherman Pass Road has the third highest east-west passage crossing over the southern Sierra, and Tenmile Road has also been identified in the Sequoia and Kings Canyon National Park's Draft General Management Plan as the preferred route to direct traffic toward Hume Lake and reduce congestion in the Grant Grove area (Highway 180).

Socioeconomics

Sequoia National Forest and GSNM are in portions of Fresno, Tulare and Kern Counties. These three counties are leaders in the state of California and the nation in agricultural products. All three counties may experience some socio-economic effects from active management of forest vegetation and/or from tourism, primarily in levels of employment in the agricultural, manufacturing (woods work, mill), service (hotel/motel), and retail sectors. It is important to understand that in the San Joaquin Valley as a whole, unemployment is consistently higher then the statewide average, which reflects the seasonality of the agricultural economy and the excess growth rate of the labor force over job creation. While all three counties enjoy some measure of tourist-related economic activity, much relating to national forests or parks, this is a relatively small proportion of the service and retail sectors. This activity is somewhat more important than the numbers would suggest because it is activity partially generated from outside these counties rather than inside. Similarly, the woods work and mill jobs, while relatively small in number (about 100 in Tulare County), are more significant economically because they are not related to the needs of local residents as much as to the demand for products elsewhere.

Commodity Production-timber management, minerals management, range management, water production and special forest products

In general, there are enough existing roads to meet the current and expected demands for commodity production on Sequoia National Forest at this time. The current road system is adequate to support a much larger program of commodity production than is expected in the next decade. The road system is more than adequate to maintain the current plantations, though the quality of these generally low standard roads is deteriorating due to lack of maintenance. The new guidelines in the SNFPA, and future guidelines from the GSNM plan may affect the need for roads in certain locations and for specific activities. The decline in commodity production has led to a decline in funding for road maintenance, and has resulted in a larger backlog of deferred maintenance on the Forest Road System as discussed earlier in this document.

Special Use Permits

A few roads are under special use authorization. These roads tend to be short, adequately maintained, and also tend to be low risk to resources. Some of these roads exist solely to access private property surrounded by National Forest System lands. Other special use roads provide access to resorts, recreation residences, organization camps, communication sites, apiaries and other authorized uses. Most of these Special Use Permit (SUP) roads have a requirement that the permittee maintain the roadway to a specific maintenance level.

General Public Transportation

The current road system provides a fairly wide range of destinations available for various public uses. Many roads are highly important for public access both to the monument, and non-monument areas including Lake Isabella and the Kern Plateau. Other roads are rarely or never used for public access. These rarely used roads are often short spurs leading to

plantations or other areas with little appeal for recreation or other public uses. In the monument, approximately 40 percent of the current road system is identified as ML 1, which is defined as closed to vehicular traffic. However, only an estimated 50 percent of these ML 1 roads are actually closed to vehicle use. On the non-monument portion of the Forest, approximately 32 percent of the current road system is identified as ML 1, and again, only an estimated 50 percent of these ML 1 roads are actually closed to vehicles.

This road system does seem to provide adequate access to the various public destinations, though there are some concerns. First, many of the roads were not built for the type of use they are receiving, and second, most of the roads are currently not getting the planned level of maintenance.

Administrative Uses

At this time there is adequate road access to serve the current administrative activities within the GSNM and the Forest. Several of the roads used for administrative purposes are also used for dispersed recreation, while others are closed to public vehicle use. However, within the monument there may be minor changes needed to the road system to more effectively manage the sequoia resources. There is also the administrative issue of roads in use at maintenance levels that are different than the recorded operational or objective maintenance levels in the Forest Transportation Atlas.

Protection-fuels

Within the forest and monument approximately half of the road system is highly important for fire protection purposes. On the non-monument portion approximately one third of the road system is highly important for fire protection purposes. These roads are either important strategic locations for stopping wildfires, or provide access to important strategic locations. Throughout the GSNM and Forest, several roads were rated as moderately important, and about one third of the road system was considered low importance for fire protection. The low importance roads were generally the short spur roads leading to plantations or natural features such as meadows. However, as the focus of fuels management changes from prevention to more active fuels management, the needs for the road system are expected to change. The deteriorating condition of most roads poses another concern. As the roads deteriorate, it becomes more difficult for fire suppression forces, specifically the new larger engines, to maneuver on these often steep narrow roads.

Social Issues

Sequoia National Forest personnel have gathered information for several years from various public involvement efforts on recreation use, specifically four-wheel drive and off-highway vehicle use. However, none of the existing data is specific to road use of the GSNM by the recreating and non-recreating public. The interdisciplinary team in concert with the GSNM team identified a need to gather information from the public in terms of their lifestyles, attitudes, beliefs and values regarding the GSNM road system. The RAP interdisciplinary team developed a public involvement package in order to adequately evaluate the social environment.

Members of the public who had expressed interest in monument planning or roads on Sequoia National Forest were sent a package regarding the RAP process within the GSNM on January 7, 2002. The package included a summary of the RAP process and how it related to the monument planning process, a Road Use Data Sheet, evaluation criteria regarding lifestyles, attitudes, beliefs and values, a chart listing most of the classified roads in the monument and a map showing all the classified roads in the monument. A glitch in the computer link between the map and the database to create the transportation layer prevented including all the classified roads in the DRAFT Public/Social Access Factors Chart. This problem was disclosed to the public because not all roads would be listed in the chart. People were asked to review the package and then fill in the Road Use Data Sheet and the DRAFT Public/Social Access Factors Chart and return them to the RAP team leader by February 22, 2002. The packages were sent to over 3,500 addresses and as of June 28, 2002 there were 501 responses. This is a 14 percent response rate. Some of the respondents represented organizations of 265 to 500,000 members.

