



Giant  
Sequoia  
National  
Monument

Transportation  
Specialist Report

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## Introduction

The presidential proclamation (Clinton 2000) establishing the Giant Sequoia National Monument (Monument) required preparation of a management plan. The required plan amends the existing 1988 Sequoia National Forest Land and Resource Management Plan (1988 Forest Plan), as amended by the 1991 Kings River Wild and Scenic River and Special Management Area Implementation Plan and the 2001 Sierra Nevada Forest Plan Amendment (2001 SNFPA). The proclamation (Clinton 2000) focused on certain resources and uses in establishing the monument, so that the proposed plan amendment also focuses on those areas in implementing the proclamation (Clinton 2000).

The Monument management plan may also incorporate the management direction provided by the 1990 Sequoia National Forest Land Management Plan Mediated Settlement Agreement (MSA) and the 2004 Sierra Nevada Forest Plan Amendment Supplemental Environmental Impact Statement (2004 SNFPA SEIS), as applicable, and to the extent that direction is consistent with the proclamation (Clinton 2000). Although the Monument plan environmental impact statement (EIS) must consider these sources of direction, the plan is not constrained by the requirements prescribed in these documents. The plan is informed by the best available science and is based on a thorough review of relevant scientific information and practical experience, per the proclamation (Clinton 2000) and planning direction, resulting in a plan which could be substantially different from current management direction.

The Monument management plan describes a long-term vision and the strategic management direction to guide management activities that move resources toward the desired conditions. This Monument plan defines the parameters (limits) for management activities and may offer the flexibility to adapt project level decisions to accommodate rapidly changing social and resource conditions.

The purpose and need of this management plan is to establish management direction for the land and resources within the Giant Sequoia National Monument, in order to protect the objects of interest, while providing key resources and opportunities for public use within the Monument. The objects of interest are generally identified in the proclamation (Clinton 2000), with the requirement that the management plan would provide direction for their proper care. Although many valuable objects of interest are identified, the proclamation (Clinton 2000) is also clear that the major purpose of the Monument is to protect and maintain the giant sequoia groves and the rare giants within their unique and natural habitat. Through public and agency dialogue, the objects of interest have been determined to be a mix of specific individuals/locations (e.g., specific caverns or named sequoias) and broad ecosystem processes (such as what occurs with sequoia groves and associated watersheds).

The proclamation (Clinton 2000) states that the Monument plan will provide for and encourage continued public and recreational access and use consistent with the purposes of the Monument. The proclamation (Clinton 2000) also states that the Monument plan will establish a transportation plan that provides for visitor enjoyment and understanding about the scientific and historical objects consistent with their protection (65 FR 24098). The transportation system would be managed for public use, related to recreation, special use authorizations, and private

land access. In addition, it would emphasize developing access points in coordination with gateway communities and other agencies to provide clear and welcoming entry into the Monument. The transportation system would also focus greater emphasis on providing access to the objects of interest and opportunities for traveling on loop roads and trails. In accordance with the proclamation (Clinton 2000), motorized vehicles, including over-snow vehicles, would be restricted to designated roads, and non-motorized mechanized vehicles (mountain bikes) would be restricted to designated roads and trails.

## **Current Management Direction**

The existing management direction in the 1988 Forest Plan and the Travel Management Rule provides for a road system that is commensurate with the level of management activities occurring in the Monument, providing appropriate access to the objects of interest for their proper care, protection, and management. Public use, related to recreation, special use authorizations, and private land access, is an important, but secondary need and does not conflict with the proper care, protection, and management of the objects of interest. Current management direction requires that the road system be sized and maintained to limit impacts to aquatic and terrestrial habitats.

## **Description of Proposal**

### **Desired Conditions, Strategies, and Objectives**

Desired conditions describe a desired future state of a resource or opportunity in the Monument. Desired conditions are aspirations and not commitments or final decisions approving projects and activities, and may be achievable only over a long period of time.

Management strategies describe the general approach that the responsible official would use to achieve the desired conditions. Strategies establish priorities in management effort and convey a sense of focus for objectives.

Objectives are concise projections of measurable, time-specific intended outcomes that are consistent with the identified strategies and provide a means of measuring progress toward achieving or maintaining desired conditions.

### **Desired Condition**

Roads are safe and fully-maintained to minimize adverse resource impacts while providing public and administrative access to National Forest System lands and facilities within the Monument. The road system is properly sized to provide needed access to the objects of interest for their proper care, protection, and management, as well as visitor enjoyment of the Monument. Roads that are no longer needed have been decommissioned to restore natural drainage and vegetation, or converted to other uses.

## Strategies

Strategy	Alt B	Alt C	Alt D	Alt E	Alt F
1. Size and maintain the road system to minimize adverse resource impacts while providing appropriate public and administrative access to National Forest System lands and facilities within the Monument.	X	X	X	X	X
2. Promote aquatic organism passage at road stream crossing where needed.	X	X	X	X	X
3. Maintain roads with effective road drainage and erosion controls to conserve existing soil and reduce effects to adjacent riparian and aquatic systems.	X	X	X	X	X
4. Complete 6th-field watershed analysis and review the transportation system in the Monument using Forest-scale Travel Analysis to inform future opportunities for changes in road status, including changes in maintenance level, decommissioning, or conversion to trails.	X	X	X	X	X
5. Consult with local tribal governments and Native Americans to provide transportation and access needs, including culturally important sites and resources for use by Native Americans.	X	X	X	X	X
6. Coordinate transportation planning, management, and road decommissioning with Sequoia and Kings Canyon National Parks; other federal, state, and county agencies; and the Tule River Indian Tribe, to reduce traffic congestion and safety hazards, especially along major travelways.	X	X	X	X	X
7. Partner with state and local agencies to operate and maintain roads for four-season use where appropriate.	X	X	X	X	X
8. Provide parking facilities to meet projected use as determined through site-specific project analysis.	X	X	X	X	X
9. Base proposals for new roads on the need to provide access for recreation opportunities, other public use, or management activities, as appropriate to the purposes of the Monument.	X	X	X	X	X
10. Manage the current road system without adding new roads.			X		
11. Manage public access provided by the road system to only provide access to developed recreation sites, not dispersed recreation.		X			
12. Convert to trails or other uses, or decommission roads not needed to meet management objectives.	X	X	X	X	X
13. Emphasize opportunities for creating loop roads where feasible and appropriate.	X	X	X	X	X
14. Provide and maintain regulatory, warning, directional, and information signing on roads for travelers' use.	X	X	X	X	X
15. Manage the road system to allow:					
Both highway legal use and off-highway vehicle (OHV) use on designated roads.	X			X	X

Highway-legal use only.		X	X		
Over-snow vehicles (OSV) use on designated roads.	X			X	X
OSV use only on paved designated roads.			X		
OSV use only to access private property, or for administrative or emergency purposes.		X			
Non-motorized mechanized vehicles (such as bicycles) on designated roads and trails.	X		X	X	X
Non-motorized mechanized vehicles (such as bicycles) only on designated roads (not trails).		X			
<b>Facilities Related Strategies</b>					
1 Maintain administrative facilities consistent with wilderness values.	X	X	X	X	X
2. Rehabilitate, replace, or relocate existing buildings to support management of the Monument.	X	X	X	X	X
3. Maintain buildings to the minimum level to protect health and prevent building deterioration.	X	X	X	X	X

## Objectives

Objective	Alt B	Alt C	Alt D	Alt E	Alt F
1. Within 2 years, complete travel analysis to determine the minimum necessary Transportation System (Subpart A of the Travel Management rule, 36 CFR 212.5) for the Monument.	X	X	X	X	X
2. Within 2 years, complete a Monument-wide watershed improvement needs inventory (WINI) to identify adverse effects to watersheds from roads.	X	X	X	X	X
3. During the life of the Monument Plan, establish a sustainable and desirable off-highway vehicle (OHV) and over-snow (OSV) route system (on the existing road system), including loop opportunities where feasible and appropriate.	X			X	X
4. During the life of the Monument Plan, establish a sustainable and desirable route system for street legal vehicles for recreation use.		X	X		
5. During the life of the Monument Plan, establish a sustainable and desirable route system for OSV use on paved roads only.				X	

## Affected Environment

### Road System Background

Most roads in the Monument were built primarily for vegetation management access between the 1950s and 1980s, although the higher standard roads were intended and designed for multiple uses including public access. Vegetation management has declined substantially since the early

1990s; however, public use of forest roads has grown steadily, and driving for pleasure is the single largest recreational use of Forest Service-managed lands.

Almost all national forest visitors travel on National Forest System (NFS) roads. These roads provide access to more than a million national and international visitors every year. Forest roads provide access for recreation, fire protection, vegetation management, commercial use, grazing, research, private property use, and insect and disease control.

National Forest System roads are not public roads in the same sense as roads that are under the jurisdiction of state and county road agencies. NFS roads are not intended to meet the transportation needs of the public at large. Instead, they are authorized for the use and administration of NFS lands. Although roads are generally open and available for public use, that use is at the discretion of the Secretary of Agriculture. Through authorities delegated by the Secretary, the Forest Service may restrict or control traffic to meet specific management direction (USDA Forest Service, Forest Service Manual [FSM] 7731).

A few motorized routes in the Monument are not part of the authorized or inventoried National Forest Transportation System (NFTS). These routes evolved in different ways; some were built as temporary roads, often for vegetation management access. Some are user-defined routes created from unauthorized use. Since they are not part of the National Forest Transportation System, these routes are not maintained or inventoried. They are often the source of environmental resource damage. According to the National Roads Policy, all unauthorized roads will be inventoried through travel analysis. However, decisions were made on most of the unauthorized motorized routes when the Monument was proclaimed on April 15, 2000, prior to the travel management rule. The Clinton proclamation (2000) limited motorized traffic to designated roads only and allowed existing roads to be altered prior to December 31, 2000. Routes not previously identified as system roads that were needed to further the purposes of the Monument were added to the road system, and the system was designated on December 31, 2000. Any remaining unauthorized motorized routes would generally be decommissioned when funding is available following site-specific NEPA analysis.

The Forest Service revised regulations regarding travel management on NFS lands to clarify policy related to motor vehicle use, including the use of off-highway vehicles. The travel management rule requires designation of those roads, trails, and areas that are open to motor vehicle use. Designation is made by class of vehicle and, if appropriate, by time of year. The final rule prohibits the use of motor vehicles off the designated system, as well as use of motor vehicles on routes and in areas that is not consistent with the designations. The clear identification of roads, trails, and areas for motor vehicle use on each national forest enhances management of NFS lands; sustains natural resource values through more effective management of motor vehicle use; enhances opportunities for motorized recreation experience on NFS lands; addresses needs for access to NFS lands; and preserves areas of opportunity on each national forest for non-motorized travel. The Sequoia National Forest will ensure that the use of off-road vehicles on public lands within the Monument is controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands (USDA Forest Service, Travel Management Rule 36 CFR Parts 212, 251, 261, and 295). The current designated transportation system for motor

vehicles is shown on the motor vehicle use maps (MVUMs) (see Appendix C in this report).

The transportation system discussion focuses on the road system over which the Forest Service has jurisdiction. The system consists of approximately 822 miles of authorized roads which form a hierarchical set of roads which access the Monument. State highways and county roads connect Forest Service roads to the rest of the transportation network in the state, but the Forest Service does not have jurisdiction over these other roads. Some specialists refer to road mileages including all jurisdictions because all roads affect their resource area, such as wildlife and hydrology. The total road mileage within the Monument is approximately 1,100 miles including all jurisdictions. Some user-created roads also exist which are neither authorized nor maintained by the Forest Service. The following table lists the mileage of the roads over which the Forest Service has jurisdiction within the Monument and for the entire Sequoia National Forest.

Approximately 822 miles of authorized roads under Forest Service jurisdiction are located in the Monument. A road is defined as a motor vehicle travelway more than 50 inches wide that is not designated and managed as a trail. The quality of roads varies by both number of lanes and surfacing, by low/medium/high standards (maintenance levels 1-5), and by functional classification (local, collector, arterial) in a general relation to maintenance levels. Each of these road types requires a different level of maintenance for upkeep (see the following maintenance level definitions). The mileage of each type of road is shown in the table below. Each road also has a functional designation as a local, collector, or arterial road.

**Table 1 Miles of Roads in the Forest and Monument by Maintenance Level**

Maintenance Levels (ML) <sup>1</sup>	Objective ML		Operational ML	
	Forest	Monument	Forest	Monument
1	505	313	197	71
2	499	255	902	515
3	337	134	304	127
4	186	69	141	72
5	98	51	81	37
<b>Total Miles</b>	<b>1,625</b>	<b>822</b>	<b>1,625</b>	<b>822</b>

1. These data were taken from the USDA Forest Service Infrastructure resource information database system (INFRA).

Maintenance levels are defined by the USDA Forest Service Handbook (FSH) as the level of service provided by and maintenance required for a specific road. Maintenance levels must be consistent with road management objectives and maintenance criteria. Roads may be currently maintained at one level and planned to be maintained at a different level at some future date. The operational maintenance level is the maintenance level currently assigned to a road considering today's needs, road condition, budget constraints, and environmental concerns; in other words, it defines the level to which the road is currently being maintained. The objective maintenance level is the maintenance level to be assigned at a future date considering future road management objectives, traffic needs, budget constraints, and environmental concerns. The objective maintenance level may be the same as, or higher or lower than, the operational maintenance level. The transition from operational maintenance level to objective maintenance level may depend on reconstruction or disinvestment.

The maintenance level represents the maintenance required for a particular type of road and the level of service that the user can expect. Maintenance levels range from one, representing lower standard roads, to five, representing higher standard roads.

**Maintenance level 1:** These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate" all traffic. These roads are not shown on motor vehicle use maps.

Roads receiving level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic but may be available and suitable for nonmotorized uses. (These roads are not shown on motor vehicle use maps (USDA Forest Service, FSH 7709.59, 62.32).

**Maintenance level 2:** Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 "No Traffic Signs," may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to: (USDA Forest Service, FSH 7709.59, 62.32).

- a. Discourage or prohibit passenger cars, or
- b. Accept or discourage high clearance vehicles.

**Maintenance level 3:** Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The Manual on Uniform Traffic Control Devices (MUTCD) is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.

Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users (USDA Forest Service, FSH 7709.59, 62.32).

**Maintenance level 4:** Assigned to roads that provide a moderate degree of user comfort

and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times (USDA Forest Service, FSH 7709.59, 62.32).

**Maintenance level 5:** Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is "encourage." (USDA Forest Service, FSH 7709.59, 62.32).

Access to the vicinity of the northern portion of the Monument is available on a variety of highways and county roads, including State Highways 99 and 63 and County Road J21, Dry Creek Road. These roads eventually focus traffic on State Highway 180 or State Highway 245, both of which enter the Monument. State Highway 180 out of Fresno serves the northern portion of the Monument, where it becomes the Kings Canyon Scenic Byway. Highway 245 through Pinehurst serves the west side of the northern portion of the Monument. The General's Highway provides access to the Monument from the south through Sequoia National Park (see MVUM maps in Appendix C in this report).

Access to the vicinity of the southern portion of the Monument is also provided by a variety of highways and county roads, including State Highways 65, 178, 14, and 155, which eventually focus traffic on State Highway 190, or County Roads SM50, SM99, and SM107 that enter the Monument. State Highway 190 out of Porterville provides access to the southern portion of the Monument. State Highway 155 provides access from the east and west to the southern portion of the Monument. In addition to State Highway 155 from the east, County Road SM99 provides access to the Monument from the Kern River Valley. County Roads SM56 and SM50 provide access to the southern portion of the Monument through California Hot Springs. The Western Divide Highway and County Road SM107 provide access to the southern portion of the Monument and link State Highway 190 to County Road SM50 (see MVUM maps in Appendix C in this report).

**Table 2 Miles of Roads in the Forest and Monument by Functional Class**

Functional Class <sup>1</sup>	Objective Class		Operational Class	
	Forest	Monument	Forest	Monument
Arterial	284	120	222	109
Collector	337	134	304	127
Local	1,004	568	1,099	586
<b>Total Miles</b>	<b>1,625</b>	<b>822</b>	<b>1,625</b>	<b>822</b>

1. These data were taken from the USDA Forest Service Infrastructure resource information data base system (INFRA).

Arterial roads (typically maintenance levels 4-5) are the main roads that traverse the forest and connect to major state highways or county roads. They are paved and designed for higher-speed

travel. Collector roads (typically maintenance level 3) connect the arterial roads to local roads and balance access needs with construction and maintenance costs. Local roads (typically maintenance levels 1-2) are at the ends of collector roads, tend to be low standard, and serve a small land area.

### **Road Management Strategies**

The USDA Forest Service has five basic strategies for managing traffic on roads excluded from the Highway Safety Act (maintenance levels 1 and 2): encourage, accept, discourage, eliminate, and prohibit. Combinations of these strategies may be applied to different user groups on the same road or trail. Even though the Highway Safety Act does not apply to these roads, road user safety is still a concern. These five strategies are discussed below (USDA Forest Service, FSH 7709.59, 25.22).

***ENCOURAGE:*** The objective is to encourage use by high-clearance vehicles (pickups, trucks, 4 by 4s, etc.) and discourage passenger cars. This is accomplished by using information techniques such as maps and guide signing. The road is operated at the standard appropriate to the intended use and requires maintenance level 2. These roads are shown on the motor vehicle use map.

***ACCEPT:*** The objective is to accept high-clearance vehicles and discourage passenger cars. The road is passable and adequate for administrative use and requires maintenance level 2. Some public use may occur until passage becomes unsafe or resource damage becomes unacceptable. At that point, the management strategy should be changed to eliminate or prohibit use. Roads with an “accept” strategy are shown on the motor vehicle use map.

***DISCOURAGE:*** The objective is to discourage all public use during certain periods. At the road entrance passage appears feasible, but entrance information is designed to discourage the general public with advisory signs, warnings, and/or barriers. The maintenance level may vary according to contract or permit requirements. These roads are shown on the motor vehicle use map.

***ELIMINATE:*** Under this strategy, all use is eliminated. The road is physically blocked rather than relying on regulations. Barriers include guardrails, logs or boulders, earthen mounds, or trees and brush used to camouflage the road entrance. The strategy does not include gates. Maintenance level 1 is required. These roads are not shown on the motor vehicle use map.

***PROHIBIT:*** Under this strategy, certain or all users are not allowed to use the road. This strategy allows the use of gates. Maintenance level may vary in accordance with contract or permit requirements.

When public motor vehicle use is prohibited year-round, roads are not shown on the motor vehicle use map, and use is prohibited by 36 CFR 261.13. When seasonal public use is allowed, roads and the restrictions are shown on the motor vehicle use map.

The Sequoia National Forest has decommissioned about 3 to 6 miles of roads in the Monument. Roads previously selected for decommissioning were identified through site-specific road analysis and NEPA analysis of negative effects on natural or cultural resources or lack of public and administrative use. Current Forest Service direction is to use travel analysis and environmental analysis at the project-specific level to identify potential roads for decommissioning.

# Funding and Cost for Road Construction, Maintenance and Decommissioning

## Road Maintenance Terminology

Maintenance needs on NFS roads are categorized and quantified in several ways that must be understood to make sense of cost data and projected annual and deferred maintenance needs reported at the national level. Common terms used in this report are defined here.

**Annual maintenance:** This term refers to the expected annual maintenance required on roadways and roadsides based on the maintenance level assigned to the road. The actual amount of maintenance required depends on the amount of use the road has received, the condition of the surface, and the season of use. Annual maintenance estimates include many work items that are not done yearly, but are annualized. For example, the aggregate surfacing on a mile of level 3 road may last 25 years and cost \$100,000 to replace. This equates to a simple annualized cost of \$4,000 per mile.

**Deferred maintenance:** This is work that can be deferred without loss of road serviceability until such time as the work can be economically or efficiently performed. Using the example above, if the surfacing is completely worn down, the deferred maintenance is \$100,000 per mile for replacement.

**Resource protection related maintenance:** These activities preserve the road prism for its intended use and minimize erosion and sediment delivery to aquatic systems. Examples include ditch and culvert cleaning; maintaining rolling dips to prevent stream diversion; or surface blading to remove wheel ruts that concentrate runoff.

