Lassen National Forest Roads Analysis

Table of Contents

List of Figures and Tables

Appendices

EXECUTIVE SUMMARY

INTRODUCTION

On January 12, 2001, the Forest Service issued the final National Forest System Road Management Rule. This rule revises regulations concerning the management, use, and maintenance of the National Forest Transportation System. The final rule is intended to help ensure that additions to the National Forest System road network are essential for resource management and use; that construction, reconstruction, and maintenance of roads minimize adverse environmental impacts; that unneeded roads are decommissioned, and that restoration of ecological processes is initiated.

This report documents the information and analysis procedure used for the Lassen National Forest roads analysis. This analysis is designed to provide decision-makers with critical information needed to manage a **minimum** road system that is safe and responsive to public needs and desires, is affordable and efficiently managed, has minimal negative ecological effects on the land, and is in balance with available funding for needed management actions.

Roads analysis is a six-step process. The steps are designed to be sequential with an understanding that the process may require feedback and iteration among steps over time as new information becomes available.

1. Setting up the analysis
2. Describing the situation
3. Identification of Concerns
4. Assessing benefits, problems and risks
5. Describing opportunities and setting priorities
6. Reporting (Key Findings)

The amount of time and effort spent on each step differs by project based on specific situations and available information. The process provides a set of possible concerns and analysis questions; the answers can help managers make choices about road system management.

The product of this analysis is a report for decision-makers and the public that documents the information and analyses used to identify existing concerns and opportunities for future national forest road systems. The key products of this roads analysis at the Forest scale includes the following:

- A discussion of the existing situation for each resource area with respect to the transportation system in general.
- A scientific development of guidelines or key indicators with **public feedback** that will be used to evaluate ecological, social and economic conditions at both the forest scale and the watershed scale. These guidelines will enable forest managers to identify concerns, and opportunities to be addressed in project level decisions.
- Display of known social and environmental concerns and opportunities to be addressed later at the project level.
- A map that displays the existing level 3, 4, and 5 road system on the forest, with a spreadsheet that describes how they are intended to be managed.
- Documentation of coordination efforts with other government agencies, tribal governments, and other jurisdictions, and documentation of public involvement.

Step 1 SETTING UP THE ANALYSIS

OBJECTIVES OF THE ANALYSIS

Establish the level and type of decision-making the analysis will inform

The roads analysis process at the Forest scale will be used to support management direction in the Lassen National Forest Land and Resource Management Plan and ongoing watershed and project analyses. It is intended to identify opportunities, which address an optimum road system that provides the appropriate balance between the benefits of access and the costs of road-associated effects to ecosystem values.

Identify Scale/Analysis Area

The analysis will:

- Be at the forest scale for the Lassen National Forest (1.1 million acres) in North eastern California, Region 5 of the National Forest System
- Concentrate on developing guidelines for addressing road management concerns and priorities related to construction, reconstruction, maintenance and decommissioning.
- Identify significant social and environmental concerns and opportunities to be addressed in project level decisions.
- Be spatial or Geographic Information System (GIS)-based whenever possible.
- Use only existing information.
- Document coordination efforts with other government agencies and jurisdictions.

INTERDISCIPLINARY TEAM MEMBERS AND PARTICIPANTS

The Core Interdisciplinary Team and their specialties:

Greg Napper, Team Leader	Transportation Planner	Forest Headquarters
Tom Rickman	Terrestrial Wildlife Biologist	Eagle Lake District
Carolyn Napper	Soil Scientist/Hydrologist	Forest Headquarters
Dave Evans	Timber Program Manager	Forest Headquarters
Terrie Veliotes	Forest Road Manager	Forest Headquarters
Jane Goodwin	Recreation Specialist	Almanor District
Larry Hood	Fire Management Officer	Forest Headquarters

Extended team members and their specialties:

Melanie McFarland	Fisheries Biologist	Forest Headquarters
Leona Rodreick	Public Affairs Specialist	Forest Headquarters
Dave Reis	Landscape Architect	Forest Headquarters
Donita Bivens	WEB Designer	Hat Creek District
Ken McCullough	Transportation Planner	Forest Headquarters
Laura Rose	Data Base Steward	Forest Headquarters
Steve Goldman	GIS Specialist	Remote sensing Lab

Advisory Committee Members

Jeff Withroe	Ecosystem Staff	Forest Headquarters
Susan Matthews	District Ranger	Almanor District
Elizabeth Norton	Public Service Staff	Forest Headquarters
Jack Walton	Forest Engineer	Forest Headquarters

ANALYSIS PLAN

The main focus of the analysis process was to develop scientific guidelines that would enable an objective assessment of the transportation system with respect to all areas of consideration. The team utilized their own professional experience and knowledge of the existing situation with respect to the road system and the Roads Analysis process objectives to frame the discussion in the existing situation report ***Appendix I***. That discussion was prompted by the questions listed in the Roads Analysis Report, which helped each team member to clearly focus on the information they would need to evaluate the road system and their resource needs and concerns.