Special interest groups, other governments and other state and federal agencies were contacted to participate in the RAP. The Tule River Indian Tribe participated in the RAP through two meetings between the RAP interdisciplinary team leader and the tribal liaison. Members of the Dunlap Band of Mono Indians were contacted, specifically those with interest in rancherias within the boundaries of the Hume Lake Ranger District. No one representing the Dunlap Band or associated with the rancherias responded to the public involvement process. The Tule River Tribe and agencies including Sequoia and Kings Canyon National Park, Mountain Home State Forest and CalTrans submitted letters with specific items of clarification or correction to add to the public/social access evaluations. These items were incorporated into this report and the supporting documents to better reflect the needs of these stakeholders in the road system. The California Four Wheel Drive Association requested that the RAP be presented at their annual meeting on February 9, 2002. The interdisciplinary team leader made a presentation at the meeting. A second meeting was held on February 18, 2002 between members of the Cal. 4WD Association and OHV coordinators for the Hume Lake, Tule River and Hot Springs Ranger Districts. Forest Service personnel reiterated the same points brought out in the February 9 meeting at this second meeting.

The RAP team planned to repeat the public involvement process during the summer of 2002 for the remainder of the Sequoia National Forest. Unfortunately the early and intense fire season culminating in the 150,000 acre McNally Fire on the Sequoia National Forest prevented implementing this plan. The Forest Management Team agreed to use the data gathered from the GSNM public involvement effort compared to the National Survey on Recreation and the Environment findings to extrapolate social issues on the non-monument portion of the forest. Additional information will be gathered from the public during appropriate more site-specific analyses.

Only 15 percent of the respondents have been using the monument area for 10 years or less. About 25 percent of the respondents have been using the monument area for 10 to 30 years. Over 60 percent of the respondents have been using this area for over 30 years, 10 percent of which have been using it for over 70 years. The longest use estimate is from the Tule River Tribe with a timeframe between 5,000 and 8,000 years. These responses

seem to indicate a high proportion of the respondents are from local areas (i.e. California, mainly Los Angeles Basin and San Joaquin Valley areas). The 1999-2001 National Survey on Recreation and the Environment Report produced by the USDA Forest Service and the University of Tennessee was used for comparison purposes where applicable.

The length of time people and their descendents have been using or living in or near the non-monument portion of the forest are assumed to be similar to those within the monument. It has long been known that the Kern Valley is a destination for people living in the southern San Joaquin Valley, the LA Basin and desert areas to the southeast. As with the monument portion, there are ranch families, descendents of homesteaders, and Native Americans (Dunlap Band of Western Mono, Tubatalatal, etc.) with very deep ties to the area and long histories of use.

On an annual basis, over 40 percent of the respondents use or live within the monument boundaries for more than six months out of the year. About 35 percent use the monument one to six months out of the year, with the assumption that the bulk of this use is during the summer. About 22 percent of the respondents use the monument for a day to a week per year and less than one percent has never used it. Outside the monument the use more than six months out of the year is probably less in some areas because there are fewer resorts and recreation residences tracts in the non-monument portion.

Several of the respondents wrote about their families' experiences over the generations using and enjoying this area. There were a few stories from families that homesteaded this area before the Forest Service even existed. Many expressed the need to maintain their connection with these mountains, and the desire to pass their various traditions of using the forest down to their children and grandchildren. This sentiment is certainly shared by people about the non-monument portion as well.

Several people commented on the need to maintain access both for resource management, but also to allow the public to see and appreciate the groves. Several people mentioned that the monument was an unnecessary designation because the resources are already protected. Many of these same individuals were concerned that certain special interest groups will close off the monument to the people who have lived in and around it for generations. Twenty four percent of the respondents supported the idea of adding roads to groves to increase tourism and management.

Several respondents wanted to ensure the sequoias and other features of the monument are protected. The most common suggestions were to eliminate roads, specifically logging roads. Many of these individuals also were very concerned about the user-created roads and the use of 4WD, OHV and OSV within the monument. Sixteen percent of the respondents supported the idea of eliminating all roads possible in groves.

Outside the monument, there is also the concern about protecting natural and cultural features. There is also the mix of public opinion on whether to eliminate logging and user-created roads as well as 4WD, OHV and OSV use on the Forest. It is assumed there may be an increased desire to maintain the existing driving oriented recreation uses in the non-monument portion because of the reduction of these opportunities in portions of the

monument; specifically the motorized, mechanized use on designated trails instead of roads per the 2001 Presidential Proclamation.

Approximately 70 percent of the respondents to the public involvement effort wanted to keep the existing road system within the monument, and they want it to be a mix of road types similar to the existing mix. On the non-monument portion, the desire to keep the existing road system would result in a similar if not higher percentage. A few of the respondents felt the rating of preferences was not well designed.

Table 9: Road Type Public Preferences from RAP Public Involvement Process

Road Type	Respondents First Choice on Road Type (Percent)
Paved	32
Gravel	25
Dirt-usable by cars	24
Dirt-usable by high-clearance vehicles	24
No roads, only trails	5
No roads or trails	<1

Though 19 percent of the respondents wanted to increase the road system within the monument, many realized that the Forest is struggling to maintain the current road system. Eleven percent of the respondents want the road system reduced, mainly suggesting elimination of short spur roads and roads causing resource damage. There is no public involvement data gathered on the non-monument portion of the Forest to determine whether people want a more extensive road system in this area, which is generally less roaded than the monument portion.

In addition, respondents to the public involvement for the GSNM included a request to add bus tour routes within the monument. This request was added as one of the options for the RAP public involvement process. Of the 501 respondents to the RAP, 3 ranked it as their first choice (<1 percent), 15 as second (3 percent), and 27 as third (5 percent) and 9 wrote in a “no” category. Several respondents said bus tours would not work for two main reasons. The monument is physically separated by Sequoia National Park into a northern and southern portion and the road system is not configured for bus tours. There is no existing road system that is a direct route between the two portions of monument, and the current road system was not built for tour bus traffic. Several portions of the current road system are too narrow and winding to allow tour buses to travel safely. No data has been gathered on whether there is a desire to create a tour bus route through the non-monument portion of the Forest.