**Safety and user related maintenance:** This term refers to activities that protect the public and agency employees and allow use of the road for the intended purpose. Examples include installation of warning devices (such as stop or bridge abutment signs); pothole patching on a level 5 road; maintaining surface and brush clearance for passenger car access to developed recreation sites; maintaining access for fire suppression initial attack equipment; or maintaining access for forest health project planning and implementation.

**Storm-proofing and aquatic passage:** These projects reconstruct a road using various techniques to minimize chronic and storm related resource damage, reduce future maintenance costs, and restore aquatic passage at stream crossings. Stormproofing includes out-sloping the road surface to the maximum extent possible and eliminating associated inboard ditches and cross drains; installing larger culverts and/or lowering the grade through stream crossings to reduce fill volume and prevent diversion; installing rolling dips on moderate road grades to minimize road surface erosion; armoring fills with rock to reduce erosion should they be overtopped; or completely replacing earth fills with rock. Aquatic passage involves replacing a pipe culvert with an open bottom culvert or bridge to restore the natural stream bottom.

**Traffic generated and non-traffic generated maintenance:** Traffic generated maintenance needs are those associated with the use of a road, such as rutting of the

roadbed caused by traffic during wet weather. In general, as use on a particular route increases, so do the traffic-generated maintenance needs. Non-traffic generated maintenance is independent of the use of a road. For example, the growth of tree limbs and brush creates a maintenance need, but the growth is independent of the volume of traffic the road receives.

National Forest Transportation System (NFTS) roads and trails require administration and maintenance to avoid problems that can arise when roads fall into disrepair; included are costs of maintenance that should be performed routinely to maintain the system to its current standard (annual maintenance) and costs of needed maintenance work that has not been completed for various reasons (deferred maintenance). Additional costs may be associated with proposed changes to the NFTS (implementation costs). These costs may be for constructing new routes that would be added to the NFTS, for safety improvements, or for increasing maintenance levels.

Each year, the Sequoia National Forest prepares a road maintenance plan, which identifies the road operation and maintenance priorities for the year, as well as maintenance that needs to be done prior to opening for traffic after seasonal closures. Resource protection and public safety are maintenance priorities. Needed maintenance that is not completed adds to the deferred maintenance backlog. Transportation system maintenance is completed by Forest Service maintenance crews, contractors, volunteers, user groups, cooperators, and other forest resources, as appropriate. Maintenance of the road system within the Monument is not funded or tracked separately from the rest of the forest. However, the Monument contains about 50 percent of the road system, so on average about half of the available maintenance funds are used within the Monument. Annual maintenance needs and deferred maintenance backlog within the Monument would also be about half of the forest totals.

In past decades, commercial users (typically timber purchasers) maintained a substantial portion of Monument roads in the Sequoia National Forest during timber sale activities. With the decrease in timber sales, however, fewer roads are being fully maintained. The following table shows forest-wide appropriated road program funding and maintenance accomplishments reported for the past 8 years. Road program funding includes both routine road maintenance and other roads program related activities. Additional road maintenance may be accomplished using other funding sources, agreements, partnerships, and other methods. Accomplishments may vary from year to year depending on how the work is accomplished and what gets accomplished (miles maintained in the following table means at least one maintenance activity was performed, not that every mile reported was fully maintained).

**Table 3 Transportation System Appropriated Funding and Maintenance - Entire Sequoia National Forest (in thousands of dollars)**

<b>Road Activity<sup>1</sup></b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Road Program Funding (CMRD)	\$556	\$462	\$410	\$575	\$641	\$548	\$588	\$492
Roads Receiving Maintenance (miles)	259	223	154	280	125	212	235	277

1. These data was taken from a variety of Forest Service budget and accomplishment reporting systems.

In recent years, the Forest Service has assessed the condition of its roads network. The network is in a deteriorating condition, due to increased use and the continued deferral of maintenance

and capital improvements. Some roads are becoming unusable through lack of maintenance, may be causing resource damage, or are no longer needed or desired for administrative or public access. These roads are candidates for decommissioning after appropriate site-specific travel analysis and environmental analysis.

Estimates of the annual maintenance costs for the existing road system in the Monument are included in the following table. Forest-wide average costs per mile to maintain each maintenance level (ML) were developed and applied to the road system to calculate the estimated total cost. The average unit costs per mile were developed on a regional (Pacific Southwest Region) level. Some maintenance activities need to be performed annually; others are performed on a less frequent cycle. The costs shown reflect the annualized cost of performing all needed maintenance activities on their required cycle.

**Table 4 Existing Transportation System Average Annual Maintenance - Monument**

<b>Road Activity</b>	<b>Miles</b>	<b>Cost/Mile (\$)</b>	<b>Annual Maintenance Cost (\$)</b>
Maintenance Level 1	71	225	15,975
Maintenance Level 2	515	543	279,645
Maintenance Level 3	127	10,870	1,380,490
Maintenance Level 4	72	14,107	1,015,704
Maintenance Level 5	37	14,107	521,959
<b>Total</b>	<b>822</b>		<b>\$3,213,733</b>

National Forest System roads must receive a certain minimum amount of annual maintenance to safely accommodate their intended use. If the minimum needed maintenance activities do not occur, these activities are termed deferred maintenance. Deferred maintenance can adversely affect the road's functionality, safety of users, drainage capacity, potential loss of investment, and increased potential for environmental damage.

### **Deferred Maintenance Backlog**

The Sequoia National Forest's transportation system has developed over the past 100 years, generally in response to public access and resource extraction needs. The current inventory shows 1,625 miles of roads in Sequoia National Forest and 822 miles of roads in the Monument, with 71 percent in maintenance levels 1 and 2 (operational ML), and 29 percent in maintenance levels 3, 4, and 5 (operational ML) for the Monument. Road maintenance budgets have declined over the past decade, and the forest's internal capability to maintain roads has been reduced with loss of maintenance personnel and equipment. The most recent estimate of deferred maintenance needs on the Sequoia National Forest is \$49,727,790 for roads as recorded in the USDA Forest Service infrastructure resource information database system (INFRA) for maintenance. This value is based on a national random sample of deferred maintenance needs taken in 2007. This value is not statistically valid at the national forest level; however, it can be used as an indicator of maintenance needs for the existing road system.

## Environmental Effects

### Legal and Regulatory Compliance

- **Highway Safety Act of 1966:** The Department of Transportation is authorized and directed to assist and cooperate with other federal departments and agencies, state and local governments, private industry, and other interested parties to increase highway safety. Each state is responsible for implementing a highway safety program to reduce traffic accidents and deaths, injuries, and property damage.
- **Title 36, Code of Federal Regulations, Part 212 (36 CFR 212):** The implementing regulation for the National Forest Roads and Trails Act (FRTA) includes portions of the Travel Management Rule published in the Federal Register on November 9, 2005. Part 212, Subpart B, provides criteria for designation of roads and trails. Providing safe transportation facilities and considering the affordability of maintaining the transportation facilities are two of the criteria.
- **The California Vehicle Code (CVC):** The CVC contains regulations related to the use of motor vehicles in California, including motor vehicles used on the National Forests. The CVC sets safety standards for motor vehicles and vehicle operators. It defines the safety equipment needed for highway legal and non-highway legal vehicles. The code also defines the roads and trails where non-highway legal motor vehicles may be operated.
- **Forest Service Manual (FSM) Sections 2350 and 7700:** The manual contains agency policy for management of the National Forest Transportation System (NFTS). Forest Service Handbook (FSH) 7709.59 describes the maintenance management system the Forest Service uses and the maintenance standards needed to meet road management objectives (RMOs). FSH 2309.18 describes the maintenance management system the Forest Service uses and the maintenance standards needed to meet trail management objectives (TMOs).

A number of changes to Forest Plan standards and guidelines are proposed for the action alternatives. A number of standards and guidelines are proposed to be deleted; some of them are not needed, because they are a matter of law, regulation, or policy, and some of them conflict with current national policy or the proclamation (Clinton 2000). Some of the actions noted in particular standards and guidelines have been completed, and a need for the standard no longer exists. Some of the standards are time sensitive, and the time frame to which they apply has long passed. Many of the changes proposed for the action alternatives are because the information included as standards and guidelines in the Forest Plan would be more appropriate as strategies to guide future actions, rather than as requirements that must be complied with.

The following proposed standards and guidelines from the 1988 LRMP are those from the forest-

wide list on pp. 4-16 to 4-39, and additional ones attached to management area prescriptions. The 2001 SNFPA standards and guidelines are from the ROD Appendix A. Standards/Guidelines for ALL Action Alternatives B, C, D, E, and F (unless noted otherwise).

**Table 5 Revised Standards and Guidelines**

Forest Plan Category	Standard/Guideline	Rationale
Roads	Maintain developed trailhead access roads and primary access routes to developed facilities at a minimum of maintenance level 3.	Revised from LRMP pp. 4-44, 4-47, 4-53, 4-55, 4-58, 4-60, 4-63, 4-67, 4-70, 4-76 in BO2, OW1, OW2, OW5, MC1, MC2, MC5, CF1, CF3, CF5.
Roads	Construct new roads only when required to manage objects of interest or provide necessary public or administrative access.	2000 Clinton proclamation.

**Table 6 Deleted Standards and Guidelines**

Forest Plan Category	Standard/Guideline	Rationale
Roads	Limit road developments in SPM ROS areas to low density, local roads. (LRMP pp. 4-44, 4-47, 4-53, 4-55, 4-58, 4-60, 4-63)	Construct new roads only when required to manage objects of interest or provide necessary public or administrative access.
Roads	Coordinate road construction with range management practices. (LRMP p. 4-78)	Construct new roads only when required to manage objects of interest or provide necessary public or administrative access.
Roads	Discourage use of roads not needed for range management. (LRMP pp. 4-78, 4-80, 4-82)	Land allocations with range emphasis are eliminated. Roads are to be managed for the overall benefit of the monument and the objects of interest, not only for range.
Roads	Manage local roads primarily for the timber resource. (LRMP p. 4-89)	Proclamation (Clinton 2000) eliminated management for timber production.

**Table 7 Standards and Guidelines to be Changed to Strategies**

Forest Plan Category	Standard/Guideline	Rationale
Roads	Manage roads to improve range management practices (i.e. seasonal closure) when consistent with the purpose of the monument. (Modified from LRMP pp. 4-78, 4-80, 4-82, 4-87)	Management areas may change.
Roads	Maintain selected roads for OHV enthusiasts in accordance with the Travel Management Plan. (Modified from LRMP p. 4-38)	This is useful to enhance visitor experience.

	Alternatives C and D: NO OHV use (street legal vehicles only), so does not apply.	
<b>Roads</b>	Improve signing of road closures to include the reason for closure. (LRMP p. 4-38)	Useful guidance for safety.
<b>Roads</b>	Conduct an integrated interdisciplinary transportation analysis, following Travel Analysis, as part of landscape analysis. Complete unauthorized road inventories for each national forest within 10 years. (2001 SNFPA ROD Appendix A, p. A-32)	This information is useful to help guide road management.
<b>Roads</b>	<p>Manage the road system to assure resource protection, provide safe access, and accommodate resource management needs.</p> <p>a. Emphasize maintenance on maintenance levels 4-5 and high volume maintenance level 3 roads to provide high degree of user comfort.</p> <p>b. May not maintain for user comfort maintenance level 3 roads with low traffic volumes.</p> <p>c. Open roads to public travel unless closure is necessary to ensure resource protection, road investment protection or for other management reasons.</p> <p>(LRMP p. 4-38)</p>	Useful guidance to manage the road system.
<b>Roads</b>	The management plan shall contain a transportation plan for the monument that provides for visitor enjoyment and understanding about the scientific and historic objects in the monument, consistent with their protection.	Useful guidance to manage the road system.
<b>Buildings and Utilities</b>	Rehabilitate, replace, or relocate existing buildings to support management of the Monument. (LRMP p. 4-38)	Useful guidance for safety.
<b>Buildings and Utilities</b>	Maintain buildings at least to minimum level that protects health and prevents building deterioration. (LRMP p. 4-38)	Useful guidance for safety.

## Assumptions and Methodology

The principal effect on the road system of each of the alternatives would be a change in management to respond to the access needs of the alternative and an increased emphasis on restoring the ecosystem. The proposed alternatives for managing the transportation system in the Monument are designed to implement the intent of the Clinton proclamation (2000). The full range of currently used access and travel management options such as changing road maintenance objectives, the road management strategies previously described, and seasonal closures; and road construction and reconstruction options would be proposed in all alternatives (except that no new road construction would occur in Alternative D). The emphasis on road management in different areas would be set by the alternative theme and the land allocations, desired conditions, and standards and guidelines. Accordingly, this plan aims to be flexible, in

order to accommodate future transportation demand. The effects analysis is based on how the alternatives would meet future access needs, while still protecting the objects of interest in the Monument. Proposed changes to the designated road system based on the management emphasis of the selected alternative would only be implemented after completion of site-specific environmental analysis. Therefore, most of the effects of the Monument alternatives are not estimated quantitatively, but qualitative evaluations and comparisons can be made between the alternatives.

This analysis considers changes needed to the National Forest Transportation System (NFTS) to meet the purpose and need of this analysis. Decisions regarding changes in the transportation system must consider: (1) providing for adequate public safety; and (2) providing adequate maintenance of the roads that will be designated for public use and administrative access. The following assumptions were made for the environmental effects of each of the alternatives:

### **All Alternatives**

- Any motor vehicle use authorized by state law is occurring on the NFTS unless there are forest-specific prohibitions.
- The forest road budget is not expected to increase in the foreseeable future.
- There is some cost for maintenance that will be borne by the Forest Service for any road open to motor vehicle use.
- State laws regulating motor vehicle drivers set the standard of care for the safety of themselves, their passengers, and other users for the NFTS.
- Effects to other resources can be found within their respective sections of the document.

### **Alternatives A, B, E, and F**

The expectation is that the majority of the current road system would continue to be used for public access as well as resource management activities. These alternatives would retain road system mileage similar to current levels of access for dispersed recreation opportunities and private land access, as well as for ecological restoration and fire protection treatment areas, compared to Alternatives C and D.

### **Alternative C**

The expectation is that most of the system roads would be used for resource management activities, but only a portion of the road system would be available for public access, mainly Maintenance Level 3 to 5 roads. Roads (mainly Maintenance Level 2) that lead to dispersed camping areas (end of the road/roadside camping) would no longer be accessible because Alternative C does not manage for dispersed camping.

### **Alternative D**

The expectation is that most of the roads would be used for public access, and only a few roads would be used for vegetation management activities. There would be a reduction in Maintenance Level 1 and 2 roads over time, due to reduced need for access to complete vegetation management projects. This alternative would provide more vehicle access to the public than Alternative C.

### **Alternative A, the Baseline**

In Chapter 3 of this EIS, the current levels of access for the Monument are described. Under alternative A, the baseline, the following activities would continue to occur under current management direction for the Monument.

- Although the MSA allows OHV use on trails in sequoia groves and elsewhere, according to the proclamation (Clinton 2000), OHV use is limited to designated roads; the exception is Forest Service trails 27E04 and 27E05 in the Kings River Special Management Area (authorized by Public Law 100-150 that created KRSMA).
- Continue to allow motorized travel on designated roads.
- Continue to provide access based on access needs.
- Continue to allow snowmobiles on designated roads.
- Continue to allow non-motorized mechanized vehicles (mountain bikes) on designated roads and trails.
- Continue to perform road and trail maintenance for the current transportation system for the Monument.
- Continue to propose and implement improvement projects for current transportation system for the Monument.
- Continue to propose road construction when needed to meet access needs associated with new recreation or administrative facilities development.
- Continue to propose road decommissioning in the Monument.
- Annual maintenance not performed on time would increase the amount of deferred maintenance.
- Lack of needed maintenance on roads over time could develop severe public safety or resource damage issues and may need to be evaluated for closure to public access.

The current ongoing effects from existing activities presented in the baseline, would generally be carried forward through the range of alternatives. Effects described for each of the alternatives include the ongoing effects described here, and changes to ongoing effects are described by alternative.

## Scientific Advisory Board (SAB) Advisories

### **XIV. Should special consideration be given to maintaining roads used by the Tule River Indian Tribe?**

This advisory is reflected in all of the proposed alternatives, under the strategies by alternative it states, "Coordinate transportation planning, management, and road decommissioning with the Sequoia and Kings Canyon National Parks; other federal, state, and county agencies; and the Tule River Indian Tribe, to reduce traffic congestion and safety hazards, especially along major travelways." "Consult with local tribal governments and Native Americans to provide transportation and access needs, including culturally important sites and resource for use by Native Americans." Resources available for maintaining the existing transportation system are very constrained, so the Sequoia N.F. must prioritize numerous competing needs for access including agency management activities, tribal activities, and public recreation. If limited Forest Service resources are unable to adequately maintain roads needed for tribal access, the Tribe

could consider taking responsibility for specific road maintenance requirements through either road use permits or other agreements with the Sequoia N.F. Resource impacts and social conflicts that arise will be dealt with on a site-specific basis.

**XVII. The transportation plan will largely determine the pattern and volume of public use on the Giant Sequoia National Monument. The issue is whether the Forest Service's June 8, 2001, Proposed Action considers a full range of transportation alternatives.**

To address this advisory, The Monument Plan provides programmatic direction to minimize adverse resource impacts while providing public and administrative access to National Forest System lands and facilities within the Monument. The size and character of the Monument transportation system in the future will be determined by the need for access based on the selected alternative and consistent with protection of the objects of interest. The programmatic level Monument Plan does not propose or authorize any ground disturbing activities. Changes to the existing transportation system will only be made after appropriate site specific project analysis and documentation is completed. Implementation of public transportation may be considered in the future in conjunction with other proposed site specific projects which have the potential for greatly increasing public use in a specific area of the Monument. One of the objectives of the Monument plan is to review and enhance the existing transportation system to create a sustainable and desirable system for motorized vehicles, consistent with the selected alternative. Resource impacts and social conflicts that arise will be dealt with on a site-specific basis.

## **Ecological Restoration and Maintenance**

The focus of the transportation report is to analyze the potential effects on the road system of various alternatives for managing the Monument. It does not focus on how the road system affects other resources, such as natural habitats which are the focus of ecological restoration. Because the road system is a constructed feature, it does not fit directly into ecological restoration which is focused on natural habitats. However the road system does have a significant influence on natural habitats. This section will briefly examine some of those influences, and how decommissioning roads can contribute to ecological restoration.

Many factors contribute to the overall influence roads have on an ecosystem. For example; season of operation, frequency of use, type of vehicles used, presence of plant and animal species, general health of the landscape, and location are important predictors of ecosystem impacts. The influences associated with the human uses allowed by the access provided by the road system will not be discussed here; see section on human use. Although not all ecosystems are affected by roads in the exact same way, the following areas of disturbance are consistently observed in forest settings, and provide a focus for ecological restoration and forest health efforts.

### **Soils**

Compaction of soils in forest road is known to reduce aeration, porosity, infiltration rates, water movement, and biological activity in soils. Soil density, organic matter, and moisture are much lower on roads than on nearby forest lands. Macropores, which provide soil drainage and infiltration, have been shown to significantly decrease in size as

a result of road construction and use; reduced infiltration and increased compaction promote soil erosion, especially during seasonal rains.

### **Hydrology**

Forest roads often develop a water-repellent soil layer caused by lack of vegetative cover, compaction, and changes in soil composition. This can substantially influence how runoff is processed. Erosion, the formation of water channels beside the road, and increased sediment loads in nearby streams are common results of this process.

### **Wildlife**

Roads are known to cause habitat fragmentation and animal mortality. Many create ecological limits with different plant species, light levels, and hiding cover, all of which may alter animal survival, reproductive success, and movement patterns. While many effects of roads on wildlife are negative, there can also be positive effects such as providing flyway corridors for airborne species.

### **Fire**

Because roads provide easier access to many forest tracts, forest roads often allow more human-caused fires to be ignited. They also provide access for fire suppression, and can serve as firebreaks that interrupt the spread of low-severity ground fires.

Proper road maintenance and road reconstruction when needed, to maintain drainage features on the roadway are important activities that contribute to maintaining a healthy ecosystem. Roads that cannot be maintained in acceptable condition or are determined not needed to meet management goals could be closed to motorized traffic, or decommissioned and stabilized. Decommissioning unneeded existing, unused, and abandoned forest roads to restore the land to a pre-road condition is an important step in the rehabilitation of natural ecosystem processes.