The outcome of the exercise that described the existing situation was a listing of concerns. The concerns identified and listed to date emerged from our experience with issues at the project level as well as from our professional assessments and comparisons of existing conditions with laws, policy and direction. To address concerns in a scientific manner the team decided to use indicators to measure both benefits and risks associated with roads. The indicators chosen were those that each team member felt would enable them to compare conditions on one road with another in a repeatable and quantifiable way ***Appendix D***. From there the interdisciplinary team (IDT) created a scoring system and spreadsheets that will be used to display the results of their individual assessments ***Appendix E***. This display will enable interdisciplinary teams at the project and watershed scale to identify significant concerns on individual roads ***Appendix F***. Scoring of individual roads will occur at the project level.

The next step in the plan will be accomplished and documented in a spreadsheet similar to the one used in step four only this one will indicate opportunities the team considered to address a particular road related concern. The display of the opportunities and the iterative process of rating the road again with a specific remedy in mind is the true collaborative synthesis that we feel is the essence of roads analysis ***Appendix G***.

The final documentation of the process is in the Road Management Objectives (RMOs), which are intended to show that the design, operation, and maintenance criteria for the road are consistent with land management plan direction, project decisions, and the results and findings of roads analysis. The team decided to utilize the Forest Transportation System database (INFRA) to store the RMO information, which will enable the utmost flexibility in data retrieval and succeeding spatial analysis ***Appendix H***.

Relevant policies, laws and guidance from regional or multi-forest assessments
The Lassen is currently participating in a pilot project to demonstrate and test the effectiveness of management activities described in the Herger-Feinstein Quincy Library Forest Recovery Act of October 12, 1998. This pilot project amends, the management direction for the Lassen, Plumas and Tahoe National Forests. The Lassen National Forest is also subject to management direction under the Sierra Nevada Forest Plan Amendment (January 2001). These plan amendments must meld with new national direction such as the Forest Service Transportation Policy, which drives the Roads Analysis requirement, and Protecting People and Sustaining Resources in Fire-Adapted Ecosystems, A Cohesive strategy, which deals with an the reduction of hazardous fuel loads. All of these policies, laws and guidance have relevance to our forest scale roads analysis process. The relationships, interpretations and precedence of management direction for transportation planning are summarized in ***Appendix C***.

INFORMATION NEEDS

The IDT identified the following information sources to use for the analysis:

- National Visitor Use Monitoring (NVUM) results for the Lassen National Forest (2000)
- Deferred maintenance costs in INFRA, from 1999-2002
- INFRA travel routes.
- Potential Public Forest Service Road (PFSR) projects submittals.
- Suitable Timber Base for the 1992 Lassen National Forest Plan.
- Roadless area inventory for the Lassen National Forest Plan.
- EIS records of decision from the Northwest Forest Plan (1994), Herger Feinstein Quincy Library Group Forest Recovery Act (HFQLG) 1999, and Sierra Nevada Forest Plan Amendment (2001).
- Lassen National Forest Land and Resource Management Plan 1993

The IDT identified the following GIS base map needs:

- Roads FS Maintenance Level #(1-5).
- Road jurisdiction (FS, State, County, Private, Other or Unknown)
- Subwatershed ID
- Streams and riparian areas.
- Soil map units.
- Defensible Fuel Profile Zone (DFPZ) ID
- Utility Corridor ID
- Railroad line ID
- Land status.

- Occurrence of threatened and endangered species.
- Research Natural Area and Special Interest Area maps
- Semi-primitive area maps
- Roadless area maps

The IDT also identified the following information that could be used in the analysis process:

- Response to questionnaires from internal staff, public respondents, road agencies and tribes
- Preceding draft roads analysis from other forests, namely the Klamath, and Medicine Bow National Forests
- Roads Analysis Process for Deer, Mill, and Antelope Creek Watersheds on the Lassen National Forest

Data needs requests were submitted to FS R5 Remote Sensing Lab in Sacramento California. Four pivot tables were generated to; assess road density by sub watershed; assess road/corridor effects within special areas by sub watershed; assess road-related soil and stream risks by sub watershed; and assess road values in proximity to current and planned DFPZ's by sub watershed.