Review of the public comments in shows that many of the respondents have developed traditions and lifestyles associated with the GSNM and Sequoia National Forest. As one can see from Table 10 (See discussion under Roaded Recreation/Public Use) and the categories developed for the National Survey on Recreation and the Environment (NSRE), there is a lot of overlap and therefore similar results in some areas. As the NSRE conclusion states, “These early findings suggest that outdoor recreation is still a basic part

of the American lifestyle. As a matter of lifestyle, traditional land, water, snow and ice settings are still very much in demand as places for casual activities such as walking, picnicking, family gatherings, sightseeing and visiting nature centers or nature trails." The current forest and monument road system is a direct link to, and often an integral part of, these recreation and other traditional land uses as shown by the responses to the public involvement process.

Recreation-unroaded recreation and road-related recreation

There are no plans to build roads in unroaded areas in the GSNM or Forest. There are several roads rated by Forest Service recreation staff as highly important for recreation access, both for reaching specific destinations and driving for pleasure. In the northern portion of GSNM, roads were generally rated of either high or low importance, whereas in the southern portion of GSNM and the non-monument portion, most roads were either of high or moderate importance. The difference between the importance ratings in the northern and southern portions of the monument may be due to the differing layout of the road systems in conjunction with the locations of privately owned land, recreation destinations, and other non-recreation public access needs.

Roaded Recreation and Public Use

Many people use the road system for a variety of uses. Table 10 below lists the public response regarding the reasons they use roads in the GSNM. The primary reason for use is driving for pleasure. Several respondents commented on enjoying the ability to explore different areas of the forest by traveling different roads and following them just to see where they go. The second most common use was access for camping. The third most commonly selected use was to get to hunting and/or fishing areas. Some of the respondents noted that they hike roads that are gated, and there was a mix of opinion on whether these roads should be open to the driving public. Most respondents (68 percent) agreed that they want access maintained, as it presently exists.

It must be noted that the intent of the Roads Analysis public involvement was to focus on road use and not the overall recreation use of the monument. In light of this intent, a comparison with the National Recreation Survey (NRS) shows similar results. The top five NRS averages in order from most popular outdoor activity to least are:

- Individual Trail/Street/Road Activities (walking, bicycling, mountain biking, hiking and horse riding/equestrian),
- Traditional Social Activities (family gathering and picnicking),
- Viewing and Photographing Activities (bird watching, viewing other wildlife, viewing wildflowers and natural vegetation and viewing natural scenery),
- Viewing and Learning Activities (visiting nature center/nature trail/zoo, visiting prehistoric/archaeological site, visiting historic site),

- Driving for Pleasure Activities (sightseeing, driving for pleasure through natural scenery, and off road/4-wheel driving/ATV/motorcycle).[17]

The rest of the reasons for use within GSNM in descending order are shown in Table 10. As one can see four of the top six most selected reasons to use roads in the GSNM are also within the top five NSRE most popular outdoor activities as well. It is assumed that these percentages would be similar on the non-monument portion of the Forest because the majority (75 percent) of the respondents used the Forest for at least 10 years prior to designation of the monument.

Table 10: Reasons People Use Forest Roads within GSNM

Reason to use Forest Roads	Percent of Respondents Selected the Reason
Driving for pleasure	81
Get to a camping area	70
Get to hunting and/or fishing areas	61
Get to trail for hiking	58
Get to picnic area	57
OHV/OSV [18]	48
Get to resort/organization camp	45
Pass through to other land	40
Get to spiritually significant place	38
Get to forest product gathering area	30
Other	26
Get to special use permit site	22

Of the respondents who selected "Other," approximately 80 percent of them said they use roads to go to their private land or special use cabin. They did not select the available choices, "Pass through to other land" or "Get to SUP site." Of the remaining "Other" respondents, several mentioned using Forest Roads for fire escape routes, needing roads because age or disabilities have limited their ability to walk very far, mountain biking and cross-country skiing. A few mentioned the need to access their grazing allotments, the Tule River Tribe mentioned resource management, the Park Service mentioned access to Dillonwood Grove, and the California Department of Fire and Forestry mentioned access to Mountain Home State Forest. The public involvement process initiated a dialogue with the Park Service on several roads that cross boundaries between the agencies. The various needs mentioned were used to edit the administrative evaluation of the non-recreation public access criteria and are reflected in the Road Matrix. It is important that the landscape analyses for the non-monument portion of the forest capture this kind of

[17] Cordell, Ken, et al, 1999-2001 National Survey on Recreation and the Environment, USDA Forest Service and the University of Tennessee, Knoxville, Tennessee, pp.1-4.

[18] NSRE data shows that 17.5 percent of the population 16 or Older participated in Off Road, 4 Wheel Driving, ATV or Motorcycle use, whereas 52.1 percent participated in Sightseeing and 51.5 percent participated in Driving for Pleasure through Natural Scenery.

information during the public involvement effort, since it has not been captured at the Forest scale.

Civil Rights and Environmental Justice

Some of the respondents were concerned that as taxpayers they may be excluded from their public lands. These respondents expressed a general concern that certain special interest groups will close off the monument to the people who have lived in and around it for generations. This same concern has been raised concerning the non-monument portion of the Forest as well during site-specific projects.

There is also a concern from several respondents about reduced vehicle access for people who have disabilities that limit their ability to walk to sites. Some of the elderly respondents also mentioned concerns about their road access needs due to physical limitations as they've aged. They want to keep roads accessible by automobile because they now need to drive to areas they could have hiked to in the past.