Although there may be countless reasons to remove unneeded roads and restore the land, the essential goals of such projects are:

- Reduce soil erosion
- Reestablish vegetation
- Promote hillside stability
- Protect plant and wildlife species
- Protect and restore aquatic and terrestrial habitats
- Restore or preserve and enhance natural drainage patterns
- Restrict access to remote or sensitive forest sites

All of these factors contribute to the larger goal of forest restoration—that is, the reestablishment of natural and self-sustaining ecosystem functions. Temporary forest roads can facilitate ecosystem restoration by providing easy access for equipment and by serving as firebreaks, but they have the potential to cause similar ecological problems as those caused by permanent roads. Several strategies have proven successful in returning land used for roads to a more natural and sustainable condition. Methods such as road ripping, reshaping, and re-vegetation are commonly used for road decommissioning projects in forested settings. The ecosystem response to these

activities is varied and depends on the initial condition of the road and the process by which the method is implemented. A successful road decommissioning project will likely need to incorporate most, if not all, of the following strategies.

**Barricades**

This method is commonly used for road decommissioning. It involves blocking the road from vehicle use. Barricades must be appropriate for their setting to be effective. When implemented alone, barricades do not usually constitute road decommissioning; however, barricading is an important first step in the land restoration process.

**Ripping**

The main purpose of ripping a road is to loosen the soil. Soils compacted by mechanize equipment may remain compacted for a long time without rehabilitation. Soil productivity and physical characteristics are crucial to an ecosystem’s overall functioning. Ripping a road reduces soil density while increasing soil porosity, infiltration, moisture, and seedbed potential.

**Reshaping**

Physical reshaping of the roadbed may be necessary to restore natural drainage patterns, prevent erosion on steep slopes, or if one management goal is to bring the landscape back to the pre-road contour. It is an expensive procedure that must be linked with other strategies to achieve full land restoration.

**Revegetation**

After ripping or reshaping, some plants may sprout from the soil seed bank or when seeds enter the road area from elsewhere, but seeding can speed up the process of reestablishing herbaceous cover, reducing erosion, and stabilizing the soil.

**Table 8 Advantages and Disadvantages of Selected Road Decommissioning Strategies**

Method	Advantages	Disadvantages
<b>Barricades</b>	<ul style="list-style-type: none"> <li>• Inexpensive and Easy</li> </ul>	<ul style="list-style-type: none"> <li>• Does not promote natural ecosystem function</li> <li>• Road can still be traveled by ATVs and by foot</li> </ul>
<b>Ripping</b>	<ul style="list-style-type: none"> <li>• Loosens soil</li> <li>• Increases soil infiltration</li> <li>• Reduces erosion</li> <li>• Prepares soil for revegetation</li> </ul>	<ul style="list-style-type: none"> <li>• Successes observed during short-term evaluation often disappear over time</li> <li>• Must plan to seed with native plants immediately following ripping to minimize the invasion of exotics</li> </ul>
<b>Reshaping</b>	<ul style="list-style-type: none"> <li>• Reduces the risk of landslides</li> <li>• Can bring the landscape back to pre-road appearance and functionality</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive and often logistically infeasible</li> <li>• Does little to promote ecosystem function unless other methods of land restoration are also implemented</li> </ul>

<p><b>Revegetation</b></p>	<ul style="list-style-type: none"> <li>• Reduces erosion</li> <li>• Minimizes colonization of exotic plants</li> <li>• Roots reduces soil density</li> <li>• Decaying plant material enhances quality and quantity of soil organic matter</li> </ul>	<ul style="list-style-type: none"> <li>• Seeds will likely not take root unless the soil has been disturbed before planting</li> <li>• Road must be well blocked to successfully eliminate all vehicle traffic</li> </ul>
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## Measures Used to Assess Environmental Effects on the Transportation System

Indicator measures are intended to address how each alternative, as the sum total of its proposed actions, responds to the Forest Plan, 2001 SNFPA, Clinton proclamation (2000), and issues identified in scoping and if the alternative would have an effect on the environment. The indicator measures used to assess environmental effects for the transportation system are:

**Public safety:** 36 CFR 212.55 requires public safety to be considered when designating roads, trails, and areas for motor vehicle use. Each alternative may create different potential safety conflicts because each alternative emphasizes various combinations of users and vehicles. Any change to the application of the traffic rules is evaluated by a Forest Service qualified engineer from a public safety perspective.

**Affordability:** 36 CFR 212.55 requires consideration of the need for maintenance and administration of the designated national forest transportation system (NFTS). Costs for the NFTS include maintenance, operations, improvements, management, enforcement, mitigation of safety or resource issues, and decommissioning. Maintenance includes costs for needed maintenance work that has not been completed at the planned time for various reasons (deferred maintenance) and costs of maintenance that should be performed routinely to maintain the transportation system at its current standard (annual maintenance). Additional costs may be associated with proposed changes to the NFTS (implementation cost). These costs may be for new construction of roads that would be added to the NFTS, safety improvements, improving maintenance levels, correction of resource problems, or other work.

**Road decommissioning/closure:** Roads that cannot be maintained in acceptable condition or are unneeded to meet management goals would be decommissioned, stabilized, and closed to motorized traffic. Decommissioned roads could be added to the trail system. Site-specific travel analysis will identify roads to be considered for decommissioning and environmental analysis.

**Road construction:** Potential construction of new roads for developed recreation facilities, loop driving opportunities, and administrative access needs could be proposed. Any changes to the application of the traffic rules will be evaluated by a Forest Service qualified engineer from a public safety perspective.

### Roads

The principal effect on roads of each of the action alternatives would be a change in management to respond to the access needs of each alternative and an increased emphasis on restoring the ecosystem. The full range of currently used access and travel management options and road construction and reconstruction options would be available in all alternatives; however, Alternative D would not propose new road construction. The emphasis in road management in different areas would be set by the alternative and the land allocations, desired conditions, and standards and guidelines. Travel analysis, on a larger scale, must identify the minimum road system. Proposed changes to the designated road system would be identified based on the management emphasis of the selected alternative and would be implemented after completion of site-specific environmental analysis. Therefore, much of the effect of the Monument alternatives is not estimated quantitatively, but qualitative evaluations and comparisons can be made.

### **All Alternatives**

In all of the alternatives, the road system would be managed to reduce safety hazards to road users and reduce unacceptable effects to the surrounding environment from roads. The highest priority for road maintenance would be the maintenance level 3 through 5 roads for public and administrative access to the objects of interest and reasonable access to private property. Other roads that provide access to private lands, important fire protection features, administrative sites, special use permitted areas and recreation areas would also be priorities to maintain.

The existing funding for road maintenance is insufficient to fully maintain the existing roads within the Monument. The lack of maintenance, particularly on the lower priority maintenance level 1 and 2 roads, is causing deterioration of the roadways. Some roads have become overgrown with brush and trees and are impassible to vehicular traffic. Other roads are causing resource damage in the form of sedimentation, as culverts and other drainage structures no longer function properly.

Funding for the past 8 years was not sufficient to maintain the road system within the Monument. The current funding is used to repair the most pressing safety-related road problems. As a result, few of the roads are being fully maintained to standard. Roads not properly receiving maintenance within the Monument would inevitably be affected, and access for both public and administrative use would continue to be degraded.

Direction for the past decade has been to encourage road decommissioning, in part to address the deferred maintenance issue. However, very little decommissioning has been completed within the Monument since the Clinton proclamation (2000) while awaiting the completion of a Monument plan and transportation plan. Once a plan is completed, the priorities for road decommissioning will be roads that are causing resource damage, are overgrown and becoming impassable to vehicle traffic, or are unneeded for administration of the Monument. Road decommissioning after appropriate project planning, especially any remaining unauthorized routes, is expected to continue under any of the alternatives.

## **Alternatives A, B, E, and F**

The road system under Alternatives A, B, E, and F would be comprised initially of approximately 822 miles of roads within the Monument. Not all of the mileage is open to public vehicular traffic. Currently, 71 miles are maintenance level 1, which is defined as closed to vehicular access. These are roads that have been placed in storage between intermittent uses. The period of storage must exceed one year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Some of the closed roads in the Monument do not have adequate physical barriers that prevent public access due to oversight at the time of closure or lack of maintenance. The expectation is that the majority of the current road system would continue to be used for public access as well as resource management activities.

Retaining road system mileage similar to current levels would provide the highest levels of access for dispersed recreation opportunities and private land access, as well as for ecological restoration and fire protection treatment areas, compared to Alternatives C and D.

Alternatives A, B, E, and F would have the highest costs for maintaining the road system because Alternatives C and D would have a reduction in maintenance level 1 and 2 roads over time (through closure/decommission) due to reduced dispersed recreation in Alternative C and reduced need for access to vegetation management in Alternative D. The reduction in maintenance costs would be achieved only after the cost of closure/decommissioning roads was paid. The maintenance strategy in Alternatives A, B, E, and F would require an increase in funding to keep the road system in acceptable condition.

If funding is not adequate to keep the road system in acceptable condition, roads would be repaired, closed, relocated, or decommissioned to reduce unacceptable effects on the surrounding environment. A lack of funding for maintenance could lead to a reduced available road mileage as roads are closed or decommissioned. If maintenance funding is adequate to prevent unacceptable effects, but not adequate for full maintenance, the overall condition of the road system could be lower for these alternatives than for Alternatives C and D.

## **Alternative C**

The road system under Alternative C would be comprised initially of approximately 822 miles of National Forest System (NFS) roads. Not all of the mileage is open to public vehicular traffic, as some is classified as maintenance level 1 road, which is defined as closed to vehicular traffic. Some of these closed roads in the Monument do not have adequate physical barriers that prevent public access due to oversight at the time of closure or lack of maintenance. The expectation is that most of the system roads would be used for resource management activities, but only a portion of the road system would be available for public access, mainly maintenance level 3 to 5 roads. Maintenance level 2 roads generally provide only dispersed recreation opportunities and could be closed to public access because Alternative C does not manage for dispersed camping (end of the road/roadside camping).

Reducing the road mileage by closing roads to public access and some decommissioning of roads

would provide a lower level of vehicular access for dispersed recreation opportunities. Roads (mainly maintenance level 2) that led to dispersed camping areas would no longer be accessible. Roads would be maintained for restoring natural processes and fire protection treatment areas, as in Alternatives A, B, E, and F. Roads proposed for decommissioning would generally be short roads, less than 1 mile long, with moderate to high risk for producing unacceptable environmental effects; not needed for resource management activities; or not providing access to recreation sites, objects of interest, special use permitted areas, or private land.

Alternative C would have lower costs for maintaining the road system, due to a reduction in the total miles of road over time and reduced use on most maintenance level 2 roads open only for administrative use. Dispersed (roadside/end of the road) camping would be prohibited; therefore, Alternative C would have a reduced transportation system in the long term. This alternative would require a lower increase in funding over time to keep the road system in acceptable condition. This assumes the roads that are decommissioned and closed are an equal mix of maintenance level 1 and 2 roads. The reduction in maintenance costs would begin after roads are decommissioned and after closed roads have gates or barriers installed. Reducing the total road mileage should reduce the maintenance costs in the long term more than the other alternatives, with costs significantly less than Alternatives A, B, E, and F and somewhat less than D.

#### **Alternative D**

The road system under Alternative D would be comprised initially of approximately 822 miles of roads within the Monument. Not all of the mileage is open to public vehicular traffic, as some is classified as maintenance level 1 road, which is defined as closed to vehicular traffic. Some of these closed roads in the Monument do not have adequate physical barriers that prevent access, due to oversight at the time of closure or lack of maintenance. There will be a reduction in maintenance level 1 and 2 roads over time, due to reduced need for access to complete vegetation management projects. The expectation is that most of the roads would be used for public access, and only a few roads will be used for vegetation management activities. Roads not needed for resource management activities and not providing a significant dispersed recreation opportunity could be considered for decommissioning.

Reducing the road mileage by decommissioning roads would provide a reduction in the level of access for dispersed recreation opportunities, as well as restoration and fire protection treatment areas, compared to Alternatives A, B, E, and F, although this alternative would provide more vehicle access to the public than Alternative C. Roads proposed for decommissioning would generally be short roads, less than 1 mile long, with moderate to high risk for producing unacceptable resource effects; not needed for resource management activities; or not providing access to recreation sites, objects of interest, special use permitted areas, or private land.

Alternative D would have lower costs for maintaining the road system than Alternatives A, B, E, and F due to a reduction in the total miles of road. It would require a lower increase in funding to keep the road system in acceptable condition over time. This assumes the roads that are decommissioned are low standard, maintenance level 1 or 2 roads. The reduction in maintenance costs would begin after roads are decommissioned and after closed roads have gates or barriers installed. Reducing the total road mileage should reduce the maintenance costs in the long term

more than the other alternatives, with costs significantly less than Alternatives A, B, E, and F, but somewhat more than Alternative C.

If funding is not adequate to keep the road system in acceptable condition, roads would be repaired, closed, relocated, or decommissioned to reduced environmental effects. A lack of funding for maintenance could lead to a reduced available road mileage as roads are decommissioned or closed. If maintenance funding is adequate to prevent unacceptable effects, but not adequate for full maintenance, the overall condition of the road system could be lower for this alternative than for Alternative C, but somewhat better than in Alternatives A, B, E, and F.

### **Public Safety**

This measurement indicator looks at the effects of proposed changes to the transportation system from a public safety perspective. Any changes to the NFTS are to be evaluated by a qualified engineer for the effects on public safety. Key factors include traffic volume, speed, limited sight distance caused by horizontal and vertical alignment, and roadside vegetation. Public safety will not be altered for any of the alternatives because the proposed road system will initially match the existing system. Seasonal closures while roads are in unusable condition due to snow or rain will occur to reduce the risk of motor vehicle accidents and getting stranded in an over-saturated road base. Over time, the alternatives that produce a more affordable transportation system are likely to have a positive effect on public safety because roads would be more fully maintained.

### **Affordability**

The existing funding for road maintenance is insufficient to fully maintain the existing roads within the Monument. Alternatives A, B, E, and F would have the highest costs for maintaining the road system because Alternatives C and D would have a reduction in maintenance level 1 and 2 roads over time (through closure/decommission). The reduction in maintenance costs would be achieved only after the cost of closure/decommissioning roads was paid. The maintenance strategy in Alternatives A, B, E, and F would require an increase in funding to keep the road system in acceptable condition. Alternative C would have lower costs for maintaining the road system, due to a reduction in the total miles of road over time and reduced use on most maintenance level 2 roads open only for administrative use. Reducing the total road mileage should reduce the maintenance costs in the long term more than the other alternatives, with costs significantly less than Alternatives A, B, E, and F and somewhat less than D. If funding is not adequate to keep the road system in acceptable condition, roads would be repaired, closed, relocated, or decommissioned to reduce unacceptable effects on the surrounding environment. A lack of funding for maintenance could lead to a reduced available road mileage as roads are closed or decommissioned.

### **New Road Construction**

New road construction could continue in Alternatives A, B, C, E, and F, although at greatly reduced levels. Variables affecting the amount of new road construction by alternative include standards and guidelines and amount of land in allocations prohibiting road construction or emphasizing no new construction. The effect of these prohibitions would probably be minimal;

there has been minimal road development needed recently. New roads would also be strictly limited in critical aquatic refuges and riparian conservation areas. In Alternatives A, B, C, E, and F, the potential construction of new roads for developed recreation facilities, loop driving opportunities, and for needed administrative access is expected. Alternative D does not allow new road construction.

### **Road Decommissioning/Closure and Conversion**

The amount of road decommissioning and closure would be similar between Alternatives A, B, E, and F. Alternatives C and D would have a significant reduction in low standard roads over time, due to reduced dispersed camping in Alternative C and a reduced need for access to complete vegetation management projects in Alternative D. The decisions to be made on which roads to decommission and close will require site specific information and analysis of access needs and environmental effects. No model is available to predict the amount of decommissioning and closure for the Monument area; however, comparisons of the amounts of decommissioning and closure between alternatives can be made by evaluating the guidance contained in the alternatives.

The primary guidance affecting road decommissioning and multi-year closure is the same for all alternatives and is found in the management direction common to all alternatives. The guidance provides that roads should be decommissioned or closed if they are unneeded or are causing unacceptable environmental effects. Similar guidance is provided for all alternatives by the national travel management rule. To a large extent, the same roads will be unneeded and will be found to be causing unacceptable environmental effects regardless of which alternative is chosen. Variation in amounts of decommissioning between alternatives would be due to differences in standards and guidelines and amount of land in allocations emphasizing decommissioning.

Since road decommissioning decisions would be made in analysis processes using public involvement, and considering access needs for fire suppression and public recreation, the effect on needed access would be expected to be minimized as much as possible; however, some roads currently open and in use would be decommissioned. Some of the roads decommissioned from the NFTS could be added to the non-motorized trail system.

### **Maintenance Levels 3-5**

Maintenance level 4 and 5 roads would generally remain in their current locations in all alternatives. Significant decommissioning of these level roads is not expected. Accomplishing accumulated deferred maintenance on these roads through rehabilitation/reconstruction would continue to be a priority for road reconstruction funding. The restored roads would provide a higher level of safety, driver comfort, and convenience, and would produce substantially less sediment than existing roads with significant deferred maintenance.

Maintenance level 3 roads would also generally remain in their current locations. Construction or decommissioning of collector roads would be unlikely. Roads would be improved and managed to provide a more stable road surface, primarily using gravel and dust abatement.

## **Maintenance Levels 1-2**

The most dramatic change in the Monument road system would be changes in the mileage and conditions of maintenance level 1 and 2 roads. The direction common to all alternatives, as well as the standards and guidelines of various alternatives, emphasize a higher priority on road improvements for ecosystem restoration. The restoration emphasis would place a higher priority on reconstruction and maintenance of maintenance level 1-2 roads, which are responsible for most of the riparian and aquatic effects of the road system. Some of these roads would be improved or better maintained to reduce effects on adjacent resources. Others would be considered for decommissioning. The availability of funding for maintenance level 1 and 2 road reconstruction and maintenance is uncertain. In all alternatives, there would be analysis of the balance between maintenance expenditures for serviceability and for environmental protection, and some improvement of environmental effects would be expected. It could become impossible to drive on some unmaintained roads, due to vegetative encroachment, and some maintenance level 2 roads needed only irregularly would be closed intentionally. There would be fewer miles of roads, and most roads decommissioned would be maintenance level 1 and 2 roads.

## **Unauthorized Routes**

As discussed in the road system background section, decisions were made when the Monument was proclaimed in April 15, 2000 on which motorized routes not previously identified as system roads would be added to the system. In all alternatives, the remaining miles of unauthorized routes (not shown in motor vehicle use maps) would generally be decommissioned. Any unauthorized routes determined to be needed since then could be added to the NFTS as new construction after appropriate travel analysis and environmental analysis are completed.

## **Indirect Effects**

Under Alternatives A, B, E, and F, the road system would be retained similar to current levels of access for dispersed recreation opportunities, private land access, ecological restoration, and fire protection treatment areas. Alternatives A, B, E, and F would potentially have the highest costs for maintaining the road system because the levels of access would be the highest. Alternatives C and D would have a substantial reduction in maintenance level 1 and 2 roads over time (closure/decommissioning), limiting driving access due to reduced dispersed recreation in Alternative C and reduced need for access to vegetation management in Alternative D. The road system under all the alternatives would initially be comprised of approximately 822 miles of roads within the Monument. Currently, 71 miles are classified as maintenance level 1 roads, which are defined as closed to vehicular traffic. Some of these closed roads in the Monument do not have adequate physical barriers that prevent public access due to oversight at the time of closure or lack of maintenance of the closure barrier. This may result in unauthorized travel on closed roads.

Alternatives C and D would have lower costs for maintaining the road system than Alternatives A, B, E, and F, because of a reduction in low standard roads over time due to reduced dispersed recreation in Alternative C and reduced need for access to complete vegetation management in

Alternative D. These alternatives would require the least increase in funding in the long term to keep the road system in acceptable condition because closing or decommissioning roads reduces maintenance costs. Overall costs are reduced, as well, once implementation costs are satisfied.