PUBLIC INVOLVEMENT

Communications Plan

The IDT was concerned about the possibility of public confusion on what this forest scale Roads Analysis Process was and was not. Since the process would not involve an action proposal resulting in a decision, it would be difficult to collect public input at the forest scale. The team agreed upon the following strategy, which is contained in the full Communications Plan in the administrative record for this analysis.

The tone of this communication effort was low-key, informative, aimed at stakeholders with a direct and meaningful interest in National Forest road system management. This was appropriate for three main reasons. First, this is not a NEPA analysis requiring a legally mandated level of public scooping and involvement (that will come later, when road-specific decisions are made). Second, this effort was intended to be completed in two months, necessitating an adequate, but not over-done, public involvement effort. Finally, numerous public scooping efforts related to road management have preceded this analysis at the project level in the implementation of the HFQLG law here on the Lassen. An adequate base of knowledge about public concerns already exists; it will be used to as a starting point to identify opportunities.

The Communications Plan for this assessment identified County Supervisors and County Public Works Director as the key contacts for public involvement. The ID team felt that the Supervisors and Public Works Directors are the county representatives who have the actual road management knowledge and information that could be useful in identifying mutual (county and Forest Service) opportunities and issues. Lassen, Plumas, Tehama, Shasta, and Butte were the key counties identified for making these contacts.

Public Contacts

In November of 2002, Almanor, Hat Creek, and Eagle Lake District Rangers contacted County Boards of Supervisors. Most of these contacts were phone conversations that followed formal letters with an executive summary that described the new Road Policy and the Roads Analysis requirement. Other contacts to local Directors of Public Works for the counties were made by the Forest Engineer and Forest Service representatives who explained the Roads Analysis Process, and offered a briefing paper, which outlined the process being developed by the Lassen. The discussions were focused on mutual road-related concerns and potential opportunities. In addition, the County Supervisors and Public Works Directors were asked to review questions that were also sent out with the executive summary.

The County Supervisors were most interested in opportunities to conduct road maintenance through cooperative agreements with the Lassen National Forest when the activities would be mutually beneficial. County public works directors were most interested in opportunities for projects that meet Resource Advisory Committee (RAC) objectives. Tehama county and the Lassen National Forest have already secured RAC funding for realignment and redesign of a county road in a watershed with anadromous fish. This project was successfully completed in October of 2002. Some of the contacts to these RAC boards have been made by Forest Service personnel already involved in watershed related projects. These relationships are becoming more prevalent as new funding sources open the doors for new opportunities.

Also in November of 2002, the Lassen National Forest sent out a list of questions to the general public in order to receive focused feedback on their needs and concerns. The comments spanned the full spectrum of sentiment regarding roads. Some people adamantly did not want any roads closed, and others were just as vocal about getting rid of as many roads as possible.

Step 2 DESCRIBING THE SITUATION

THE ANALYSIS AREA

The Lassen National Forest consists of about 1.1 million acres of forest and range lands in northeastern California (see Figure 1). Three different geomorphic provinces meet within the Forest and contribute to its great diversity – the Sierra Nevada Mountains, the Southern Cascade Mountains and the Modoc plateau. Elevations range from 900 feet to 8,677 feet. Topography varies from deep river canyons to vast sagebrush flats and to sharp rocky peaks. Annual precipitation ranges from 16 inches to 90 inches. Summers are hot and dry; winters are cool and wet with rain in the foothills and snow at the higher elevations. State, and county road systems connect with the Forest Transportation System.

Development History

The road system has long been established; early roads even predated formation of the National Forest. The road system has had additions and upgrades through the years to the present. Arterial, collector, and local roads have been added, with numerous additions in the 1970s. New road construction averaged around 30 miles per year since 1970. Road construction continued into the 1980s. Few roads were added in the 1990s.

Primary destinations

Significant numbers of recreationists use the road system in summer, fall, and spring. Some forest roads are snowed in during the winter. However, the open highway system transports large number of recreationists to cross-country skiing and snowmobiling trailheads.

Prominent transportation features are State highways 44 and 36, that run east west through the forest and Highway 89 that runs north and south. Scenic driving between Nevada and California is very common as well as providing key connections for commerce. Both high standard (paved) and lower standard county roads also traverse the forest and create essential connections for more local travel and access to the forest.