The NSRE surveyed individuals to determine if different segments of society differ in their values toward the National Forests. For five National Forest values, the researchers broke down responses by individuals' ages, gender, race, income groups and education. One of these values is "Provide access, facilities and services for outdoor recreation." The importance ratings changed across each category evaluated. This forest value became increasingly important for segments of the population in the following categories:

- As people age (especially from age 45+),
- Females,
- Native Americans (much more important),
- Blacks (slightly higher importance),
- Income of $15,000 to $24,000,
- Individuals attaining up to and including an eighth grade education.[19]

Information of this type was not requested during the Road Analysis public involvement. However, the change in terms of age does coincide with the RAP responses received. Further study would be necessary to determine if different segments of society differ in their values toward providing road access within the GSNM and the Forest.

Issues

In accordance with Forest Service miscellaneous report FS-643, the interdisciplinary team identified road-related issues based on coordination with Forest and District line officers and the information obtained from the public involvement process (FS-643 pp.23-24).

There are six main issues associated with roads on the Sequoia National Forest, both within and outside the GSNM:

[19] Cordell, Ken, et al, 1999-2001 NSRE powerpoint presentation, Keeping Ourselves Informed about What the Public Values.

- Concern that roads will negatively affect the water flow within the watersheds for various reasons including the shallow, erosive soils, areas of steep terrain and proximity of roads to stream courses.
- Concern that adequate road access is maintained for private landowners, recreation and business users, administrative and vegetation management activities, and for fire protection.
- Concern the lifestyles and traditions associated with using roads for commodity production will have to change because the monument is no longer part of the suitable timber base for the forest.
- Concern the lifestyles and traditions associated with using roads for 4WD/OHV/OSV associated recreation will have to change because certain factions of the public want no 4WD/OHV/OSV use allowed in the monument or forest.
- Concern that roads have negative effects to the human dimension by allowing people to access and damage heritage resource sites, and create visually offensive scars on the land.
- Concern that roads have negative effects to wildlife by fragmenting wildlife habitat leading to species and suitable habitat declines.

Access is the primary public issue related to roads. For some of the public that means access should be maintained for "their" needs. Many visitors have strong family traditions and ties to certain areas, which have become a belief in the right to continue accessing these areas. Another part of the public wants access to be limited, specifically for OHV use, timber production, cattle grazing and other uses they deem damaging to the natural resources …(Forest Trail Plan FEIS, Appendix O).

The primary concern for land managers is to provide adequate access for public use and resource management, including recreation, private land, and vegetation treatment for fuels reduction, fire protection and wildlife habitat improvement. Within the monument specifically, the focus is on management of sequoia ecosystems and the other objects of interest as discussed in the 2000 Presidential Proclamation establishing Giant Sequoia National Monument.

The primary legal constraints on roads and roads management are the requirements to protect heritage resources, requirements to allow reasonable access to private in-holdings, and the standards and guidelines in the 2001 Sierra Nevada Forest Plan Amendment including the aquatic management strategy. The other constraint at this time is the budgeted road maintenance allocation.

Opportunities and Priorities

This portion of the report identifies the management opportunities, establishes priorities and formulates technical recommendations for the existing and future road system. These opportunities and priorities were developed using the issues, benefits, problems and risks identified in the preceding steps. The questions below are from the FS-643 miscellaneous report and guide the following discussion (FS-643 pp.31-33).

The RAP showed that most roads within the GSNM and Forest are used by both the public and Forest Service for a variety of reasons. The results of the analysis are summarized in Appendix B of this document. Appendix B.

Risk to Ecosystem Sustainability

Does the existing system of roads create an unacceptable risk to ecosystem sustainability?

Several roads rated as moderate or low geo-hazard risk have moderate to low access needs and have high risk for other resource risk factors. These matrix ratings make them potential candidates for relocation or removal after site-specific analysis is conducted.

Portions of the existing road system create risks to ecosystem sustainability. The roads that follow perennial and intermittent creeks generally have a higher impact on water flow and quality. There are also densely roaded areas within the monument and forest that are affecting the quality of wildlife habitat. Aquatic species and their habitat are being affected by the road stream crossings and the proximity of roads to creeks, particularly in the Erskine Creek area. However, the extent of negative effects is not certain at this scale. If the road system is not adequately maintained, the potential risks to the ecosystem are likely to increase in different areas mainly in terms of sediment yield to creeks. It is imperative that road effects to terrestrial and aquatic species habitat be revisited at a more site-specific analysis scale. More site-specific evaluation criteria may need to be developed to better address concerns within specific landscapes as well.

Budget Constraints-Current and Projected

Can the maintenance requirements of the existing system be met with current and projected budgets?

The limiting factor in road management at this time is funding. As stated repeatedly in this report, the current and predicted road maintenance budgets do not adequately fund maintenance of the existing road system (See Table 8). If Sequoia National Forest personnel used the current allocated road maintenance budget to bring roads within the forest up to standard, approximately 55 percent of the paved road system (ML 4-5) would be maintained; none of the native surfaced roads (ML 1-3) would receive maintenance. This has the potential to significantly affect the risks to the ecosystems and access needs if the road system continues to deteriorate at the current rate. Though there are social and economic factors that could benefit from more roads or roads at higher maintenance levels (ML 3-5) than currently exist, the economic feasibility does not exist. Maps 1-3 in Appendix B shows the “minimum road system” in terms of current and expected funding from current and expected sources. It may be better termed the “maximum affordable road system.” These few roads would become the minimum or backbone road system in accordance with FSM 7712.1 quoted on page 1 of this document because funding is the limiting factor at this time.

Projected Access Needs

Are some existing roads not needed to meet projected access needs?

Some existing roads have been rated low in importance for access both by the public and for administrative purposes. Some of these same roads have moderate to high resource risk factors, which may make them likely candidates to consider for decommissioning. Several of the roads have been rated high in importance for vegetation management. However, the vegetation management needs should decrease under the SNFPA as plantations reach maturity and no longer need maintenance. This may result in several more roads becoming available to consider for decommissioning in the next few decades. Depending on the GSNM planning effort, the road system may be altered due to changes in management direction.