To support the existing NFTS with current and projected appropriated and non-appropriated maintenance funding, routine maintenance is being reduced, maintenance cycles are extended, and selective repairs are made to ensure public safety and prevent significant resource damage. Major repairs are funded by special appropriations outside of the annual forest budget. Current and projected funding levels do not cover deferred maintenance, which means that the deferred maintenance backlog grows annually (i.e., roads that are to be maintained once every 5 years may be maintained only once every 10 years). Over time, roads may develop severe public safety or resource damage issues and may need to be evaluated for closure to public motorized vehicular use.

Not performing routine annual maintenance on time increases the amount of deferred maintenance. Also, not performing routine annual maintenance may increase the amount of resource damage and/or safety issues caused by the use of the roads and trails. If annual maintenance was fully funded, it would still leave a large amount of deferred maintenance that would only be completed upon identification of a safety hazard to the public or the potential for severe resource damage.

## Cumulative Effects

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions that are a result, in part, of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. Several reasons exist for not taking this approach. First, a catalogue and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because information is limited on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005, regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of

past actions without delving into the historical details of individual past actions."

The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4 (f)) (July 24, 2008), which state, in part:

CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR 1508.7)

For these reasons, the analysis of past actions in this section is based on current environmental conditions.

Before the 1930s, travel within the Monument was limited to a few unsurfaced county roads and state highways, with some wagon roads through the public domain lands. During the 1930s, many roads were constructed by the Sequoia National Forest as fire protection truck trails. Some of the important routes have received minor upgrading. Many road miles from the 1930s are no longer available for motorized use after wildernesses were designated from the 1960s to the present.

All alternatives would be comprised initially of approximately 822 miles of road (approximately 51 percent of the total forest road mileage). Alternatives A, B, E, and F would provide the highest levels of access for dispersed recreation opportunities, private land access, ecological restoration, and fire protection treatment areas. Alternatives C and D would provide the lowest levels of access because of a significant reduction in maintenance level 1 and 2 roads over time (closure/decommissioning) due to reduced dispersed recreation in Alternative C and reduced needs for access to vegetation management projects in Alternative D.

There are no significant cumulative effects on public safety in any of the alternatives. Under all alternatives, coordination and collaboration with national, state, and county officials in the transportation management facilities to and through the Monument would continue to ensure that

access is maintained, standards are consistent, safety issues are addressed, and efficiency is considered at all times. The Forest Service is required to provide reasonable access to private inholdings. As ownership changes, the access requirements may also change. Overall, the transportation system for the Monument will strive to be efficient and safe, provide access to areas of interest, and provide for the variety of modes of transportation used by all to the greatest extent possible.

None of the alternatives are likely to result in a transportation system that can be fully maintained; the forest's road maintenance budget is not expected to increase significantly, and deferred maintenance would likely increase in all the alternatives. However, the cumulative effect of reducing the size of the road system in Alternatives C and D should result in a transportation system on which a higher percentage of required maintenance can be accomplished, once implementation costs for closing or decommissioning roads are satisfied. Implementation costs can be significant and may temporarily reduce the funds available for maintenance, which further adds to the deferred maintenance backlog.

As the population grows and urban development expands, the continuous use of NFS roads will increase. There is currently a greater demand for a variety of recreation uses in both motorized and non-motorized settings. The maintenance level 3 to 5 roads that connect the Monument to these areas will experience the most increased day use traffic, particularly on weekends. This traffic adds to the maintenance work required, but there is no additional funding to accomplish the work. Not performing routine annual maintenance on time may increase the amount of deferred maintenance. Also, not performing routine annual maintenance may increase the amount of resource damage and/or safety issues caused by the use of the roads. National Forest System lands adjacent to population centers are affected the most by user-created roads that access the forest from residential properties. As travel to and through the Monument increases, there will be more effects on surrounding public roads.

All alternatives would emphasize public access to the Monument, and non-motorized recreation activities would be enhanced. Permittees and landowners would take a greater role in maintaining their access where the public is not allowed on motorized vehicles. Motor vehicle effects on soils and watersheds should be reduced; however, closed roads without annual access needs would receive less maintenance than they currently do and may increase watershed effects slightly.

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## Appendix A-Travel Analysis

### Travel Analysis Process

The current Forest Service direction for travel analysis is the result of a series of agency decisions over the last decade concerning the management of motorized vehicle use on national forest lands. The initial policy included only roads, but evolved over time through additional policy decisions to address all motorized travel: on roads, on trails, and in areas designated as open for cross-country motorized travel.

Agency policy requiring a scientific based analysis for travel management decisions began in August 1999, when the Washington Office of the USDA Forest Service published Miscellaneous Report FS-643 titled “Roads Analysis: Informing Decisions about Managing the National Forest Transportation System.” The objective of roads analysis was to provide decision-makers with critical information to develop road systems that were safe and responsive to public needs and desires, were affordable and efficiently managed, had minimal negative ecological effects on the land, and were in balance with available funding for needed management actions.

In October 1999, the agency published Interim Directive 7710 authorizing units to use, as appropriate, the road analysis procedure embedded in FS-643 to assist land managers making major road management decisions. In January 2001, the Forest Service issued the final National Forest System Road Management Rule. This Roads Rule revised regulations concerning the management, use, and maintenance of the National Forest Transportation System (NFTS) to make them consistent with changes in public demands and use of National Forest System resources and in response to the need to better manage funds available for road construction, reconstruction, maintenance, and decommissioning. The final Roads Rule removed the emphasis on transportation development and added a requirement for sound science-based transportation analysis. The final Roads Rule was intended to help ensure that additions to the National Forest System road network were those deemed essential for resource management and use; that construction, reconstruction, and maintenance of roads minimized adverse environmental impacts; and that unneeded roads were decommissioned, and restoration of ecological processes was initiated.

In November 2005, the U.S. Department of Agriculture promulgated the final rule for “Travel Management: Designated Routes and Areas for Motor Vehicle Use,” otherwise known as the Travel Management Rule which is current policy. The Federal Register renamed Road Analysis “Travel Analysis” and streamlined some of its procedural requirements for the purpose of designating roads, trails, and areas for motor vehicle use, and to expand the scope of roads analysis to encompass trails and areas. Travel Analysis is required to inform decisions related to identification of the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands; and to inform decisions related to the designation of roads, trails, and areas for motor vehicle use.

Current travel management policy (as of November 2005) requires that a system of roads, trails, and areas be designated for motorized use. However, designation of a road system for motorized use was completed in the Monument in December 2000. The proclamation (Clinton 2000) states:

The management plan shall contain a transportation plan for the monument that provides for visitor enjoyment and understanding about the scientific and historic objects in the monument, consistent with their protection. For the purposes of protecting the objects included in the monument, motorized vehicle use will be permitted only on designated roads, and non-motorized mechanized vehicle use will be permitted only on designated roads and trails, except for emergency or authorized administrative purposes or to provide access for persons with disabilities. No new roads or trails will be authorized within the monument except to further the purposes of the monument. Prior to the issuance of the management plan, existing roads and trails may be closed or altered to protect the objects of interest in the monument, and motorized vehicle use will be permitted on trails until but not after December 31, 2000 (Clinton 2000, p. 24098).

Current management of the Monument complies with the proclamation direction to limit motorized vehicles to designated roads, with the exception of Trails 27E04 and 27E05 in the Kings River Special Management Area (KRSMA). Designated road maps were published in 2001 and with the 2003 Monument Plan FEIS. In October 2008, the Sequoia National Forest published Motor Vehicle Use Maps (MVUMs) for the Monument in accordance with the Travel Management Rule. The maps are based on the 2001 designated road maps and identify National Forest System roads and Forest System trails in the Giant Sequoia National Monument that are designated for motor vehicle use. There are no areas in the Monument that are open to cross-country travel by motorized vehicles.

An analysis of the entire designated road system in the Monument was completed in 2003 following the Roads Analysis Process (RAP), which was agency direction at the time. The process was very similar to the current transportation analysis direction, except that it was expanded to include motorized trails and areas. Since motorized travel is limited to designated roads in the Monument, the RAP completed in 2003 is still a valid tool to help inform decisions about the road system.

In the completed RAP, evaluation criteria were created based on specific topic areas described in the FS-643 miscellaneous report (agency direction at the time). These topics include ecosystem functions and processes; aquatic, riparian zones and water quality; terrestrial wildlife; economics; 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. The same criteria would be appropriate to evaluate the need for future changes in the trail system.

Some topic areas are best evaluated at the more site-specific scale than at the forest scale. Some of the data can become diluted at the broad scale so that some areas appear to have low impacts, when at the more site-specific scale, negative impacts can be seen and evaluated. The Road Analysis Process for the Monument has been conducted at a broad, forest scale to identify overall trends. The interdisciplinary team used evaluation criteria to generate an information baseline against which the existing and future road systems can be compared. They went through the questions to describe the baseline and any apparent benefits, problems, or risks of the current

road system. The Road Analysis is not a NEPA process; it is an integrated ecological, social, and economic approach to transportation planning, addressing both existing and future transportation roads. The completed Monument RAP is included in this appendix; a full description of the evaluation criteria developed for the Monument RAP can be found in Appendices C and D of the RAP document.

The information and analysis methods in the Monument RAP were used on the entire road system to identify social and environmental opportunities, problems, risks, and priorities for future road management. The procedures and criteria used in the Monument RAP to evaluate the transportation system and identify access needs are very similar to the methods in current travel analysis direction. The RAP is included because it is a very useful document that can be used to inform travel analysis at the project level.

The designated road system analyzed by the Monument RAP included approximately 900 miles of roads, based on Geographic Information System (GIS) data at the time. The current designated road system in the Monument includes approximately 822 miles of roads. The mileage difference of approximately 78 miles is mainly due to corrections to road lengths between 2003 and 2009 and to road segments included in the 900-mile total that are actually outside the Monument boundary. Several roads cross the Monument boundary, with segments both inside and outside the Monument. Review of the data identified the following roads with segment lengths outside the boundary which were included in the 900-mile total: Davis Rd (12S01), 18.0 miles; Delilah Rd (12S19), 7.8 miles; Uhl Pocket Rd (24S01), 5.1 miles; and Sandy Creek Rd (24S07), 4.0 miles, for a total of approximately 35 miles of the 78-mile difference. These roads represent the greatest differences in current Monument mileage. There are additional roads not listed, but not with a significant inconsistency.

The Forest Service maintains data in both spatial and tabular formats, but until recently equivalent data elements were not linked to ensure consistency in the data. For example, the curved line in GIS that represents a road has a length, and the same road listed in the corporate data warehouse (Infrastructure database, or INFRA for short) also has a data element for the road length. When the Monument RAP was completed in 2003, GIS data were used for road mileages, but the data were not linked and validated with data in INFRA. Since that time, the forest has worked to link mileages in the two data systems and correct any inconsistencies. This process of data correction accounts for much of the difference between the 900-mile road total in 2003 and the current 822-mile total.

# Roads Analysis Process

Sequoia National Forest and Giant Sequoia National Monument

Roads Analysis Process

September 16, 2003

M. Emmendorfer and J. Grenz

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

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, analysis can be conducted at the river basin, watershed, landscape and project levels (SNFPA Appendix T). Under the Roads Policy analysis 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 analysis would include an assessment of maintenance level (ML) 3, 4 and 5 roads. This information would be incorporated into landscape analysis. 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 Appendix T, p. T-4). 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 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 of the RAP). 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 of the RAP).

### **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 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 (1998 Report of the Forest Service Performance Highlights of the Natural Resource Agenda).

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: recreation, fire protection and suppression, commercial uses, grazing, university research, private property access, mining, vegetation management, and insect and disease control (Cordell et al. 1999-2000 National Survey on Recreation and the Environment, USDA Forest Service and the University of Tennessee, Knoxville, Tennessee).

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 of the RAP).

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).

“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 analysis of negative impacts to natural resources, or lack of public and administrative use. This broad scale RAP is 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 of the RAP 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 objectives 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.

The following table 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 (of the RAP) 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 <sup>1</sup>
1	517	359

2	479	280
3	325	144
4	200	69
5	100	47
<b>Total Miles</b>	<b>1,621</b>	<b>899</b>

1. 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 (see the following table). Total road miles in the SQF and GSNM using this classification system are presented in the second table below. 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 <sup>1</sup>	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.
Collector: Serves smaller land areas than arterials. Connects arterials to local roads or terminal facilities.	B: Congested during heavy traffic, slower speeds and periodic dust; accommodates any legal-size load or vehicle	Level 4: Passenger vehicles-Smooth surface.
Local: Single purpose road. Connects terminal facilities with collectors or arterials.	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.
	D: Traffic flow is slow and may be blocked by management activities. Two-way traffic is difficult, backing maybe required. Rough and irregular surface. Accommodates high clearance vehicles. Single purpose facility.	Level 2: High-clearance vehicles. Level 1: Closed more than 1 year.

1. 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**

Functional Class	Miles in Sequoia National Forest	Miles in GSNM <sup>1</sup>
Arterial	300	116
Collector	325	144
Local	996	639
Total miles	1621	899

1. 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 of the RAP 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) percent of ML1 roads must be fully maintained (5 percent 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 the following table). 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			(\$780,235)

forest)			
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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. (Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 446). The table 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.

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

National Forest	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Sequoia	1,455	1,571	1,639	1,453	1,412	1,111	738	793	779	877	792	912

(Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 447)

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.” (Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 447). 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 percent for health and safety (clearing along roadsides, repairing potholes, replacing signs, etc.)
- 39 percent 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 percent 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. (Administrative National Forest System Roads – Deferred Maintenance and Capital Improvement, Oct. 19, 2001.) 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).

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 (e.g., 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. The following table lists the botanical areas, their acreage and the Ranger District on which they can be found.

**Table 6: Botanical Areas within Sequoia National Forest**

<b>Botanical Area</b>	<b>Acres</b>	<b>Ranger District</b>
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 the Kern River (formerly 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 (Cordell et al.). 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.

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.

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 the following table 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. The following table 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.

**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		28	

Springs*			
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 wilderness and inventoried roadless areas have passive value, i.e., that 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 Sequoia National Forest RAP are (See Appendices C and D of the RAP for full description of each criterion):

1. Aquatic Risk Factors
  1. Geologic Hazard
  2. Stream Crossing Density
  3. Riparian Zone – Stream Proximity
2. Terrestrial Risk Factors
  1. Heritage Resources
  2. Road Density Effects to Wildlife Habitat
  3. Scenic Resources
3. Access Factors
  1. Private/Non-recreation Public Access
  2. Public Access (Recreation)
  3. Administrative Site Access
  4. Vegetation Management
  5. Fire Protection
4. 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.

### **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 (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).

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 (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 the following table (derived from previous tables in this document).

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

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			\$491,300		\$491,300

budget				
Annual shortfall 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 Ten Mile Road (13S09). Sherman Pass Road has the third highest east-west passage crossing over the southern Sierra, and Ten Mile Road has also been identified in 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 socioeconomic 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 than 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, organizational 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 analysis.

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 time frame 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 descendants 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 2000 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 the following table (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. The table 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).(Cordell et al. 1999-2001 National Survey on Recreation and the Environment, USDA Forest Service and the University of Tennessee, Knoxville, Tennessee, pp. 1-4.)

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	48
Get to resort/organization camp	45
Pass through to other land	40
Get to spiritually significant place	38

Get to forest product gathering areas	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 analysis for the non-Monument portion of the forest capture this kind of 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 have 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.(Cordell et al. 1999-

2001 NSRE

- power-point presentation, Keeping Ourselves Informed about What the Public Values).

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:

- 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 inholdings, 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.

### **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. 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 of the RAP 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 the table 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:

1. Roads rarely used by the public or Forest Service (i.e., low need equivalent) and are high risk equivalent would be considered for decommissioning.
2. 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.
3. Roads accessing vegetation that has reached desired condition may be evaluated for decommissioning or storm-proofing.
4. 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.
5. 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).
6. 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
<b>Ecosystem Functions and Processes (EF) (3):</b> 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?
<b>Aquatic, Riparian Zone, and Water Quality (AQ) (7):</b> 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 flood plains; 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?
<b>Terrestrial Wildlife (TW) (4):</b> How does the road system directly affect unique communities or special features in the area?
<b>Water Production (WP) (2):</b> How does road development and use affect water quality in

municipal watersheds?
<b>Administrative Use (AU) (2):</b> How does the road system affect investigative or enforcement activities?
<b>Protection (PT) (4):</b> How does the road system contribute to airborne dust emissions resulting in reduced visibility and human health concerns?
<b>Unroaded Recreation (UR) (3):</b> 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?
<b>Road-Related Recreation (RR) (3):</b> 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?

1. 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:** This is work that can be deferred, without loss of road serviceability, until such time as the work can be economically or efficiently performed. Using the example above, if the surfacing is completely worn down, the deferred maintenance is \$100,000 per mile for replacement.

**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. (Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 444).

**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. (Sierra Nevada Forest Plan Amendment, Final EIS, Volume 2, Chapter 3, part 5.5, page 444).

**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:

- 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.

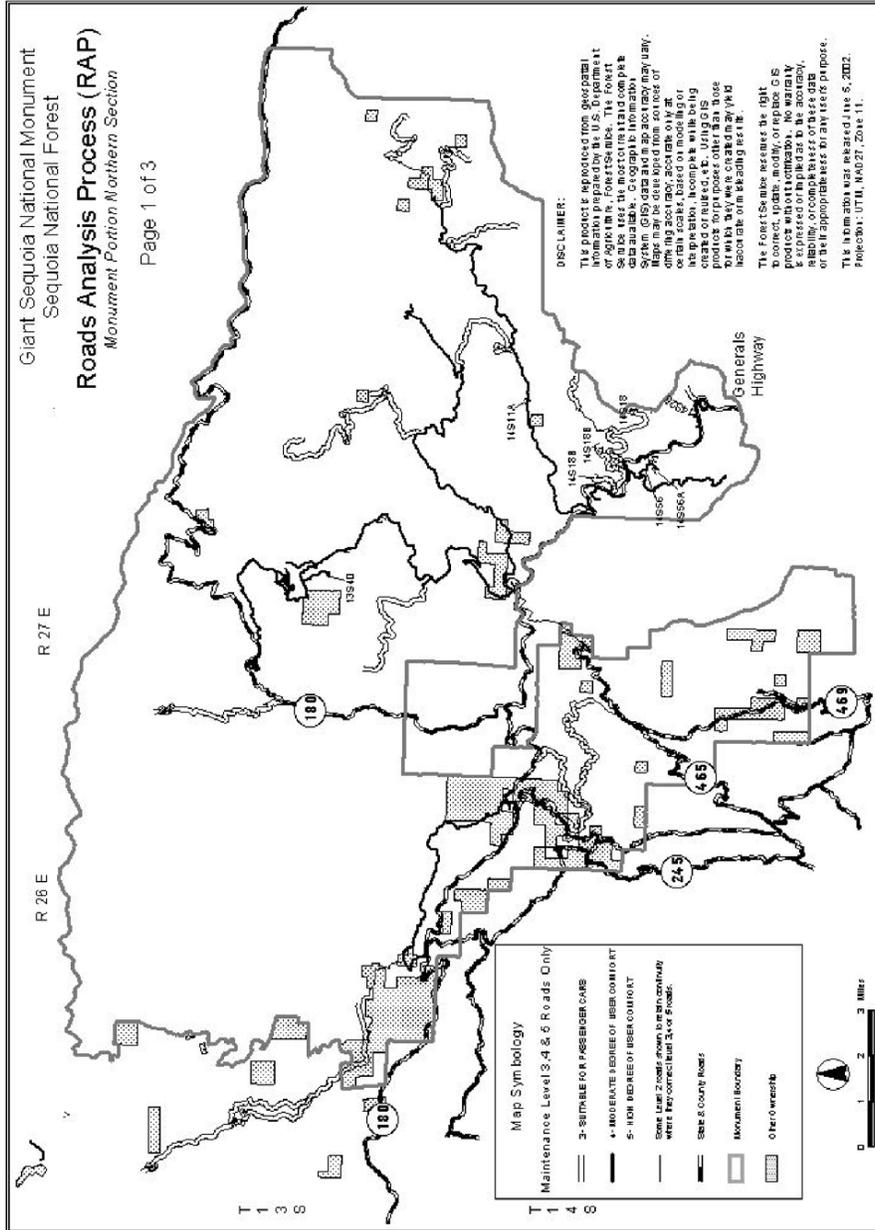
**Maintenance Level 3:** Roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Typically, low speed, single lane, with turnouts and native or aggregate surfacing.