The communities of Chester, Westwood, Hat Creek, Mineral, and Susanville lie within or are adjacent to the forest boundary.

THE NATIONAL FOREST TRANSPORTATION SYSTEM

General Description

The transportation system on the Lassen National Forest serves a variety of resource management and access needs. Most roads on the Forest were originally constructed for commercial access purposes including grazing, timber, and mineral extraction. Others resulted from construction of water storage and transmission projects for municipal water supplies. Over the past 100 years, an extensive road network has been developed and continues to serve commercial, recreation, and administrative purposes and provide access to private lands.

The 1993 Lassen National Forest Plan affected environment identified approximately 500 miles of “uninventoried roads”. The plan states…

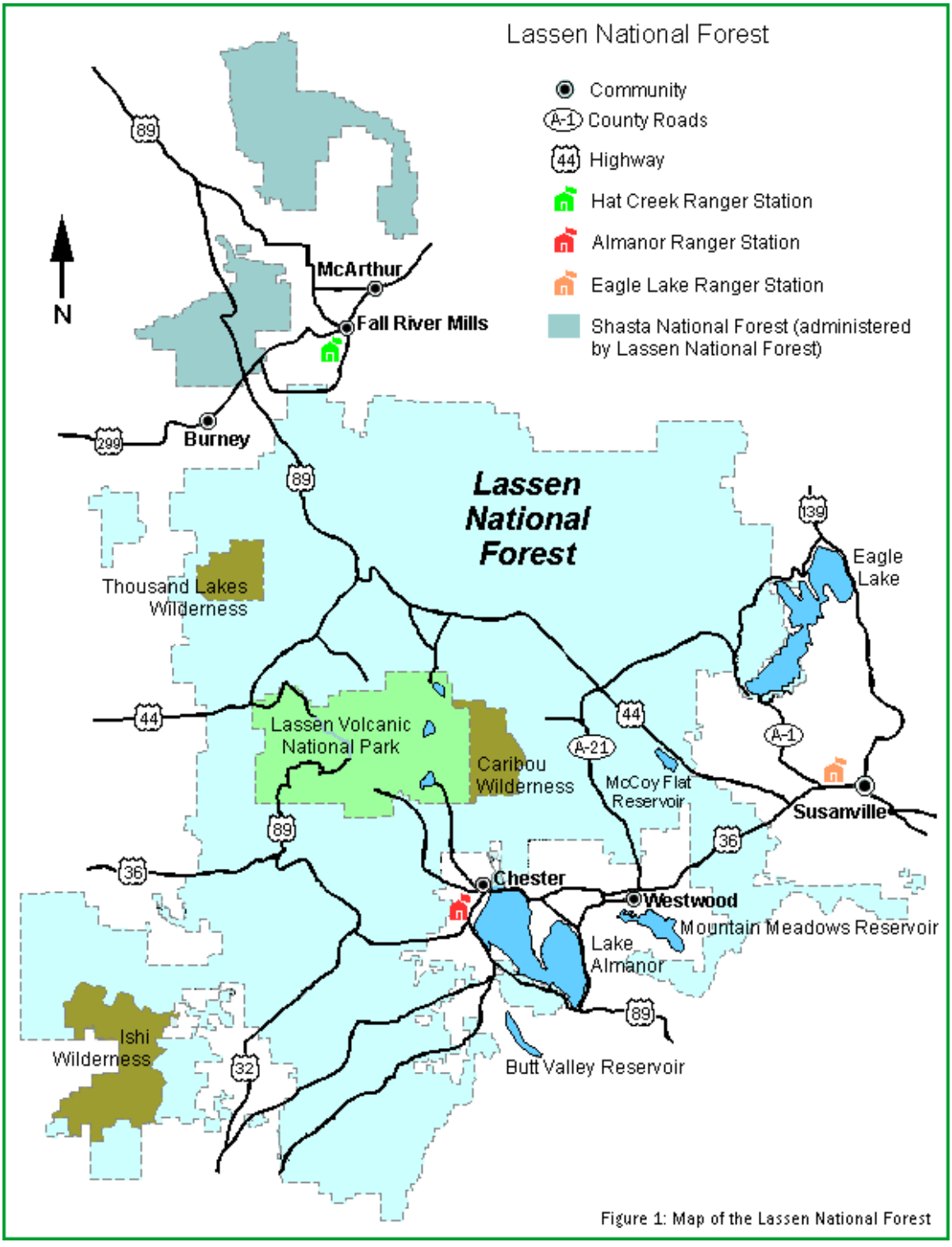

Figure 1: Map of the Lassen National Forest

- As projects are planned in areas containing these roads, Forest management personnel will determine whether to add them to the Forest development road system or to obliterate them.
- Forest Service policy is to maintain roads at the minimum level necessary for recreation, resource use, safety, Forest administration and adjacent area protection.