Benefits and Risks of Proposed New Access

If new access is proposed, what are the expected benefits and risks?

At this time addition of new roads in the GSNM and Forest would be limited. Newly constructed roads are typically short, of local designation and related to a single need such as accessing new recreation opportunities, or serving a private piece of property surrounded by National Forest System land. Other existing roads are sometimes acquired through land acquisitions (purchases or exchanges). The alternatives in the monument planning process may affect the amount of roads within the transportation system. Annually less than one mile of road construction is expected within the GSNM or Forest. Within the monument, dependent on the management plan alternative selected, zero to one mile or more of road could be decommissioned or converted to trail annually. With little additional access proposed, the expected risks and benefits are minimal.

Opportunities to Change Existing Road System

What opportunities exist to change the road system to reduce the problems and risks or to be more consistent with forest plan direction and strategic intent of the roads system?

Several opportunities exist to change the road system to reduce problems and risks. The Road Matrix is a tool to identify the equivalent risk and need of each road as illustrated in Table 11 below.

Table 11: Potential Risk and Need Equivalent Combinations by Road

Risk Equivalent	**Need Equivalent**		
	Low/Low	Low/Moderate	Low/High
	Moderate/Low	Moderate/Moderate	Moderate/High
	High/Low	High/Moderate	High/High

Roads on which to consider changes include:

- Roads rarely used by the public or Forest Service (i.e. low need equivalent) and are high risk equivalent would be considered for decommissioning.
- Roads rarely used by the public or Forest Service (i.e. low need equivalent) and are low resource risk equivalent could be considered for decommissioning or storm-proofing.
- Roads accessing vegetation that has reached desired condition may be evaluated for decommissioning or storm-proofing.
- Roads frequently used by the public or Forest Service (i.e. moderate to high need equivalent) with moderate to high resource risk equivalent could be evaluated to relocate portions of the roads away from resource risks or create alternate access routes with fewer resource risks.
- Two or more roads accessing the same area, where traffic could be directed onto the more stable road and decommission the less stable road(s).
- Create a loop road to eliminate several spurs accessing the same area.

There would be an initial cost outlay to relocate, decommission roads, or convert roads to trails. The long-term effect would be reduced risk to ecosystems from deteriorating roads and potentially a smaller and more efficient road system to fund. A reduction in the road system mileage should allow the limited maintenance funds to be used on a larger proportion of the transportation system.

Several action items were identified that need to occur for decision-makers to be better informed on the road system:

- Update the current Forest Transportation Atlas with the information gathered in the RAP, and maintain the FTA.
- The current operational road maintenance levels need to be verified on the ground and the database corrected prior to implementation of projects that affect or are affected by the road system (FSM 7712.14).
- Additional evaluation criteria may need to be developed to fully determine effects at a more site-specific level (i.e. location of PACs, etc. in relation to roads). Table 12 below lists several of the questions from which potential evaluation criteria could be developed where appropriate.
- Reevaluate the objective road maintenance levels in light of the change in management objectives within the GSNM, and the national and local trends in road maintenance funding since these designations were last made (circa 1980).
- During ecosystem analyses for the non-monument portion of the forest capture private use and public transportation needs information during the public involvement effort, since it has not been fully captured during this Forest scale RAP.
- Review and modify road closure orders to help address the fact that only an estimated 50 percent of the ML 1 roads on the forest are actually closed to vehicular use.
- Use dialogue initiated during public involvement process to begin evaluating and addressing opportunities to work with other agencies and governments regarding

roads (i.e. National Park Service, CalTrans, Mountain Home State Forest, the Tule River Indian Reservation, etc.).

- Recognize that the RAP is a "living document" and an iterative process, so as the Forest Engineering staff updates the FTA based on watershed, landscape and project level analyses (See SNFPA Appendix T), new site-specific projects need to be based on the most current transportation system information available. FSM 7712 offers additional guidelines for when a forest-scale RAP is updated with changes in conditions, such as available funding, inventory and monitoring results, severe disturbance events (ERFO) or new regulatory requirements

Table 12: Questions to Guide Development of More Site-Specific Evaluation Criteria*

Question to be Answered
Ecosystem Functions and Processes (EF) (3): To what degree do the presence, type, and location of roads contribute to the control of insects, diseases, and parasites?
EF (5): What are the adverse effects of noise caused by developing, using, and maintaining roads?
Aquatic, Riparian Zone, and Water Quality (AQ) (7): What downstream beneficial uses of water exist in the area? What changes in uses and demand are expected over time? How are they affected or put at risk by road-derived pollutants?
AQ (9): How does the road system alter physical channel dynamics, including isolation of floodplains; constraints on channel migration; and the movement of large wood, fine organic matter, and sediment?
AQ (11): How does the road system affect shading, litterfall, and riparian plant communities?
AQ (13): How and where does the road system facilitate the introduction of non-native aquatic species?
AQ (14): To what extent does the road system overlap with areas of exceptionally high aquatic diversity or productivity, or areas containing rare or unique aquatic species or species of interest?
Terrestrial Wildlife (TW) (4): How does the road system directly affect unique communities or special features in the area?
Water Production (WP) (2): How does road development and use affect water quality in municipal watersheds?
Administrative Use (AU) (2): How does the road system affect investigative or enforcement activities?
Protection (PT) (4): How does the road system contribute to airborne dust emissions resulting in reduced visibility and human health concerns?
Unroaded Recreation (UR) (3): What are the adverse effects of noise and other disturbances caused by developing, using, and maintaining roads, on the quantity, quality, and type of unroaded recreation opportunities?
Road-Related Recreation (RR) (3): What are the adverse effects of noise and other disturbances caused by constructing, using, and maintaining roads on the quantity, quality, or type of roaded recreation opportunities?

*These questions and background information can be found in FS-643.