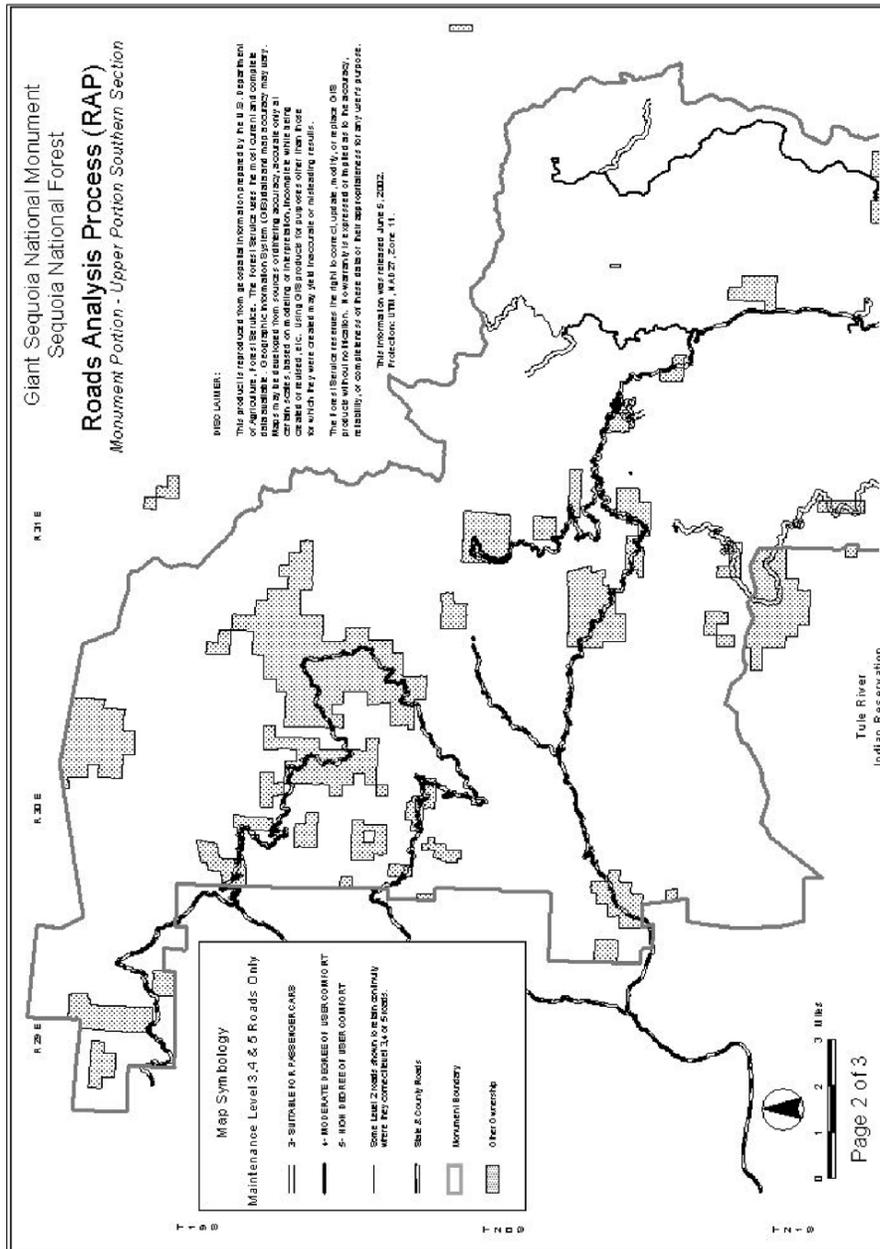
**Maintenance Level 2:** Roads open for use by high clearance vehicles. Passenger car traffic is discouraged. Traffic is minor administrative, permitted, or dispersed recreation. Non-traffic generated maintenance is minimal.

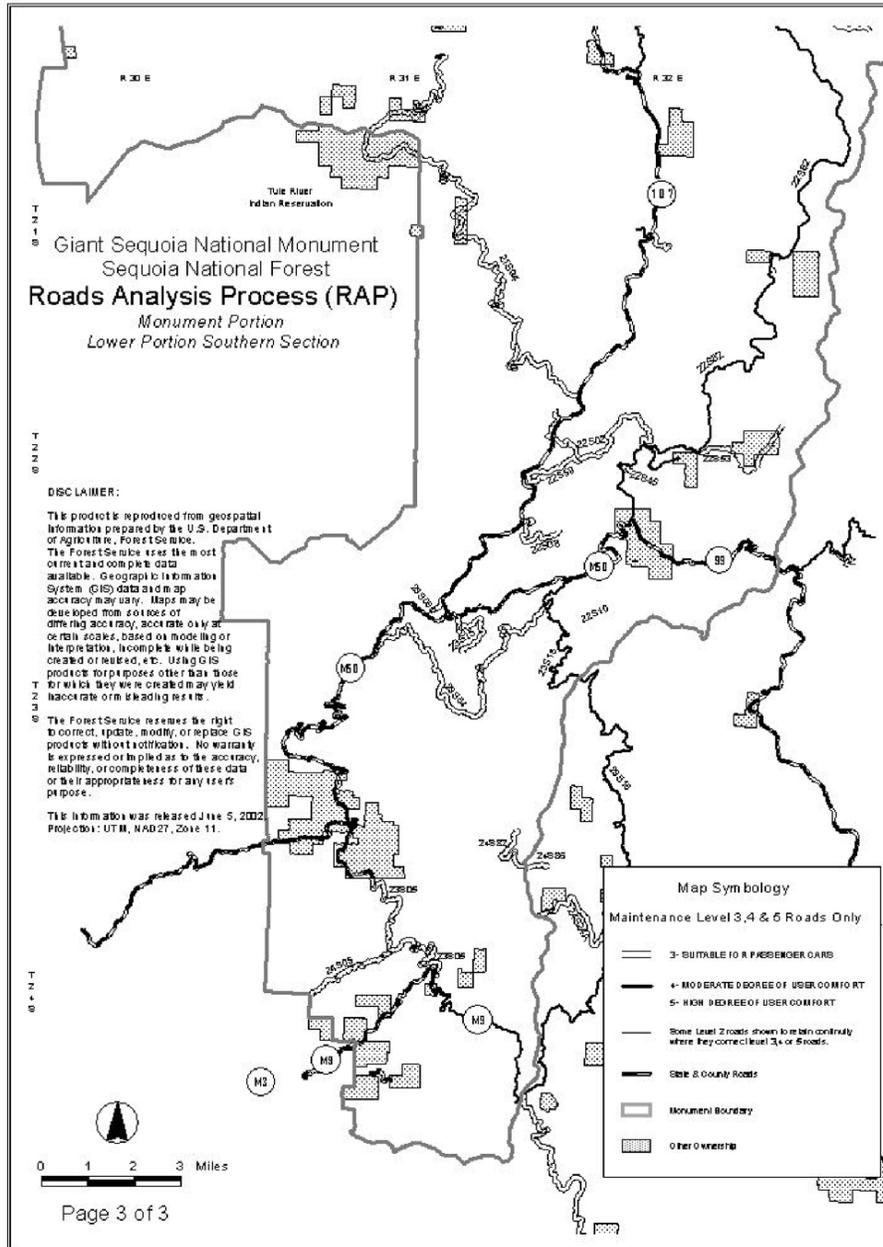
**Maintenance Level 1:** These roads are closed though some intermittent use may be authorized. When closed, they must be physically closed with barricades, berms, gates, or other closure devices. Closures must be in place for one year or more. When open, the road may be maintained at any other level. 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

(map 1 of 3)







## Appendix C-Analysis Criteria

### Sequoia National Forest RAP Evaluation Criteria

#### AQUATIC RISK FACTORS (3)

##### 1. Geologic Hazard

###### Description of Indicator

The Geologic Hazard Factor uses landslide mapping and certain topographic, soil or rock materials, and geologic conditions as an indicator of potential future mass wasting and sediment production. In general, this factor identifies those roads located within potentially unstable terrain or within areas with high sensitivity to erosion. In this context it is used primarily as a water quality and aquatic species habitat risk factor. This factor evaluates the terrain that the road is located within and considers the terrain above and below the road. This factor is an indicator of the potential to initiate mass wasting or erosion from roads rather than the potential for impacts to roads from processes initiated upslope. This factor can also be viewed as an indicator for potential damage to the road system, cost of storm damage repair, or as an indicator of high maintenance needs.

1 = (Low hazard) No portion of the road segment lies within areas identified as high geologic hazard, and less than 10 percent of the road segment length is located within areas identified as moderate geologic hazard.

3 = (Moderate hazard) Less than 30 percent of the road segment lies within areas identified as high geologic hazard; OR 10 percent or greater of the road segment is located within areas identified as moderate geologic hazard.

6 = (High hazard) 30 percent or greater of the road segment is located within areas identified as high geologic hazard.

##### 2. Stream Crossing Density

###### Description of Indicator

The Stream Crossing Density Factor determines the relative hazard associated with stream crossings within the road segment. This factor is defined in terms of the frequency of stream crossings per road mile for each road segment within a watershed of about 30,000 to 50,000 acres. The more frequent the stream crossings, the more potential there is to run over aquatic species, damage riparian habitat, add sediment to the stream or create impediments to species movement. The species potentially impacted include California red-legged frogs, foothill and mountain yellow-legged frogs or Western pond turtles. Frequency values are generated from GIS based on the number of times a stream segment intersects the road segment.

1 = (Low risk) Road segment has a density of 0 to 2 stream crossings per road mile.

2 = (Moderate Risk) Road segment has a density of 3 to 4 stream crossings per road mile.

3 = (High Risk) Road segment has a density which exceeds 4 stream crossings per road mile.

### 3. Riparian Zone – Stream Proximity

#### Description of Indicator

The Riparian Zone – Stream Proximity Factor determines the relative degree of connectivity between the road system and the stream system. This factor is related to the portion of the road segment within the riparian zone or in close proximity to a stream. For this factor, riparian zones are defined as the area bordering a stream with potential for streamside habitat. The riparian zone is 300 feet wide on each side of perennial streams and 150 feet wide on each side of intermittent streams, as measured from the center of the stream channel. The longer a road follows a stream within the riparian zone, the more potential there is to run over aquatic species, damage riparian habitat, add sediment to the stream or create impediments to species movement. The species potentially impacted include California red-legged frogs, foothill and mountain yellow-legged frogs or Western pond turtles.

1 = (Low risk) 0 to 5 percent of the road segment is within the riparian zone.

2 = (Moderate risk) 6 to 10 percent of the road segment is within the riparian zone.

3 = (High risk) Greater than 10 percent of the road segment is within the riparian zone.

#### Aquatic Risk Factor Composite Rating

A composite rating of low, moderate and high was assigned to each road segment based on combining values of the aquatic risk factors. A cumulative aquatic score was given from a sum total of all risk factors. The lowest possible score within the aquatic matrix is 6, the highest is 30, and the range of points is 23. Threshold scores were established by dividing the possible range of cumulative scores into thirds. Each category assigned this way has a range of 8 to 9.

Low = Road segment has a combined numerical value that ranges from 3 to 5.

Moderate = Road segment has a combined numerical value that ranges from 6 to 8.

High = Road segment has combined numerical value equal to or greater than 9.

**Table: 13: Aquatic Risk Factor Composite Rating**

Road Number	Geologic Hazard <sup>1</sup>	Stream Crossing Density	Riparian Zone Proximity	Aquatic Risk Composite
13SXX	1	1	1	3
22SXX	3	2	2	7
15SYY	6	3	3	12

1. The geologic hazard was weighted heavier than the other aquatic factors because of the greater risk to the road, and other resources if the road fails, in these areas.

## **TERRESTRIAL RISK FACTORS (3)**

### **1. Heritage Resources**

#### **Description of Indicator**

This factor is based on the extent of risk to recorded heritage sites either directly or indirectly related to the road segment (within 500 ft. of the road). Road segments are rated on the potential that road maintenance/reconstruction, human use and/or vandalism could affect sites. A numeric value is assigned to each road segment based on the following criteria:

1 = (Low risk) No recorded sites in or adjacent to the road that could be damaged due to road work or use. These roads do not provide access for potential looters to recorded heritage sites.

2 = (Moderate risk) No known sites in or adjacent to the road; OR the road provides access to an area with a known high density of sites or isolated sites that are near to but over 500 feet from the road. The road may provide access to looters.

3 = (High risk) One or more known sites in the road corridor (within 500 feet) that could be impacted by maintenance or use of the road. The road may provide looters with easy access to sites, and allow people to drive onto or camp on the sites.

### **2. Road Density Effects to Wildlife Habitat**

#### **Description of Indicator**

Road density (roaded miles per mile squared): Wildlife species and habitat quality can be impacted in areas with high road density and use. Potential influencing factors include: direct road related mortality; species road aversion and other behavioral modification; habitat loss, fragmentation and isolation of populations. The type of road (i.e. maintenance level) further contributes to the scale of effects to wildlife. Thomas et al. (1979, figure 74) assessed the impacts of traveled roads on the potential effectiveness of summer deer habitat utilizing both road density and maintenance levels (adapted from Perry and Overly 1977). Road density and corresponding maintenance levels per square mile were calculated using arc view, generating a percent value and then placed in the corresponding risk categories:

1 = (Low Risk) Less than 20 percent decline in habitat effectiveness by roaded miles per square mile.

2 = (Moderate Risk) Greater than 20 percent and less than 40 percent decline in habitat effectiveness by roaded miles per square mile.

3 = (High Risk) Greater than 40 percent decline in habitat effectiveness by roaded miles per square mile.

### **3. Scenic Resources**

#### **Description of Indicator**

This factor is based on the impacts the road segment prism has on scenic integrity. Scenic integrity indicates the degree of intactness and wholeness of the landscape character. Human activity can sometimes raise or maintain integrity. Road segments are rated by the amount of changes in the visibility of the road and effects to the scenic view on the landscape due to road construction or maintenance/ reconstruction.

1 = Road segment prism presents few to no impacts to the scenic resource (fits well within the landscape) or presents a slightly altered appearance to the valued landscape character.

2 = Road segment prism presents a moderately altered appearance to the valued landscape character.

3 = Road segment prism presents a heavily altered appearance to the valued landscape character.

### **Terrestrial Risk Factor Composite Rating**

A composite rating of low, moderate and high was assigned to each road segment based on combining values of the terrestrial risk factors. A cumulative score was given from a sum total of all risk factors. The lowest possible score within the terrestrial matrix is 3, the highest is 9, and the range of points is 6. Threshold scores were established by dividing the possible range of cumulative scores into thirds. Each category assigned this way has a range of 2 to 3.

Low = Road segment has a combined numerical value that ranges from 3 to 4.

Moderate = Road segment has a combined numerical value that ranges from 5 to 7.

High = Road segment has combined numerical value equal to or greater than 8.

**Table 14: Terrestrial Risk Factor Composite Rating**

<b>Road Number</b>	<b>Heritage Resources</b>	<b>Road Density/ Wildlife Habitat</b>	<b>Scenic Resources</b>	<b>Terrestrial Risk Composite</b>
13SXX	1	1	1	3
22SXX	2	2	2	6
19SXY	3	3	3	9

## **ACCESS FACTORS (5)**

### **1. Private/Non-recreation Public Access**

#### **Description of Indicators**

The road system provides access to private landowners and non-Forest Service land managed by other agencies and tribes including Sequoia and Kings Canyon National Parks, Mountain Home State Forest, Public Domain Tracts (Dunlap Band of Western Mono Indians) and the Tule River Indian Reservation. In addition to private lands some roads provide access to facilities authorized by special use permit or other permits for activities including hydroelectric facilities, power

lines, communications sites, cattle grazing, resorts, recreation residences, organization camps, and public users for firewood cutting. When the road provides access to other landowners, the Forest Service is obligated to provide for reasonable access. Because of the need to provide and manage this access, this factor is heavily weighted.

6 = (Low importance) Road segment does not provide access to non-Forest Service managed land, a special use permit site (power line, communication site, etc.) or other non-recreation public access.

3 = (Moderate importance) Road segment serves as an alternate access to non-Forest Service managed land, a special use permit site (power line, communication site, municipal water facilities, etc.) or other non-recreation public access.

1 = (High importance) Road segment serves as the primary access to non-Forest Service managed land, a special use permit site (power line, communication site, or municipal water facilities, etc.) or other non-recreation public access.

## **2. Public Access (Recreation)**

### **Description of Indicator**

This factor is based on the extent of public recreation use by passenger cars, motor homes, pickups, etc. (such as for camping, hunting/fishing, OHV use, bicycling, etc.) for road segments. Road segments are rated on the type of human uses the segment serves such as access to dispersed or developed recreation sites (campgrounds, trailheads, viewpoints, fee cabin rentals). A numeric value is assigned to each road segment based on the following criteria:

3 = (Low importance) Road segment is blocked to use by passenger cars or pickups, or only provides access for seldom used dispersed recreation, or there is no known dispersed recreation and is not a marked OHV route on the monument OHV map.

2 = (Moderate importance) Road segment is open to vehicle use and is used for dispersed recreation, or road segment is a secondary route for OHV use and driving for pleasure.

1 = (High importance) Road segment serves as the primary access to a developed recreation facility or heavily-used, dispersed recreation site, or road segment is the primary destination for OHV (OSV, 4WD, etc.) use or driving for pleasure.

## **3. Administrative Site Access**

### **Description of Indicator**

This factor is based on the extent of Forest Service use for access to administrative sites such as Ranger Stations, rock sources, repeater sites, weather stations, water sources and roads that are classified as arterial. A numeric value is assigned to each road segment based on the following criteria:

3 = (Low importance) Road segment does not provide access to Forest Service administrative

sites, rock sources, repeater sites, weather stations, water sources and is not classified as a arterial route.

2 = (Moderate importance) Road segment serves as an alternate access to Forest Service administrative sites, rock sources, repeater sites, weather stations, water sources and is not classified as a arterial route.

1 = (High importance) Road segment serves as the primary access to Forest Service administrative sites, rock sources, repeater sites, weather stations; or road segment is classified as an arterial route or accesses a water source (water tank at campground, work center, etc.).

#### **4. Vegetation Management**

##### **Description of Indicator**

This factor is based on the various access needs to efficiently and effectively manage vegetation. Vegetation management can be used in some areas to reduce fuel levels to reduce the risk of catastrophic fire, protect communities from fire, increase regeneration of giant sequoias and restore groves to desired stand conditions, restore ecosystems to a more natural fire regime of frequent but low intensity fires, and restore other vegetation types, such as plantations, to more natural conditions, or to limit the spread of introduced exotic insects or diseases.

Numerical scores are applied to road segments based on access needs to urban intermix defense zones or threat zones, Strategically Placed Land Area Treatments (SPLATs) or areas of high fire susceptibility, giant sequoia groves, and existing plantations.

3 = (Low importance) Road segment provides limited access to areas of high fire susceptibility, urban intermix defense zones or threat zones, giant sequoia groves or existing plantations.

2 = (Moderate importance) Road segment provides access to areas with moderate acreage of high fire susceptibility, urban intermix defense zones or threat zones, giant sequoia groves or existing plantations.

1 = (High importance) Road segment provides access to areas with high acreage of high fire susceptibility, urban intermix defense zones or threat zones, giant sequoia groves or existing plantations.

#### **5. Fire Protection**

##### **Description of Indicator**

Roads are a useful tool in protecting areas from fires. They provide access to areas for detecting fires, and deployment of suppression forces during initial attack and extended attack on wildfires. Roads can be used as fuelbreaks to limit fire spread under low and moderate conditions or for backfiring operations. Roads have often been used as the starting point accessing fuelbreaks and have value in isolating and breaking up the continuity of fuelbeds. Roads have different values for fire suppression due to the position on slope. Ridgetop roads tend to be most useful for firebreaks and defensible firelines. Midslope roads have the least value as firelines, but

they often provide access to the defensible locations and are therefore still important. Well-maintained roads located in or in close proximity to communities are important for suppression resources to maneuver while protecting homes and maintaining firefighter safety. Public and commercial road access can lead to increased ignitions; this effect is highly variable from district to district.