These goals are entirely consistent with the new Forest service Transportation policy and the objectives of this Roads Analysis. The terms have changed but the intent has not.

There are currently 3,683 miles of classified[1] National Forest System (NFS) roads on the Lassen National Forest transportation system, and we estimate 500 miles of unclassified. The three ranger districts, Almanor, Eagle Lake and Hat Creek share management of the road system.

Twenty percent (706 miles) of the NFS roads are managed and maintained for public use with low-clearance vehicles (passenger cars). These arterial and collector roads are used to provide primary access to large portions of the national forest. Arterials normally serve as connections between towns, major county roads or state highways and are main thoroughfares through the Forest. Collectors link large areas of the Forest to arterials or other main highways. These roads receive the highest traffic and are the most costly to maintain to standard. They are the focus of this forest scale roads analysis.

NFS roads are maintained to varying standards depending on the level of use and management objectives. There are five maintenance levels used by the Forest Service to describe the intended use and determine the work needed to preserve the investment in the road. These maintenance levels are described in *FSH 7709.58 – Transportation System Maintenance Handbook*. Table 1 summarizes the miles of level 1 through 5 roads under Forest Service jurisdiction on the Lassen.

The remaining 2,903 miles of inventoried NFS roads are either restricted to motor vehicle traffic use (maintenance level 1) or are managed only for high-clearance vehicles such as pickup trucks and four-wheel drive vehicles (maintenance level 2). These roads are single-purpose, low volume roads normally single-lane and unsurfaced.

Table 1.System road miles by maintenance level (classified roads)

Maintenance Level	Miles	Description
1	279	Physically blocked to motor vehicles
2	2,674	Open to traffic, high clearance vehicles
3	706	Open to low clearance passenger vehicles
4	0.1	Smoothly graded and dust abated
5	24	High degree of user comfort, usually paved
Total	**3683.10**	

[1] Classified roads are wholly or partially within or adjacent to NFS lands that are determined to be needed for long-term motor vehicle use, including state roads, privately owned roads, NFS roads, and other roads authorized by the Forest Service.

Other roads (unclassified[2]) on National Forest System land have been identified in the field and added to the Forest transportation inventory. There are 500 miles of these unclassified roads. The majority of these roads have been created through timber management as temporary roads and then utilized by off-road vehicles. These roads are awaiting management decisions on whether or not to include them as part of the transportation system or to decommission or restrict them to further use. The analysis for these decisions will be made at the watershed or project scale.

Federally Designated Forest Highways and Scenic Byways

The analysis area contains seven Forest Highways designated under the Public Lands Highways program of the Transportation Equity Act for the 21st Century (TEA21). These routes are Forest Service owned roads qualifying for federal funding for improvement or enhancement. They provide access to and within the National Forest. These roads are listed in Appendix B.

Forest Highway funding can be used for planning, design, and construction or reconstruction of these designated routes. Other work can include parking areas, interpretive signing, acquisitions of scenic easements or sites, sanitary and water facilities, and pedestrian and bicycle paths.

Distinctive Routes

Distinctive Routes are described as the best routes through the forest. They are designated on the forest visitor map as "Primary Routes" and distinctive route marker signs are maintained on these routes.

County Roads

The Lassen National Forest has cooperative agreements with the Lassen, Plumas and Shasta counties for the planning, survey, design, construction, reconstruction and maintenance and use of certain forest development roads. These agreements state that Forest Service and Counties will cooperate in maintaining the roads system agreed upon and assign maintenance responsibilities in accordance with use benefits. The Lassen National Forest is located in 7 California counties: Lassen, Plumas, Modoc, Siskiyou, Tehama, Shasta and Butte.

Potential Public Forest Service Roads

Public Forest Service Roads (PFSR) are passenger car access routes into or through the National Forest or Grasslands; they are roads under the jurisdiction of the Forest Service and are open to public travel. Public Forest Service Roads may be extensions or connectors to Forest Highways, State, County, or other federal systems. The Public Forest Service Roads designation is intended to respond to increasing recreation and public travel on forest roads by supplementing appropriated funds for maintenance with Highway Trust Funds. The Lassen National Forest will be using the Roads Analysis Process outlined in this report to identify potential public road designations.