As stated throughout this document, there are several roads in use and being maintained at a maintenance level different than the recorded operational or objective maintenance level in the Forest Transportation Atlas (FTA). Correcting maintenance levels in the FTA to reflect existing conditions on the ground would improve the information available to resource specialists and decision makers in terms of roads and their effects on other resources. It should also make administrative decisions regarding road maintenance level more consistent throughout the monument and forest.

The costs and mileages described in this RAP report reflect conditions as of September 2001. The Forest Engineering staff has been updating the Forest Transportation Atlas based on both clerical errors found during the RAP analysis and field surveys conducted along roads since that date.

Appendix A
Glossary

Road Definitions:

- **Forest Road:** Any road wholly or partly within, adjacent to, and serving the National Forest System and which is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources (23 USC 101).
- **Public Roads:** Roads that are under the jurisdiction of and maintained by, a public authority that are open to public travel (23 USC 101(a)).
- **National Forest System Roads:** Forest roads under the jurisdiction of the Forest Service (23 USC 101).
- **Forest Transportation Atlas:** An inventory, description, display and other associated information for those roads, trails and airfields that are important to the management and use of National Forest System lands or to the development and use of resources upon which communities within or adjacent to the National Forests depend.
- **Classified Roads:** Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service (36 CFR 212.1).
- **Deferred Maintenance[20]:** Maintenance activities that can be delayed without critical loss of facility serviceability until the work can be economically or efficiently performed.
- **Low Standard Roads:** Forest roads constructed and maintained for use by prudent drivers in high clearance vehicles (such as pickup trucks, 4WD vehicles and sport utility vehicles) as opposed to ordinary passenger cars. These roads are low-standard, unsurfaced, single-lane roads with turnouts. They were designed to be driven at five to ten miles per hour.
- **Temporary Roads:** Roads authorized by contract, permit, lease, other written authorization, or emergency operation not intended to be a part of the forest transportation system and not necessary for long-term resource management (36 CFR 212.1).
- **Unclassified Roads:** Roads on National forest System lands that are not needed for, and not managed as part of, the forest transportation system, such as unplanned roads, abandoned travel ways, off-road vehicle tracks which have not been designated and managed as a trail, and those roads no longer under permit or authorization.[21]
- **Maintained for Public Use:** A Memorandum of Understanding with the Federal Highway Administration defines national forest system roads open to the public as those roads open to unrestricted use by the general public in standard passenger cars, including those roads on a seasonal basis or for emergencies.[22]
- **Decommissioning:** is defined as activities that result in the stabilization and restoration of unneeded roads to a more natural state (FSM 7703.2(1)). Decommissioning includes applying various treatments, which may include one or more of the following:

[20] Duck Creek-Swains RAP, version 1, April 2001
[21] Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 444
[22] Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 444

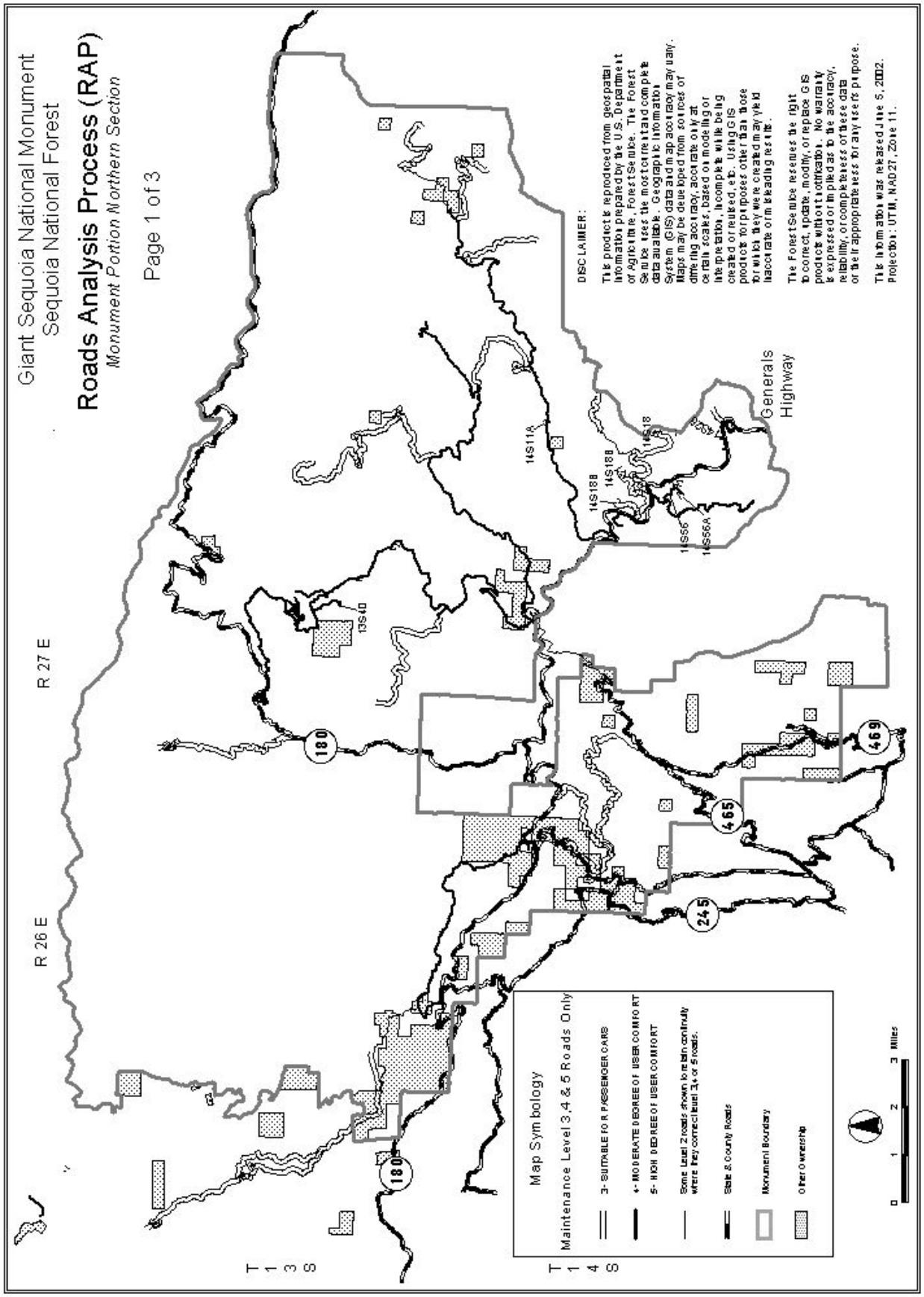
- Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation;
- Blocking the entrance to a road; installing water bars;
- Removing culverts, reestablishing drainage-ways, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed;
- Completely eliminating the roadbed by restoring natural contours and slopes; or other methods designed to meet the specific conditions associated with the unneeded roads.