Numerical scores are assigned to road segments based on position on slope and continuity of fuelbeds, on whether the road provides access to facilities or private property to be protected, and whether there is a high incidence of ignitions.

6 = (Low importance) Segment is midslope with little holding value for initial attack or extended attack, and does not provide access to roads with good holding value. The segment does little to isolate or break up the continuity of fuels in the area. The segment is not important for protection of facilities or private property.

3 = (Moderate importance) Segment is midslope or ridgetop with some holding value for initial attack and/or extended attack, and provides alternate access to roads with good holding value. The segment is useful in breaking up continuity of fuels. The segment may or may not be important for protection of facilities or private property.

1 = (High importance) Segment is ridgetop or close to ridgetop with good holding value for initial attack and/or extended attack, or provides extensive access to roads with good holding value. The segment is very useful in breaking up continuity of fuels. The segment is important for protection of facilities or private property. This segment is important for firefighter and public safety.

### **Access Composite Rating**

A composite rating of low, moderate, or high importance is assigned to each road segment for access factors based on the following criteria:

Low = A numerical sum of 20-27 for Private, Public Transportation, Administrative, Vegetation Management or Fire Protection Access for the road segment.

Moderate = A numerical sum of 12-19 for Private, Public Transportation, Administrative, Vegetation Management or Fire Protection Access for the road segment.

High = A numerical sum of 5-11 for Private, Public Transportation, Administrative, Vegetation Management or Fire Protection Access for the road segment.

A high rating indicates high demand for the road and, conversely, a low indicates little demand.

**Table 15: Access Composite Rating**

<b>Road Number</b>	<b>Private Use/Public Transportation*</b>	<b>Recreation Access</b>	<b>Admin. Site Access</b>	<b>Veg. Mgt. Access</b>	<b>Fire Protection*</b>	<b>Access Composite</b>
13SXX	1	1	1	1	1	5
22SXX	1	2	2	2	3	3
15SYY	6	3	3	3	6	27

\*Both Private use/Public transportation and Fire Protection are weighted heavier than the other access factors for specific reasons. The Forest Service is required to provide reasonable access to private property that is surrounded by National Forest System lands, for this reason the private use portion was rated heavier. In addition, the need to protect forest ecosystems, and private and public facilities from catastrophic fire is an important issue.

## **SOCIAL FACTORS (2)**

### **1. Lifestyle, Attitudes, Beliefs, and Values**

#### **Description of Indicator**

This factor is based on the extent the road system may affect human lifestyles, attitudes, beliefs, and values. Lifestyles include employment, traditional uses, hobbies, and spiritual practices; attitudes, beliefs, and values include cultural values, significance of sequoias, other values of the road including access to special places, and the desire to maintain access to their public land. More specifically, this factor looks at the positive aspects of roads for the individual and the community. It analyzes the importance of a road for a variety of needs such as: access to areas for environmental and historical education and interpretation, psychological well-being, stress relief, solitude, desire to be in a natural setting, spend time with family, and access for the general public's other perceived needs and values of the forest. Access to Native American gathering and cultural sites are included here.

#### **Lifestyle**

3 = (Low importance) Road segment is not used for employment reasons, or traditional uses nor are there any known uses related to personal hobbies or spiritual values associated with the road.

2 = (Moderate Importance) Road segment is used occasionally for employment, means to earn a living, or traditional uses; or personal hobbies are pursued and/or spiritual values occur.

1 = (High Importance) Road segment is used for regular employment, traditional use, hobby or spiritual practice.

#### **Attitudes, beliefs, and values**

3 = (Low imp.) No desires expressed to retain road segment.

2 = (Moderate imp.) Moderate value given to road segment (Access for sake of maintaining access to National Forest). Access to a special place may be provided to a limited number of visitors.

1 = (High imp.) High demand expressed for road segment with consistent desire to access special place(s).

## 2. Economics by Road Maintenance Level

### Description of Indicator

This factor is based on our ability to maintain the existing road system with the current budget. The arterial (ML 5) and collector roads (ML 4) are generally paved and these roads must be maintained to a high standard; however, paved roads are much more expensive to maintain than native surfaced roads. The collector roads (ML 3) are open to the public and must be maintained by law (Highway Public Safety Act) to a minimum safe standard. The forest annual road maintenance budget has been on a decline in recent years and the allocated maintenance funds are not sufficient to maintain the entire forest road system.

### Surfacing

3 = (Low imp.) Road segment is closed or is accessible only by high clearance vehicle. ML is 1 or 2.

2 = (Moderate imp.) Road segment consists primarily of native surfacing and is listed as an operational ML

3 road. These road segments are open for public use and travel.

1 = (High imp.) Road segment is all paved; ML 4 or 5.

### Social Composite Rating

A composite rating of low, moderate, or high importance is assigned to each road segment for social factors based on the following criteria:

Low = A numerical value of 7-9 for economic, lifestyle, attitudes, and beliefs values for the road segment.

Moderate = A numerical value of 5-6 for economic, lifestyle, attitudes, and beliefs values for the road segment.

High = A numerical value of 3-4 for economic, lifestyle, attitudes, and beliefs values for the road segment. A high rating indicates low values for the road and, conversely, a low indicates high value.

**Table 16: Social Composite Rating**

Road Number	Lifestyle	Attitude, Belief, Value	Economics	Social Composite
13SXX	1	1	1	3
22SXX	2	2	2	6
15SYY	3	3	3	9

## **Appendix D-Analytical Reports**

### **Evaluation Criteria Development Process;**

M. Emmendorfer; May 3, 2002

The evaluation criteria were developed using the Roads Analysis: Informing Decisions about Managing the National Forest Transportation System (FS-643), specifically Appendix 1: Ecological, Social and Economic Considerations. The following discussion describes the development process specific to each criteria including units of indicator and data sources. Each question from Appendix 1 of FS-643 is listed, whether the RAP addressed the question and why it was or was not addressed.

#### **Aquatic Risk Factors**

The Forest Hydrologist was consulted at the beginning of the development process to determine what measures are standard, or necessary at a forest scale in terms of aquatic risks from roads. In addition the Forest Wildlife Officer and Zone Fisheries Biologist were consulted to determine measures of effects of roads to aquatic species and their habitat. Three criteria were developed to address the aquatic risks at the forest scale.

Non-native fish are regularly planted in several streams by the State Department of Fish and Game. There is a concern in specific locations about introduction of non-native aquatic species, however this is an issue measurable only at the project level or landscape scale.

#### **Geologic Hazard**

The geologic hazard rating was developed to address the issues of surface erosion, mass wasting, and modification of the hydrology of the area due to the road location across the landscape.

#### ***Units of Indicator***

The units are expressed as the percentage of road length from the travel route layer within areas identified as low, moderate, or high geologic hazard in the slope stability layer generated by Ecological Unit Inventory (EUI).

#### ***Data Sources***

The geologic hazard map was created using the EUI slope stability layer that combines hazard units from the following Geographic Information System (GIS) map layers: 1) Slope Morphology, 2) Geomorphic Map Units (GMU), 3) Sequoia National Forest Soil Survey, and, 4) the USGS Geologic Map of the Sequoia National Forest. Units from the slope morphology layer combine steep slope gradients with converging topography (or hollows) and are used as an indicator of potential for shallow rapid landslides and debris flows. Units from the GMU layer include those landforms that have a mass wasting origin, or a high incidence of mass wasting. Units from the Soil Survey layer include mapped landslides, glacial lacustrine (lakebed) deposits, mountain headwalls, and inner gorge landforms. Units from the Geologic Map include relatively weak bedrock units with a tendency toward large-scale landsliding and/or fine sediment

production or mapped landslides.

### **Stream Crossing Density**

This rating was developed to address the issues of road-stream crossings influencing local stream channels, water quality and movement of aquatic species. It also gives an indication of the potential for pollutants to enter the stream system, effects to beneficial uses down stream, and overlap of the road system on high quality or unique aquatic species habitat.

#### *Units of Indicator*

The units for stream crossing density are expressed as the number of stream crossings per road mile for each road segment.

#### *Data Sources*

The stream layer and travel route layers are used to determine crossings.

### **Riparian Zone-Stream Proximity**

This rating was developed to address the issues of hydrologic connections between the road and the streams, effects to wetlands, constraints to channel migration, shading and other effects to riparian plant communities, water quality in terms of sediment potential, and movement of aquatic species. It also gives an indication of the potential for pollutants to enter the stream system, effects to beneficial uses down stream, and overlap of the road system on high quality or unique aquatic species habitat.

#### *Unit of Indicator*

This indicator is based on the percentage of road segment within 300 or 150 feet of the stream, per the riparian conservation area guidelines in the SNFPA.

#### *Data Sources*

The data comes from the SNFPA guidelines used to buffer the perennial and intermittent stream layer, which is then overlaid with the travel routes.

### **Terrestrial Risk Factors**

The Forest and Hume Lake District Archaeologists, and Forest and Monument Wildlife Biologists were consulted at the beginning of the development process to determine what measures are standard, or necessary at a forest scale in terms of risks to heritage resources, and wildlife species and wildlife habitat from roads.

### **Heritage Resources**

This rating was developed to address the issues of damage to culturally significant places from the road itself or by providing access for vandals. A distance of 500 feet between the road and a known heritage resource site was determined to be an appropriate measure based on the field knowledge and expert opinion of the Hume Lake District Archaeologist.

### ***Unit of Indicator***

This indicator is based on proximity of known sites to roadways.

### ***Data Sources***

The data was interpreted by the Hume Lake District Archaeologist using the heritage resources site atlas overlaid with the travel routes, and his field knowledge of known sites.

### **Road Density Effects to Wildlife Habitat**

This rating was developed by the Forest and Monument Wildlife Biologists, based on Thomas et al. (1979, figure 74). The rating addresses the issues of effects to wildlife species and the quality of their habitat due to roads. The impact of roads on wildlife and their habitat is markedly influenced by road density and its use (i.e., maintenance level). Deer were selected as a sensitive indicator to assess road impacts and serve as a proxy for a variety of wildlife that may be influenced by roads. The calculation below was generated from figure 74 in Thomas et al. (1979).

$$[(\text{Arterials (Maintenance Level (ML) 4 and 5)} \times .08) + (\text{Collectors (ML 3)} \times .17) + (\text{Locals (ML 1 and 2)} \times .09)] \times 100 = \text{Percent Loss of Habitat Effectiveness}$$

Some site-specific activities, including poaching are issues measurable only at the project level or landscape scale. The review of road effects to Protected Activity Centers and other site-specific wildlife habitat areas becomes diluted at the forest scale, and will need to be analyzed at the landscape or project level instead.

### ***Units of Indicator***

The rating is based on the formula above used at a 1-mile square grid.

### ***Data Sources***

The data comes from the formula above overlaid with the travel routes and a 1-mile square grid.

### **Scenic Resources**

This rating was developed by the Forest Landscape Architect to address the issue of visual scars on the land by the existence of roads across the landscape.

### ***Unit of Indicator***

This indicator is based on the appearance of the road prism across the landscape.

### ***Data Sources***

The data comes from the digital orthophotos overlaid with the travel routes at the 7.5-minute scale. The data was interpreted by the Forest Landscape Architect.

### **Access Factors**

These factors were developed to address the various access needs of private property owners, the visiting public, other agencies and organizations, and Forest Service personnel to manage the natural and cultural resources and facilities within the forest and Monument. The Giant Sequoia National Monument is removed from the commercial timber and mineral base, of the Sequoia National Forest, however vegetation management activities are still necessary to manage the monument ecosystem.

### **Private/Non-Recreation Public Access**

This rating was developed by the Hume Lake and Tule River/Hot Springs District Recreation and Resource Officers, and the Special Use Administrators. It addresses the issues of access to non-recreation special use permits, special forest products, range management, private inholdings, hydroelectric power sources, impoundments and distribution canals, and culturally significant places or properties. The Dunlap Band of Mono Indians, specifically allotment holders, and Tule River Indian Tribe were contacted and consulted, as necessary, to ensure access to culturally significant areas was rated appropriately (memo in project file).

### ***Unit of Indicator***

This indicator is based on known uses of a road.

### ***Data Sources***

The data comes from the Meaningful Measures database, special uses permitted sites, private inholdings, firewood cutting areas and other non-recreation uses associated with specific travel routes, and review of 7.5-minute quadrangles. Some of the data was gathered in discussions with other agencies or organizations during the public involvement process (See Appendix F of the RAP) and from the Hume Lake and Tule River/Hot Springs District Resource Officers and Special Uses Administrators.

### **Public Access (Recreation)**

This rating was developed by the Hume Lake and Tule River/Hot Springs District Recreation and Resource Officers, and the Special Use Administrators. It addresses the issues of access to various destinations both for developed and dispersed recreation activities. It includes access to

unroaded recreation destinations, road-related recreation, including off-highway vehicles and over snow vehicles, and annual special use recreation events.

### ***Unit of Indicator***

This indicator is based on known uses of a road.

### ***Data Sources***

The data comes from various sources associated with specific travel routes, review of 7.5-minute quadrangles and Forest Recreation Map. These sources include the Forest Trail Plan FEIS and project record, and the Meaningful Measures database (Concentrated Use areas used for dispersed recreation data). The data was interpreted and verified by the Hume Lake and Tule River/Hot Springs District Resource Officers, OHV Coordinators (especially, secondary route identification) and Special Uses Administrators.

### **Administrative Site Access**

This rating was developed by the Forest Landscape Architect in association with the Hume Lake and Tule River/Hot Springs District Recreation and Resource Officers. It addresses the issues of access to various administrative destinations including work centers, campground infrastructure (water tanks, etc.) and repeaters, and the type of road (arterial).

### ***Unit of Indicator***

This indicator is based on known uses of a road.

### ***Data Sources***

The data comes from the INFRA database associated with specific travel routes, and review of 7.5 minute quadrangles. Additional information comes from the Meaningful Measures database and local expertise of district personnel (facilities managers).

### **Vegetation Management**

This rating was developed by the Forest Fire Planner with assistance from the Hume Lake and Tule River/Hot Springs Fuels Specialists, and the Hume Lake and Tule River/Hot Springs Silviculturists. It addresses the issues of access for vegetation management for regenerating wildlife habitat, ecosystem health, vectors for noxious weeds and fuels reduction and management in terms of strategic access points and fuel types.

### **Description of Vegetation Indicator**

Management treatments can be used to determine the size and species of vegetation, tree density, crown size, and plant vigor. Treatments begun when trees are young are frequently used to accelerate the development of late successional habitat by producing large diameter trees earlier

in the life of the stand and providing space for the development of multi-story canopies. Stands can be thinned to achieve a structure and fuel loading that allows wildfires to burn in more natural patterns and intensities. Road access is often necessary to maintain healthy stand conditions by removing trees injured by biotic or atmospheric factors, or to control the spread of noxious weeds, insects or diseases. This is often done along roads and trails to allow safe public travel.

Numerical scores are assigned to road segments based on the degree to which they access plantations or wild stands in need of silvicultural treatment to restore desired conditions or to create a more natural fire regime.

### **Description of Fuels Management Indicator**

*How does the road system affect fuels management?*

It has been recognized that within the last century the amounts of available fuel have significantly increased over historic amounts. The situation now is that fuels occupy more contiguous tracts of land that support larger and more intense fires. This increase of fuels is reflected in the shift of conditions class and change in fire regime for various vegetation types. Wildland fire policy directs that fuels management be substantially increased on National Forest System lands to restore ecosystems and to reduce deleterious fire effects and suppression costs.

Priority roads for conducting management activities are roads that take crews and other resources such as engines, watertenders and overhead to project areas. National Fire Plan Key Point 3 – Hazardous Fuels Reduction directs activities to focus on wildland urban interface areas to reduce risk to people and property. Project areas for fuels management activities have also been outlined in the SNFPA as areas that have been identified as wildland urban intermix. The defense and threat zones have been delineated on maps so that there is little question where the intermix is located. There is also a need for projects away from the urban intermix to restore fire to the ecosystem. And management of fuels down slope and within giant sequoia groves is a high priority within GSNM.

The expected workload in fuels management is quite extensive on Giant Sequoia National Monument, particularly in the mixed conifer ecosystem. The acres that have missed more than 5 fire cycles totals up to approximately 75 percent of the forest. Therefore, there is a need to treat as much acreage as possible using all available access routes. There will be some roads that provide duplicate access to some areas, or do not provide enough access, in such cases as these, roads may be found unnecessary. Roads not only provide access for fire personnel, and are useful as fire lines for prescribed burning. Primarily most roads will be considered important for the treatment of fuels.

Numerical scores are assigned to road segments based on whether they access a project or projected treatment area. Land Allocations such as threat zones, defense zones and SPLATs are areas of priorities.

## **Vegetation Rating**

Road access is a prerequisite for both stand maintenance and establishment activities, and fuels management treatments. The ratings shown below assign a relative rating for the value of a road segment for silvicultural and fuels management purposes. Ratings are based on stand age as an indicator of treatment feasibility, and current need for reforestation or fuels reduction treatments.

3 = Low importance = Road segment accesses plantations or wild stands in desired condition and free-to-grow;  
or segment does not intersect an area planned to have fuel treatment done in next 20 years.

2 = Moderate importance = Road segment accesses stands >20 years old; or segment intersects area that has moderate level of acreage planned to be treated within the next 20 years.

1 = High importance = Road segment accesses stands less than 20 years old in need of density or structural changes, or stands with unacceptable insect or weed conditions; or segment intersects an area that has a high level of acreage planned for fuel treatment within the next 20 years.

## ***Unit of Indicator***

This indicator is based on: fire susceptibility in terms of fire history, slopes, urban intermix, and fuels in and below sequoia groves; access to giant sequoia groves; level of damage from noxious plants and insects; and plantation age as an indicator of treatment feasibility.

## ***Data Sources***

The data come from the INFRA database associated with specific travel routes, the vegetation layer, annual tree mortality surveys, and from the urban defense and threat zones and SPLATs (includes fire susceptibility factors) overlaid with the travel routes.

## **Fire Protection**

This rating was developed by the Forest Fire Planner with assistance from the Hume Lake and Tule River/Hot Springs Fuels Specialists. It addresses the issues of access for protecting people and public, administrative and private facilities from wildfires.

*How does the road system affect the capacity of the Forest Service and cooperators to suppress wildfires?*

Roads are useful tools for suppression resources during initial attack and extended attack for wildfires. Roads can limit fire spread under low and moderate conditions and can be used for burnout operations for indirect line construction. Roads have often been used as foundations for fuelbreaks and have value in isolating and breaking up the continuity of fuelbeds. Roads have different values for fire suppression due to the position on slope. Ridgetop roads tend to be most useful for firebreaks and defensible firelines while midslope roads have least value.

Public and commercial road access are known to lead to increased ignitions, this effect is highly variable from district to district. If there are known corridors that trend to high fire incidence the value of closing the road may be considered.

*How does the road system affect risk to firefighters and to public safety?*

Roads affect firefighter safety when they are obliged to use them. Roads that lead to and through communities are used by firefighters so that they can protect the communities. Roads that are narrow and not well maintained may slow resources or entrap resources in unexpected conditions. In general, roads are usually the safest place to be in a wildfire situation, however, the usefulness of the roads as safety zones depends on the amount of vegetation adjacent to the roadway. The quantity of road system is not more important to firefighter and public safety as much as how well they are maintained.

### ***Unit of Indicator***

This indicator is based on fire susceptibility in terms of fire history, slopes, and urban intermix.

### ***Data Sources***

The data comes from the 7.5-minute quadrangle topography, and the pre-attack map (includes SPLATs and fuelbreaks) overlaid with the travel routes. The local suppression knowledge of district personnel is very important in this evaluation.

### **Social Factors**

These factors were developed to address the socioeconomic issues surrounding the road system including the cost of maintaining the road system, and the lifestyles, attitudes, beliefs and values associated with the roaded and unroaded features of the area. Within both the forest and Monument there are no plans to develop roads in any of the designated unroaded areas. The issue of site-specific creating new roads or decommissioning roads needs to be analyzed at the landscape and project scale.

Examples of social issues include:

1. What are the perceived needs and values for roads? How does road management affect one's dependence on, need for, and desire for roads?
2. What are the perceived needs and values for access? How does road management affect one's dependence on, need for, and desire for access?
3. How does the road system affect cultural and traditional uses?
4. How is community, social, and economic health affected by road management (for example, lifestyles, businesses such as tourism industry, infrastructure maintenance)?