Maintenance Levels:

- **Maintenance Level 5:** Roads that provide a high degree of user comfort and convenience. Normally double lane, paved facilities or aggregate surface with dust abatement. This is the highest standard of forest Service road maintenance.
- **Maintenance Level 4:** Roads that provide moderate degree of user comfort and convenience at moderate speeds. Most are double lane, paved surfaced though some may be single lane.
- **Maintenance Level 3:** Roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Typically, low speed, single lane, with turnouts and native or aggregate surfacing.
- **Maintenance Level 2:** Roads open for use by high clearance vehicles. Passenger car traffic is discouraged. Traffic is minor administrative, permitted, or dispersed recreation. Non-traffic generated maintenance is minimal.
- **Maintenance Level 1:** These roads are closed though some intermittent use may be authorized. When closed, they must be physically closed with barricades, berms, gates, or other closure devices. Closures must be in place for one year or more. When open, the road may be maintained at any other level. When closed to vehicular traffic, the road may be suitable and used for non-motorized uses, with custodial maintenance to protect adjacent resources.

Appendix B

Maps


Giant Sequoia National Monument
Sequoia National Forest
Roads Analysis Process (RAP)
Monument Portion Northern Section
Page 1 of 3
R 26 E
R 27 E
T 13 S
T 14 S
Generals Highway
180
245
465
469
13S40
14S11A
14S18B
14S18
14S56
14S56A
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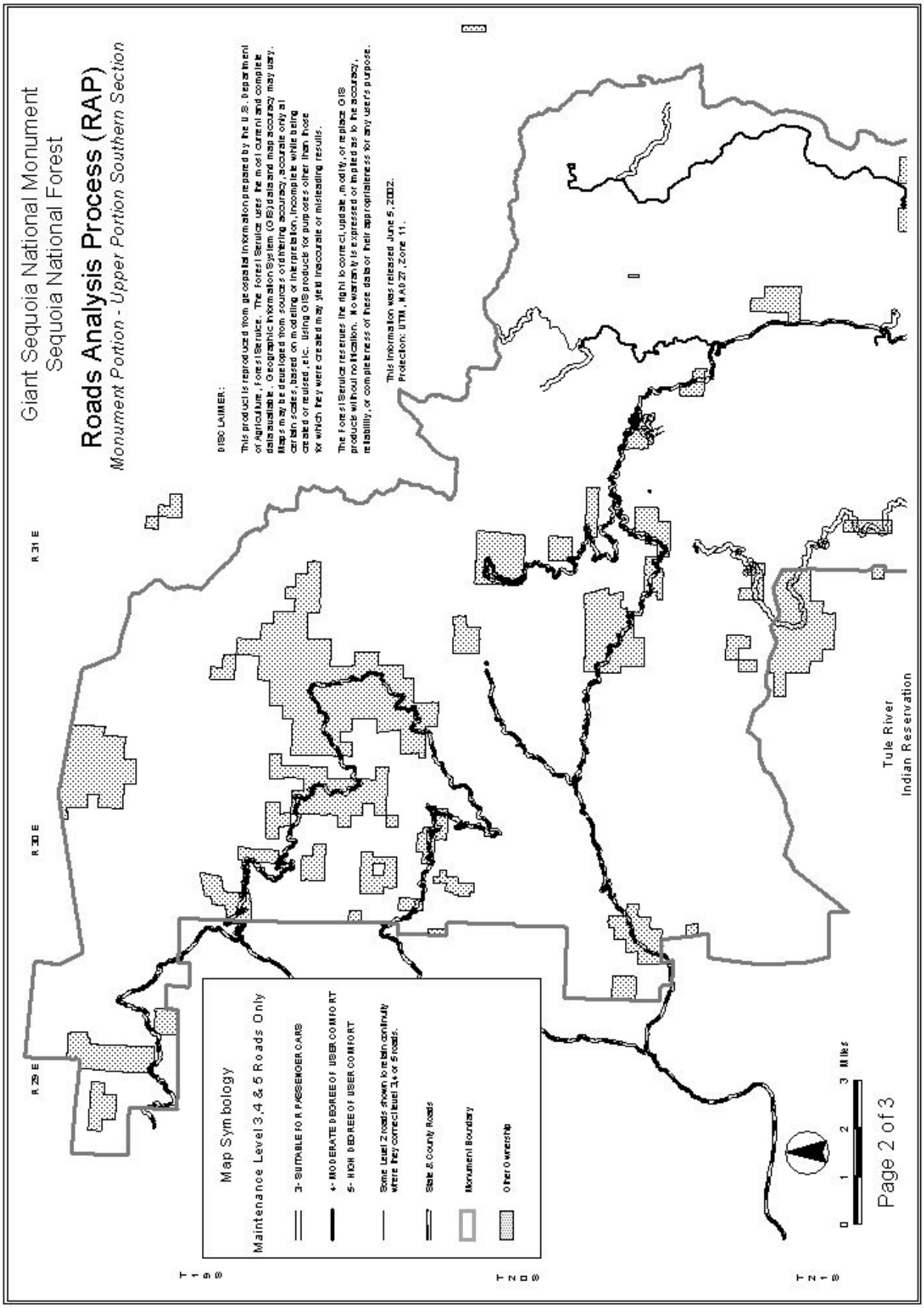
This information was released June 5, 2002.
Projection: UTM, NAD27, Zone 11.
Map Symbology
Maintenance Level 3,4 & 5 Roads Only
3- SUITABLE FOR PASSENGER CARS
4- MODERATE DEGREE OF USER COMFORT
5- HIGH DEGREE OF USER COMFORT
Some Level 2 roads shown to retain continuity where they connect level 3,4 or 5 roads.
State & County Roads
Monument Boundary
Other Ownership
0
1
2
3 Miles


Giant Sequoia National Monument
Sequoia National Forest
Roads Analysis Process (RAP)
Monument Portion - Upper Portion Southern Section
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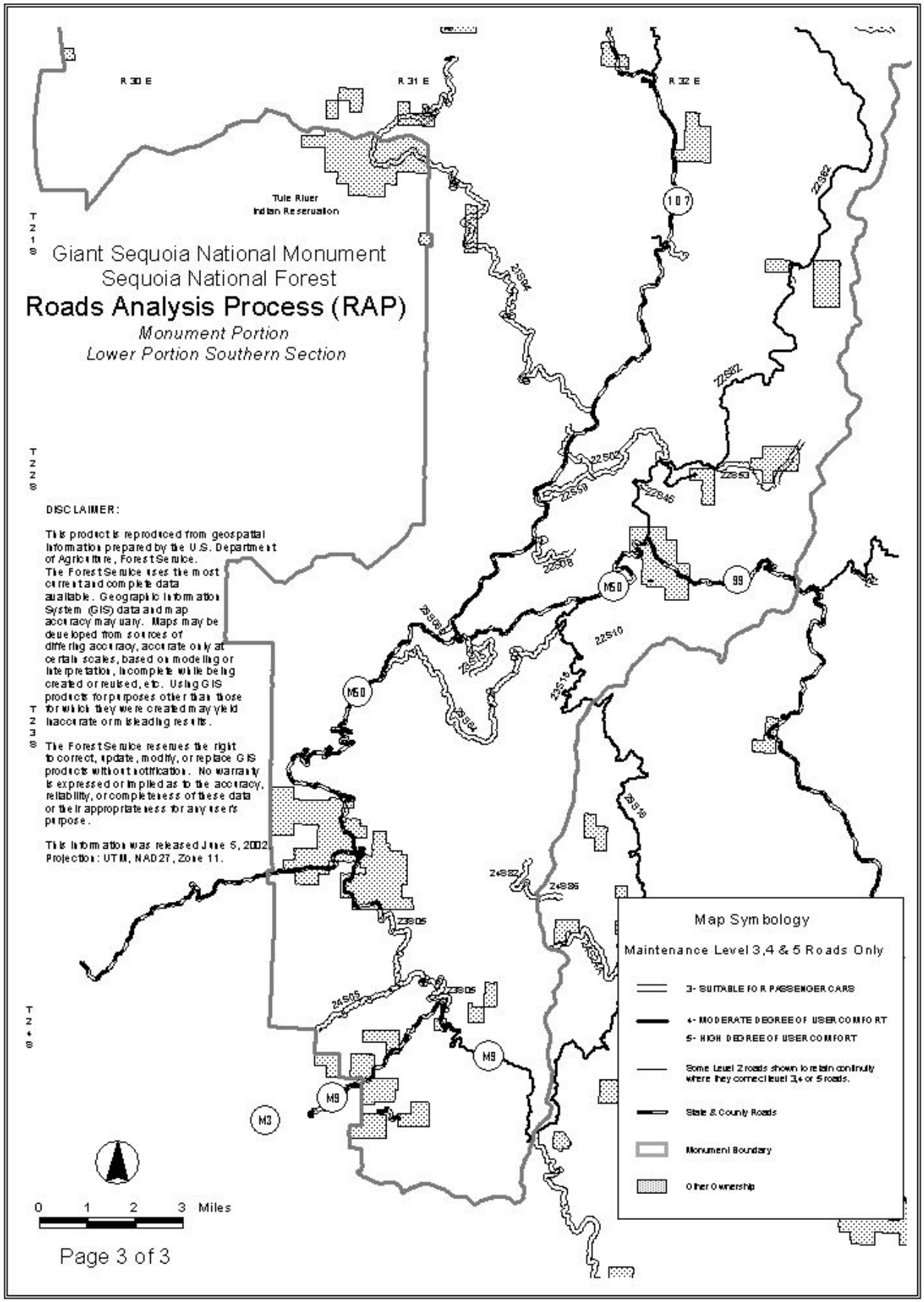
Projection: UTM, NAD27, Zone 11.
R 29 E
R 30 E
R 31 E
T 19 S
T 20 S
T 21 S
Tule River
Indian Reservation
Map Symbology
Maintenance Level 3,4 & 5 Roads Only
3- SUITABLE FOR PASSENGER CARS
4- MODERATE DEGREE OF USER COMFORT
5- HIGH DEGREE OF USER COMFORT
Some Level 2 roads shown to maintain continuity where they connect to 3+ or 5 roads.
State & County Roads
Monument Boundary
Other Ownership
0 1 2 3 Miles
Page 2 of 3


R 30 E
R 31 E
R 32 E
Tule River
Indian Reservation
T 21 S
T 22 S
T 23 S
T 24 S
Giant Sequoia National Monument
Sequoia National Forest
Roads Analysis Process (RAP)
Monument Portion
Lower Portion Southern Section
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0 1 2 3 Miles
Page 3 of 3