5. What is the perceived social and economic dependency of a community on an unroaded area versus the value of that unroaded area for its intrinsic existence and symbolic values?
6. How does road management affect wilderness attributes, including natural integrity, opportunities for solitude, and opportunities for primitive recreation?

### **Lifestyles, Attitudes, Beliefs, and Values**

These ratings were developed by the Forest Landscape Architect and the actual rating was done by over 450 individuals during the public involvement process. These ratings address the public's values, needs and desires for roads, access, traditional and cultural uses, access for economic and lifestyle reasons, perceived changes in access needs due to the GSNM, and civil rights in terms of access for the elderly, cultural reasons, disabled and low-income groups.

#### ***Unit of Indicator***

This indicator is based on identified traditional uses, hobbies or spiritual values associated with specific roads.

#### ***Data Sources***

The data comes from public involvement with focus groups associating the travel routes with specific traditional uses, hobbies or spiritual values.

### **Economics by Road Maintenance Level**

This rating was developed by the Forest Transportation Engineer. It was developed to address the costs and benefits of the road system as it exists and sets the baseline for further evaluation at the landscape and project level in the event road construction or decommissioning is proposed.

#### ***Unit of Indicator***

This indicator is based on the cost of maintaining the various roads, with more importance given to maintaining the arterial and collector roads because of direction found in the Highway Public Safety Act.

#### ***Data Sources***

The data comes from the INFRA database linked to the travel routes.

# Sequoia National Forest Giant Sequoia National Monument Roads Analysis Project

GIS Input; C. Klein; November 2001

Project directory and workspace set up by Annette Fredette as /fsfiles/fstmp/rap

Initial coverages placed in this directory by Annette; (with the exception of sqf\_trans1113 and watershed\_bdy, these coverages represent the individual 5th field HUC watersheds that are influenced by the Giant Sequoia National Monument.)

**Table 17: Watersheds That Are Influenced by the Giant Sequoia National Monument**

Watersheds		
Converse_mill	Converse_mill	Converse_mill
Deer_creek	Deer_creek	Deer_creek
Durwood_brush	Durwood_brush	Durwood_brush
Kings_River	Kings_River	Kings_River
Little_kern	Little_kern	
Lower_kaweah	Lower_kaweah	

The coverage watershed\_bdy is the outermost boundary of the 5th field HUCs that are influenced by the Giant Sequoia National Monument.

Sqf\_trans1113 was the first version of the roads coverage that had been routed into travel routes by Tom Potter of the Regional Office. This version was not completely routed, but was determined to be completed enough to start using for the roads analysis. The determination to use this version was made due to the time constraints involved in completing the monument portion of the Roads Analysis.

By the time the second version sqf\_trans1120 became available, there had already been substantial GIS analysis done such that starting over was not feasible due to the time constraints. Additional routed roads added to subsequent versions would be reviewed individually under each analysis factor and added to the final factor analysis table.

Of the 14 analysis factors, sufficient coverages existed to perform GIS analysis on 5. Those factors are: Geologic Hazard, Stream Crossing Density, Riparian Zone Proximity, Vegetation Management Access and Road Density/Wildlife Habitat.

The following forest wide coverages were used.

**Table 18: Coverage Forest-Wide**

<b>Data</b>	<b>Forest Coverage</b>	<b>Location</b>
Roads	Sqf_trans1113	/fsfiles/fstmp/rap
Monument Boundary	Sqfmonu00_2	/fsfiles/ref/library/gis/sequoia/forest
Watersheds	Sqf5huc01_3	/fsfiles/ref/library/gis/sequoia/soils_water
Ecological Unit Inventory	Sequoia_eui	/fsfiles/ref/library/gis/sequoia/forest
Streams	Sqfstrm98_2	/fsfiles/ref/library/gis/sequoia/forest
Managed Stands	Sqfstnd98_4	/fsfiles/ref/library/gis/sequoia/forest/managed_stands/srs
Urban Intermix	Sqfimix01_1	/fsfiles/ref/library/gis/sequoia/fire
Existing Vegetation	Sqfeveg97_7	/fsfiles/ref/library/gis/sequoia/forest
Current Timber Sales	Sqfsale_utm11	/fsfiles/fstmp/gistmp
SPLAT	Sqfsplat01_2	/fsfiles/ref/library/gis/sequoia/fire

The following coverage were created during the analysis:

**Table 19: Coverage Created During Analysis**

<b>Data</b>	<b>Coverage</b>	<b>Location</b>
Monument Roads	Sqf_montrans	/fsfiles/fstmp/rap
Monument Streams	Monu_strms	/fsfiles/fstmp/rap
Stream Buffers	Monu_strm_buff	/fsfiles/fstmp/rap
Plantations	Pla_nopct	/fsfiles/fstmp/rap
Road Density Grid	Mon_rd_density	/fsfiles/fstmp/rap

**Sqf\_montrans** was created by first clipping the entire roads coverage to the forest boundary, then to the coverage watershed\_bdy. The following fields were added to this table to populate with the ratings in the analysis: geo\_haz, strm\_dens, strm\_prox, veg\_mgt and rd\_dens\_wl

**Monu\_strms** was created by clipping the entire streams coverage to the monument boundary.

**Monu\_strm\_buff** was created by querying the monu\_strms coverage for perennial streams and buffering 300 feet. Then querying the monu\_strms coverage for intermittent (seasonal) streams and buffering 150 feet. These two interim buffered coverages were then merged to create the final buffered stream coverage.

**Pla\_nopct** represents the plantations that are less than 20 years old and have not had a precommercial thinning. The srs/gis master arview project created by digital visions enterprise was used. This project automatically connects to Oracle and pulls in the local forest SRS database (psw\_activity). It displays the physical stand numbers, activities, stocking and survival tables by default. The managed stand layer is then brought into the project and linked and cross-

linked to the physical stand numbers. All other attribute data is then automatically linked. A query was then performed for all stands that were less than 20 years old using the year of origin field. From those results, another query was performed to pull out all stands that had no precommercial thinning activity. Activity codes 4511.2 (release for growth and precommercial thinning combined), 4521 (individual or selected tree precommercial thinning) and 4522 (strip precommercial thinning) were used. The resulting dataset was converted to a shapefile (pla\_nopct) and filed under /fsfiles/fstmp/rap.

### **Aquatic Risk Factors**

#### **Geologic Hazard Indicator**

Coverages Used: sqfmonu00\_2, sqf\_montrans, and sequoia\_eui

**Table 20: Aquatic Risk Factors**

<b>EUI Slope Stability Field</b>	<b>Rating</b>
Unknown	1
Low Hazard	1
Moderate Hazard	3
High Hazard	6
Very High Hazard	6

Sequoia\_eui was queried on the slope stability field.

All roads completely within high or very high were rated as 6, all roads completely within moderate were rated as 3 and all roads completely within low or unknown were rated as 1. All roads with their center in high or very high were looked at. Those meeting the criteria were rated as 6. All roads with their center in moderate were looked at. Those meeting the criteria were rated as 3, some were rated as 6 if more than 30% of the road was in high or very high.

All roads with their center in low or unknown were looked at. Those meeting the criteria were rated as 1, some were rated as 3 if more than 10% of the road was in moderate.

For the few roads left, each was looked at closely and placed in the appropriate category.

#### **Stream Crossing Density Indicator**

Coverages used: watershed\_bdy, sqfmonu00\_2, sqf\_montrans, monu\_strms (perennial and intermittent)

**Table 21: Stream Crossing Density Indicator**

Stream Crossing per Road Mile	Risk Rating
0-2	1 (low)
3-4	2 (moderate)
4+	3 (high)

Roads were intersected with monu\_strms. Those roads not intersecting any streams automatically received a 1.

Roads exceeding a half-mile with only 1 stream crossing received a 1. Roads exceeding a mile with only 2 stream crossings received a 1.

This covered many of the roads within the Monument boundary. The remaining roads were looked at and compared their lengths to the number of stream crossings. Each was given the appropriate risk rating for the calculation.

Roads less than a mile in length with a stream crossing or crossings were looked at closely. Many of these shorter roads received a high rating even if they had only 1 crossing because of the calculation of stream crossing per road mile.

**Riparian Zone – Stream Proximity Indicator**

Coverages used: monu\_strm\_buff, watershed\_bdy, sqf\_montrans

**Table 22: Riparian Zone – Stream Proximity Indicator**

Segment within Riparian Zone	Risk Rating
0-5%	1 (low)
6-10%	2 (moderate)
10+%	3 (high)

Roads were intersected with monu\_strm\_buff. Those roads not intersecting any stream buffers automatically received a 1.

Roads with an obvious insignificant piece within a stream buffer received a 1.

Roads with the majority or all of their length within a stream buffer received a 3. Roads with half of their length obviously in a stream buffer received a 3.

The remainder of the roads were looked at closely and a measurement taken of that portion of the road within the buffer. This was calculated as a percentage of the whole and the roads were assigned a risk rating according to the table above.

**Access Factors**

Vegetation Management Indicator

Coverages used: sqfmonu00\_2, dryesh\_ts, pla\_nopct, sqf\_montrans, sqfsale\_utm11, sqfstnd98\_4, sqfmix01\_1, sqfeveg97\_7, sqfsplat01\_2 and watershed\_bdy

**Table 23: Access Factors**

Management	Indicator	Access Rating
Silviculture	Stand < 20 yrs & free to grow	3 (low)
Fuels	In SPLAT or not in Urban Core, Defense or Threat Zone	3 (low)
Silviculture	Wild stand 20-69 yrs old or mod acres treatment planned 20 yrs	3 (moderate)
Fuels	Threat Zone	2 (moderate)
Silviculture	Stand < 20 yrs and needing treatment	1 (low)
Fuels	Urban Core or Defense Zone	1 (low)

A proxy of stands less than 20 years old having no precommercial thinning activity was used to identify stands needing silvicultural treatment within 20 years and thus meeting the high access rating. Fuels ratings were applied first as the Urban Intermix GIS coverage is fairly extensive and fuels treatments are receiving higher priority as they relate to defense of urban interface.

Roads in an Urban Core, or Defense Zones were assigned a 1.

Roads in a Threat zone and not already assigned a 1 were rated as a 2.

Roads not in a Threat or Defense or Urban Core were rated as a 3.

Silvicultural treatment needs were used next beginning with the pla\_nopct coverage. Roads accessing these plantations (even though previously rated low or moderate for fuels) were rated as 1. The existing vegetation coverage was queried for those stands age 20-69 years old in the mixed conifer or conifer cover types. The size class field was used as a proxy for age, those in size class 2 and 3 represent trees primarily 20-69 yrs of age. Displayed on top of this was the managed stand layer to help eliminate areas that appeared to be wild stands from the previous query but were actually older plantations. Roads accessing the queried wild stands were rated as a 2. By default all other roads were rated a 3.

Since the managed stand coverage is not completely up to date, the coverage sqfsale\_utm11 was used to reflect additional managed stands not on this coverage from recent and planned timber sale units.

For those roads rated a 3 (low), the district silviculturists took a closer look to determine if there was local knowledge that a road was accessing an area with current needs or plans within the next 20 years. These roads were rated according to their determination of access importance and the values were updated when necessary

Additionally, some roads rated as 2 (moderate) in the GIS analysis were downgraded to a 3 (low) after review by the silviculturist. These modifications were only made to roads not previously

rated moderate by the fuels rating.

### Terrestrial Risk Factor

Road Density Effects to Wildlife Habitat

Coverages used: sqf\_montrans, mon\_rd\_density, sqfmonu00\_2, sqf5huc01\_3

% Decline in Habitat Effectiveness	Risk Rating
0-<20%	1 (low)
20-39%	2 (moderate)
>40%	3 (high)

A one-mile grid was displayed over the analysis area. A shapefile (mon\_rd\_density) was created using the displayed grid as a template. The following formula (provided by the Forest Wildlife Biologist) was applied within each 1-mile “pixel” using miles of road by operational maintenance level.

$(\text{miles of ML 4 \& 5} * .08) + (\text{miles of ML 3} * .17) + (\text{miles of ML 1 and 2} * .09) * 100 = \% \text{ decline in habitat effectiveness.}$

Once the formula was applied, each “pixel” in the mon\_rd\_density grid was assigned a risk rating using the table above.

There does exist a means of automatically calculating road density using Arc GRID or ERDAS Imagine software, but the expertise in these programs or applying that type of analysis does not exist on this forest. Also, the Wildlife Biologist did not want to just look at total road density, but wanted to weight the roads based on knowledge of the effects of different road types on wildlife.

The task of “clipping” out each individual 1 mile pixel of road and calculating road mileage by maintenance level would have been incredibly time consuming and may not have been completed in the allotted time frame. It was decided to plot out the analysis area at 1 inch to the mile scale with the grid, monument boundary, roads by maintenance level and watershed boundaries displayed. Using this plotted map, the above formula was applied visually to each 1-mile pixel and the square was colored with a highlighter to reflect the risk rating. Pink for high, orange for moderate and yellow for low.

Occasional spot-checking was done on individual pixels by measuring the roads by maintenance levels on screen in arcview and applying the formula to cross check for accuracy.

The rating information on the paper map was transferred to the mon\_rd\_density shapefile. All pixels with a high or moderate rating were attributed individually and by default all others were attributed as low. This resulting density grid coverage was then intersected with the roads coverage.

All roads intersecting the high pixels were assigned a 3, all roads intersecting the moderate pixels that had not yet been attributed as a 3 were assigned a 2 and the remainder were assigned a 1.

To help facilitate the process of visually applying the formula, a table was developed to show the road maintenance levels with miles of road multiplied by the weighting factor that would categorize a pixel as low, moderate or high if all the roads in the pixel were of that same maintenance level. This is the table that was developed.

**Table 25: Road Maintenance Levels with Miles Multiplied by Weighting Factor**

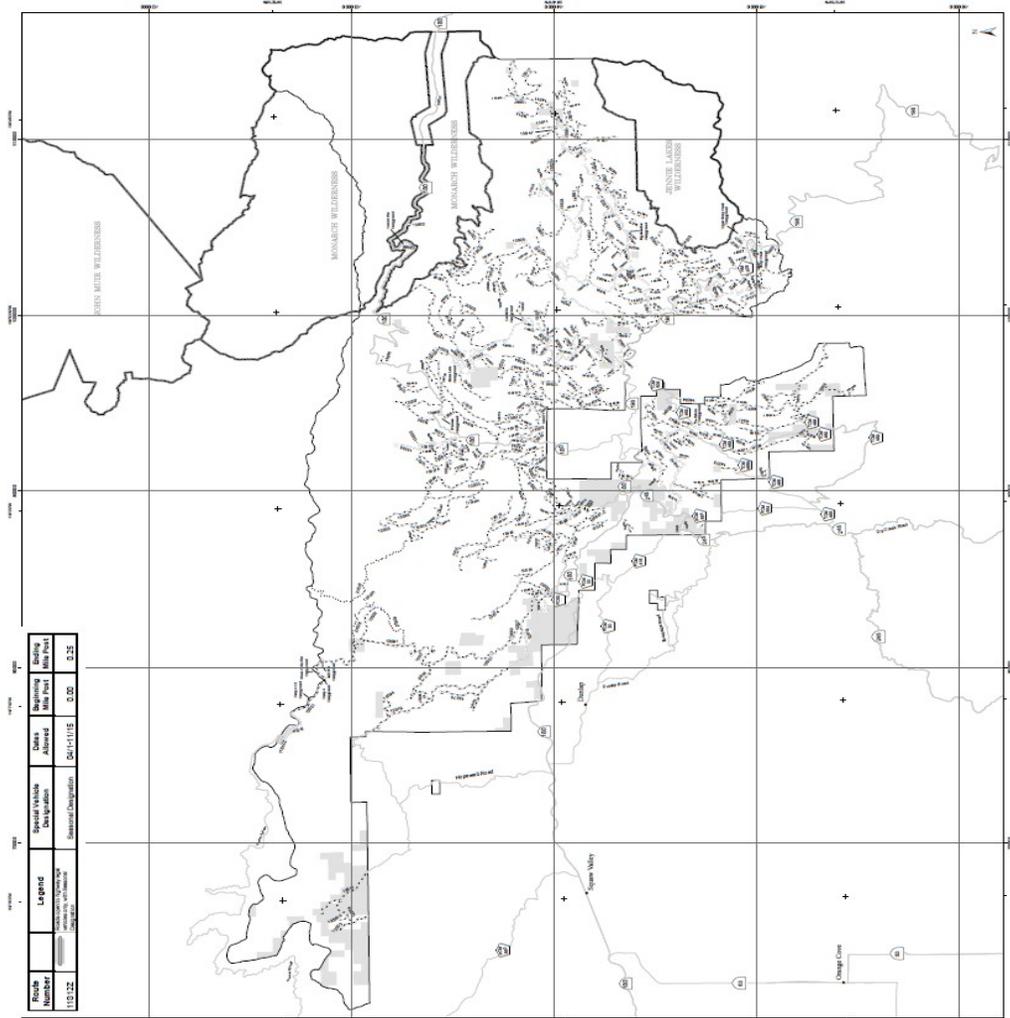
Level 4 & 5 roads * (.08)		Level 3 roads * (.17)		Level 1 & 2 roads * (.09)	
Rating	Miles of Road	Rating	Miles of Road	Rating	Miles of Road
L	< 2.4 miles	L	< 1.2 miles	L	< 2.2 miles
M	2.5 – 4.9 miles	M	1.2 – 2.3 miles	M	2.3 – 4.4 miles
H	> 5 miles	H	> 2.4 miles	H	> 4.5 miles

This process was somewhat time consuming but went well. After displaying the density grid by high, moderate and low pixels and the roads with their assigned risk ratings of high, moderate, and low, the correlation between the two was very evident.

## **Appendix B-List of Roads Analyzed**

# Appendix C-Motor Vehicle Use Maps

## Hume Lake Motor Vehicle Use Map



**LEGEND**

- Area Open to Motor Vehicle Use
- Area Open to Light Vehicle Use
- Area Open to Heavy Vehicle Use
- Area Open to All Vehicle Use
- Area Closed to All Vehicle Use
- Area Closed to Light Vehicle Use
- Area Closed to Heavy Vehicle Use
- Area Closed to All Vehicle Use

**EXPLANATION OF LEGEND ITEMS**

Area Open to Motor Vehicle Use: This area is open to all motor vehicles, including passenger cars, trucks, and trailers.

Area Open to Light Vehicle Use: This area is open to passenger cars and light trucks.

Area Open to Heavy Vehicle Use: This area is open to heavy trucks and trailers.

Area Open to All Vehicle Use: This area is open to all motor vehicles, including passenger cars, trucks, and trailers.

Area Closed to All Vehicle Use: This area is closed to all motor vehicles.

Area Closed to Light Vehicle Use: This area is closed to passenger cars and light trucks.

Area Closed to Heavy Vehicle Use: This area is closed to heavy trucks and trailers.

Area Closed to All Vehicle Use: This area is closed to all motor vehicles.

**EXPLANATION OF LEGEND ITEMS**

Area Open to Motor Vehicle Use: This area is open to all motor vehicles, including passenger cars, trucks, and trailers.

Area Open to Light Vehicle Use: This area is open to passenger cars and light trucks.

Area Open to Heavy Vehicle Use: This area is open to heavy trucks and trailers.

Area Open to All Vehicle Use: This area is open to all motor vehicles, including passenger cars, trucks, and trailers.

Area Closed to All Vehicle Use: This area is closed to all motor vehicles.

Area Closed to Light Vehicle Use: This area is closed to passenger cars and light trucks.

Area Closed to Heavy Vehicle Use: This area is closed to heavy trucks and trailers.

Area Closed to All Vehicle Use: This area is closed to all motor vehicles.

**VICINITY MAP**

**PURPOSE AND CONTENTS OF THIS MAP**

This map is intended to provide information on the motor vehicle use designations for the Hume Lake area. The map shows the boundaries of the various motor vehicle use designations and the roads that are open to motor vehicle use. The map also shows the locations of the various motor vehicle use designations and the roads that are open to motor vehicle use.

**PURPOSE AND CONTENTS OF THIS MAP**

This map is intended to provide information on the motor vehicle use designations for the Hume Lake area. The map shows the boundaries of the various motor vehicle use designations and the roads that are open to motor vehicle use. The map also shows the locations of the various motor vehicle use designations and the roads that are open to motor vehicle use.

**OPERATOR RESPONSIBILITIES**

Operators of motor vehicles are responsible for knowing and following the rules of the road. Operators should always wear their seat belts and never drink and drive. Operators should also be aware of the motor vehicle use designations on the map and follow the rules that apply to those designations.

**PROHIBITIONS**

Motor vehicles are prohibited from operating on certain roads and in certain areas. These prohibitions are shown on the map and are intended to protect the environment and public safety.

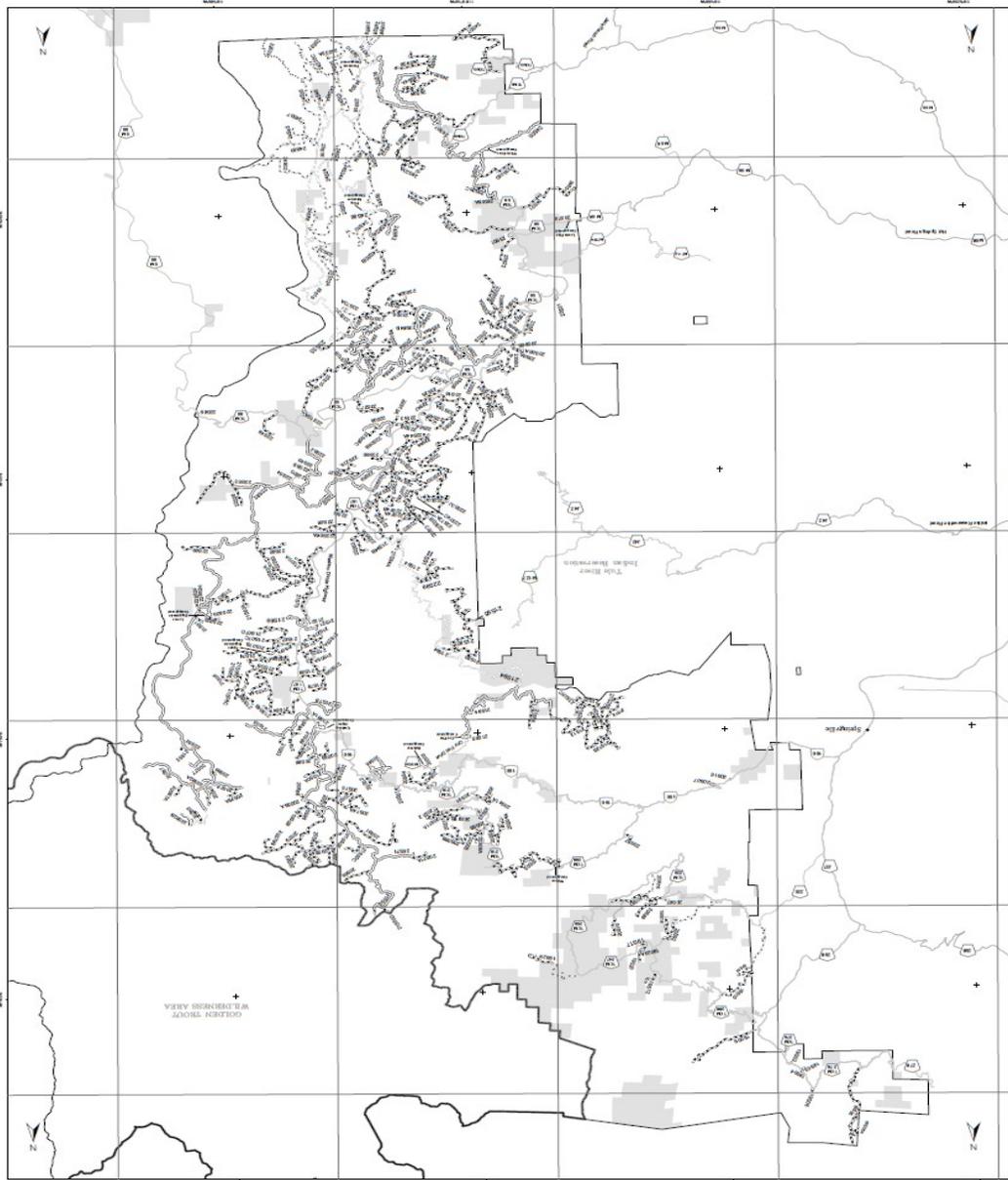
**Motor Vehicle Use Map**

Revised National Forest  
Hume Lake Ranger District  
(Hume Lake, CA)

**CONTACT INFORMATION**

United States Department of Agriculture  
Forest Service  
Hume Lake Ranger District  
10000 Hume Lake Road  
Hume Lake, CA 95021  
Phone: (530) 938-2200  
Fax: (530) 938-2201

# Western Divide Motor Vehicle Use Map



**LEGEND**

- Motor Vehicle Use Zone
- State Route
- County Boundary
- City Boundary
- Water
- Topographic Contour

Scale: 0 to 10 Miles

**EXPLANATION OF LEGEND ITEMS**

**Motor Vehicle Use Zone**  
 These areas are open to motor vehicle use. Motor vehicle use is restricted to certain areas within these zones.

**State Route**  
 These routes are open to motor vehicle use. Motor vehicle use is restricted to certain areas within these routes.

**County Boundary**  
 These boundaries are shown for reference purposes only.

**City Boundary**  
 These boundaries are shown for reference purposes only.

**Water**  
 These areas are open to motor vehicle use. Motor vehicle use is restricted to certain areas within these areas.

**Topographic Contour**  
 These contours are shown for reference purposes only.

**Motor Vehicle Use Map**

Sierra Nevada Forest  
 Grand Staircase-Escalante National Monument  
 (From Lake 80 to Other 100)

California Forest Service  
 UNITED STATES DEPARTMENT OF AGRICULTURE

**INFORMATION SOURCES**

Sierra Nevada Forest  
 Grand Staircase-Escalante National Monument  
 (From Lake 80 to Other 100)

**INFORMATION SOURCES**

Sierra Nevada Forest  
 Grand Staircase-Escalante National Monument  
 (From Lake 80 to Other 100)

## **Appendix D – Transportation Plan**

The proclamation (Clinton 2000) states:

The management plan shall contain a transportation plan for the monument that provides for visitor enjoyment and understanding about the scientific and historic objects in the monument, consistent with their protection. For the purposes of protecting the objects included in the monument, motorized vehicle use will be permitted only on designated roads, and non-motorized mechanized vehicle use will be permitted only on designated roads and trails, except for emergency or authorized administrative purposes or to provide access for persons with disabilities. No new roads or trails will be authorized within the monument except to further the purposes of the monument. Prior to the issuance of the management plan, existing roads and trails may be closed or altered to protect the objects of interest in the monument, and motorized vehicle use will be permitted on trails until but not after December 31, 2000 (Clinton 2000, p. 24098).

Current management of the Monument complies with the proclamation direction to limit motorized vehicles to designated roads, with the exception of Trails 27E04 and 27E05 in the Kings River Special Management Area KRSMA. Designated road maps were published in 2001 and with the 2003 Monument Plan Final EIS, and motor vehicle use maps (MVUMs) were published in 2008 to reflect this management of the transportation system in the Monument (the two MVUMs covering the Monument are included in the Map Packet for this Monument Plan).

Because the Giant Sequoia National Monument Plan is a programmatic level decision and does not directly authorize any project level site specific actions, the transportation plan also does not make any site specific changes to the transportation system. Instead it provides a framework by which to manage the transportation system and make future decisions concerning changes to it that support the management intent of the Monument Plan. Changes to the existing transportation system will only be made after appropriate site-specific environmental analysis.

### **Desired Conditions**

Roads are safe and fully-maintained to minimize adverse resource impacts while providing public and administrative access to National Forest System lands and facilities within the Monument. The road system is properly sized to provide needed access to the objects of interest for their proper care, protection, and management, as well as visitor enjoyment of the Monument. Roads that are no longer needed have been decommissioned to restore natural drainage and vegetation, or converted to other uses.

## Strategies and Objectives for the Transportation System

The transportation system will provide high levels of access for public and management use, consistent with protection and restoration of the Monument. New roads will be constructed to meet management goals such as to provide access to new recreation facilities, to provide access to the objects of interest, to provide access to new administrative sites, to replace roads that have unacceptable resource impacts, or to provide access for scientific research.

### Strategies

1. Size and maintain the road system to minimize adverse resource impacts while providing appropriate public and administrative access to National Forest System lands and facilities within the Monument.
2. Promote aquatic organism passage at road stream crossing where needed.
3. Maintain roads with effective road drainage and erosion controls to conserve existing soil and reduce effects to adjacent riparian and aquatic systems.
4. Complete 6th-field watershed analysis and review the transportation system in the Monument using Forest-scale Travel Analysis to inform future opportunities for changes in road status, including changes in maintenance level, decommissioning, or conversion to trails.
5. Consult with local tribal governments and Native Americans to provide transportation and access needs, including culturally important sites and resources for use by Native Americans.
6. Coordinate transportation planning, management, and road decommissioning with Sequoia and Kings Canyon National Parks; other federal, state, and county agencies; and the Tule River Indian Tribe, to reduce traffic congestion and safety hazards, especially along major travelways.
7. Partner with state and local agencies to operate and maintain roads for four-season use where appropriate.
8. Provide parking facilities to meet projected use as determined through site-specific project analysis.
9. Base proposals for new roads on the need to provide access for recreation opportunities, other public use, or management activities, as appropriate to the purposes of the Monument.
10. Convert to trails or other uses, or decommission roads not needed to meet management objectives.

11. Emphasize opportunities for creating loop roads where feasible and appropriate.
12. Provide and maintain regulatory, warning, directional, and information signing on roads for travelers' use.
13. Manage the road system to allow:
  - a. Both highway legal use and off-highway vehicle (OHV) use on designated roads.
  - b. Over-snow vehicles (OSV) use on designated roads.
  - c. Non-motorized mechanized vehicles (such as bicycles) on designated roads and trails.

## Objectives

1. Within 2 years, complete travel analysis to determine the minimum necessary Transportation System (Subpart A of the Travel Management rule, 36 CFR 212.5) for the Monument.
2. Within 2 years, complete a Monument-wide watershed improvement needs inventory (WINI) to identify adverse effects to watersheds from roads.
3. During the life of the Monument Plan, establish a sustainable and desirable off-highway vehicle (OHV) and over-snow (OSV) route system (on the existing road system), including loop opportunities where feasible and appropriate.

## Current Transportation System

### Road System

The road system in the Monument consists of approximately 822 miles of classified roads, ranging from single-lane dirt roads to paved-double lane roads. The miles of road by their assigned maintenance level (ML) are shown in the following table. These data are derived from the forest corporate tabular database for infrastructure (INFRA). The *operational* maintenance level is the maintenance level currently assigned to a road considering today's needs, road condition, budget constraints, and environmental concerns; in other words, it defines the level to which the road is currently being maintained. The *objective* maintenance level is the desired maintenance level to be assigned at a future date considering future road management objectives, traffic needs, budget constraints, and environmental concerns. The objective maintenance level may be the same as, or higher or lower than, the operational maintenance level. Both maintenance levels may change in the future.

**Table 1: Miles of Roads in the Monument by Maintenance Level**

Maintenance Levels (ML)	Objective ML	Operational ML
1 (closed to motorized traffic)	313	71
2 (managed for high-clearance vehicles)	255	515
3 (low standard, passenger vehicle traffic)	134	127
4 (moderate standard, passenger vehicle traffic)	69	72
5 (two-lane paved, passenger vehicle traffic)	51	37
<b>Total Miles</b>	<b>822</b>	<b>822</b>

Each road has a functional designation as an arterial, collector, or local road, as shown in the following table (data from the INFRA database). Arterial roads (typically maintenance levels 4-5) are the main roads that traverse the forest and connect to major state highways or county roads. They are paved and designed for higher-speed travel. Collector roads (typically maintenance level 3) connect the arterial roads to local roads and balance access needs with construction and maintenance costs. Local roads (typically maintenance levels 1-2) are at the ends of collector roads, tend to be low standard, and serve a small land area.

**Table 2: Miles of Road by Functional Class**

Functional Class	Objective Class	Operational Class
Arterial	120	109
Collector	134	127
Local	568	586
<b>Total miles</b>	<b>822</b>	<b>822</b>

Approximately 265 miles of road are designated for OHV use in the northern portion of the Monument. The southern portion has OHV recreation opportunities on approximately 250 miles of unpaved, designated roads.

The road system in the Monument that is currently designated for motorized use is shown on the MVUMs for the Hume Lake and Western Divide Ranger Districts (see the map packet). These maps are published as required by the Travel Management Rule; they display the entire districts, including land outside the Monument, because they cannot be published for areas smaller than an administrative unit.

## Trail System

The trail system within the Monument currently consists of approximately 196 miles of system trails, including about 12 miles of the Summit National Recreation Trail. Twelve developed trailheads offer parking, information, and restrooms; and 10 other trailheads provide only parking for trail users.

Some trail facilities are located within the current administrative boundaries of giant sequoia groves. Two interpretive trails, the Indian Basin Trail and the Trail of 100 Giants (about 2.53

miles combined) and seven trailheads (Chicago Stump, Boole Tree, Cherry Gap, Evans, Little Boulder, Freeman Creek, and Needles) are located in groves. OHV use is still allowed on about 3.8 miles of trail in the Kings River Special Management Area, which was designated under Public Law 100-150. This public law takes precedence over the proclamation (Clinton 2000). This motorized use is shown on the MVUM for the Hume Lake Ranger District (see the map packet).

## **Snowmobile Use**

In the northern portion of the Monument, 39 miles of marked routes are available for over-snow vehicles, 21 of which are groomed; an additional 50 miles of unmarked roadbeds are open to snowmobiles. These routes offer opportunities for all levels of riding experience, from easy, groomed routes to very difficult, deep-powder routes. Facilities include four winter trailheads with parking, two of which have restrooms. Montecito Lake Resort, authorized under special use permit, offers 31 miles of groomed trails used exclusively by cross-country skiers.

The southern portion of the Monument features approximately 114 miles of primary groomed and marked roads, 68 miles of secondary groomed and marked roads, a warming hut located north of the junction of State Highway 190 and the Western Divide Highway, and three trailheads. Cross-country skiing commonly occurs along the groomed snowmobile routes with some adventure trail-breaking occurring off-road. Volunteers commonly mark approximately four miles of ungroomed ski trails in the Quaking Aspen/Ponderosa and Parker Pass areas.

## **Transportation System Management**

### **Maintenance Strategy**

Currently available funding is insufficient to fully maintain the existing road system. The following strategies will be used to prioritize needed maintenance and to improve the ability to complete all needed maintenance:

1. Public safety and natural resource protection would be the highest priorities for maintenance.
2. Maintenance Levels 3 through 5 roads would be higher priority for maintenance than Maintenance Levels 1 and 2 roads due to the higher potential loss of investment, generally higher traffic volumes and speeds, and resulting safety risks and liabilities.
3. Submit appropriate projects for maintenance, reconstruction, or rehabilitation funding when opportunities are available (agency funding, state grants, partnerships, and other sources).
4. Seek additional sources of funding to reduce the maintenance backlog and keep the road system in acceptable condition. Potential sources include Federal Highway Trust Fund

funding through the national transportation bill and appropriated funding specifically for specially designated areas such as monuments.

5. Partner with user groups, permittees, and other entities to accomplish needed road maintenance.
6. Consider reducing the assigned maintenance level of individual roads based on access needs, resource risks, and costs to improve the ability to maintain the entire road system.
7. Consider closing roads not currently needed for resource management activities or significant recreation access, to reduce maintenance costs while retaining the road prism for expected future access needs.
8. Consider opportunities to reduce the size of the road system by decommissioning individual roads or converting them to non-motorized trails.

## **Road System Changes**

Changes to the road system may include actions such as changes of assigned maintenance levels of individual roads, construction of new roads, removal of roads from the system through decommissioning, and conversion of roads to trails. New roads could be constructed to meet management goals to provide access to new recreation facilities or opportunities; to provide access to the objects of interest; to provide access to administrative sites (ranger stations, work centers, etc.); to replace roads producing unacceptable resource impacts; or to provide access for scientific research.

The priority for road retention emphasizes retaining road access for public use and for management activities similar to current access levels. For public access, emphasis should be on maintaining roads to recreation sites, concentrated use areas used for dispersed recreation, sites authorized by special use permits, and private land. The road system will also be available for recreation driving, and for off highway vehicle use on roads designated for such use. For management access, emphasis should be on ecosystem restoration and fire protection.

Roads with high risks for causing unacceptable impacts to natural resources should be repaired, relocated, closed, or decommissioned to reduce impacts. Road decommissioning should focus on roads producing unacceptable impacts where repair or relocation are unreasonable, roads where the potential for resource impacts and high maintenance costs outweigh the need for access for resource management or recreation, and any unauthorized motorized routes remaining after the road system was designated in 2000, as required by the proclamation.

Changes to the road system will be made through the travel analysis process and site-specific NEPA analysis. The objective of travel analysis is to provide decisionmakers with critical information to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions. Travel analysis is required

to inform decisions related to identification of the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands; and to inform decisions related to the designation of roads for motor vehicle use.

An analysis of the entire designated road system in the Monument was completed in 2003 following the roads analysis process (RAP), which was agency direction at the time. The process was very similar to the current transportation analysis direction, except that it was expanded to include motorized trails and areas. Since motorized travel is limited to designated roads in the Monument, the RAP completed in 2003 is still a valid tool to help inform decisions about the road system.

In the completed RAP, evaluation criteria were created based on specific topic areas described in the FS-643 miscellaneous report (agency direction at the time). These topics included ecosystem functions and processes; aquatic, riparian zones, and water quality; terrestrial wildlife; economics; 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. Similar criteria would be appropriate to evaluate the need for future changes in the trail system.

The evaluation criteria developed for the Monument RAP were:

#### Aquatic risk factors

1. Geologic hazard
2. Stream crossing density
3. Riparian zone – stream proximity

#### Terrestrial risk factors

1. Heritage resources
2. Road density effects on wildlife habitat
3. Scenic resources

#### Access factors

1. Private/non-recreation public access
2. Public access (recreation)
3. Administrative site access
4. Vegetation management
5. Fire protection

#### Social factors

1. Lifestyle, attitudes, beliefs and values

2. Economics

The aquatic and terrestrial risk factors were combined into a consolidated “risk equivalent” with a rating of low, medium, or high. The access and social factors were also combined into a consolidated “need equivalent” with a rating of low, medium, or high. This resulted in a combined potential risk versus need equivalent rating for each road in the system. The nine potential combined ratings are displayed in the following table.

**Table 3: Table Potential Risk and Need Equivalent Combination Ratings**

Risk Equivalent	Need Equivalent		
	Low/low	Low/moderate	Low/high
	Moderate/low	Moderate/moderate	Moderate/high
	High/low	High/moderate	High/high

Based on the combined rating, roads could be considered for the following changes:

1. Roads rarely used by the public or Forest Service (i.e., low need equivalent) and with high risk equivalent could be considered for decommissioning.
2. Roads rarely used by the public or Forest Service (i.e., low need equivalent) and with low resource risk equivalent could be considered for decommissioning or storm-proofing.
3. Roads accessing vegetation that has reached desired condition may be evaluated for decommissioning or storm-proofing.
4. 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.
5. Where two or more roads access the same area, traffic could be directed onto the more stable road and the less stable road(s) could be decommissioned.

The complete RAP can be found in Appendix A of the Transportation Report and listing of roads is in Appendix B of the Transportation Report, which is available in the project file at the Supervisor's Office of the Sequoia National Forest.

Some topic areas are best evaluated at the more site-specific scale than at the forest or monument-wide scale. Some data can become diluted at the broad scale so that areas appear to have low impacts, whereas negative impacts can be seen and evaluated more readily at the more site-specific scale. The Monument RAP was conducted at a broad, forest scale to identify overall trends. Travel analysis can be conducted at multiple scales as required to adequately inform proposed actions.

When changes are proposed to the road system to further the purposes of the Monument, the decisions made will be informed by travel analysis and site-specific project analysis. Evaluation criteria for the travel analysis will include criteria similar to the criteria described above for the RAP, as well as other criteria appropriate to the specific proposed action.