---

[2] Unclassified roads are roads on NFS lands that are not managed as part of the Forest transportation system (unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail, and those roads that were once under permit or other authorization and were not decommissioned upon termination of the authorization).

EXISTING SITUATION SUMMARY BY AREA OF CONSIDERATION

Ecosystem Functions and Processes (EF)

Agents of ecosystem disturbance include fires floods, landslides, ice and snow, windstorms, and soil erosion (Atzet and Martin 1942). The Lassen National Forest has recently experienced significant flood and fire events. In 1997, a rain on snow event caused major damage to forest roads, washing out culverts at stream crossings and triggering several major landslides (some unrelated to roads). Several fires on the forest in the last few years have consumed thousands of acres. The Cone Fire, Goat Fire, Storrie fire, and Gun II fires have burned on the Lassen since 1998. Atzet and Martin (1992) indicate that fire is "undoubtedly the most frequent and widespread disturbance factor", at least before the creation of the National Forests. Post development of the national forest transportation system floods and landslides are more common and more destructive. Nevertheless wildfire is considered the dominant ecological process on the landscape within and around the boundaries of the Lassen National Forest.

Other disturbance events notwithstanding, the focus of this section will be wildfire. Resource protection (fire suppression) is one of many reasons for maintaining a road network. Roads allow rapid response and safe deployment of firefighting resources. Roads can be an impediment to fire spread at low intensity levels, which can aid in suppression efforts. Recent large fire events suggest that when fire conditions are very high to extreme, wildfires increase in size regardless of the presence of roads (USDA 2000a). At present, roads provide a means to effectively treat fuels and manage for conditions that approximate vegetative characteristics that were more common prior to European settlement.

Many areas on the forest have been identified in the LRMP for prescribed natural fire as a means to reducing fuels. While existing roads provide a safe and economical infrastructure that effectively sub-divides large areas for the express purpose of prescribed fire, Forest level analysis and LRMP guidelines do not support constructing new roads for the purpose of managing disturbance processes. As fuels management strategies are developed at the project level, there will be at the same time an opportunity to evaluate and determine the road network that optimizes firefighter safety, efficiency and effectiveness.

Aquatic, Riparian Zone, and Water Quality (AQ)

The Forest has 1,650 miles of streams that carry a total average stream flow of 1.3 million-acre feet of runoff from Forestlands. Water quality is good in all major streams. The riparian areas on the Forest total about 12,000 acres, and are generally in good condition. Both stream and riparian impacts from roads are due largely to geometric design standards used from the 1950's through the 1980's. In sloped road configurations and the extensive use of culverted drainage design has had a significant impact on these resources. Much of the damage from the storm event of 1997 mentioned above was due to design standards that did not recognize the relationships of roads to adverse aquatic and riparian effects.

In the early 1980's, the agency began a shift in emphasis away from commodity outputs to a more holistic view of resource management. This new focus allowed the Forest Service to recognize the impacts from higher standard road design and a transition to lower standards was begun. These lower design standards permitted the road alignment to follow the existing contour of the ground more closely resulting in significantly less excavation, embankment,

and ground disturbance. Roads now are more routinely designed with out slope configuration that reduces the unnatural concentration of water on the hill slope. Stream crossings with self-maintaining fords are used whenever possible to reduce the risk of culvert failures. The amount of new construction has tapered off since the mid 1980's due primarily to the fact that most of the ground suitable for ground based vegetation management have been roaded. The emphasis now has shifted to finding ways to maintain the road system and make roads more benign on the landscape. Aquatic and riparian concerns will drive many of the innovations in design standards and funding sources for repair and maintenance of the transportation system in the future.

Geology: The forest is named after Lassen Peak, an active volcano located within Lassen Volcanic National Park. About 85 percent of the forest is covered with volcanic geology of relatively recent origin. The southwestern part of the forest has steep slopes and stream cut canyons, and some landslide potential. The southern 15 percent of the forest has non-volcanic geology, consisting mainly of granitic, metamorphic, and sedimentary rocks. The highest elevations of the forest were glaciated in the last ice age. The road system is affected in many ways by the underlying characteristics of the geology it traverses. Mass wasting can be expected in steep topography and erosion rates are high in the less consolidated granitics. The differences across the Forest are in general easy to recognize and the location, design and maintenance of roads can be tailored to fit these differences.

Terrestrial Wildlife (TW)

The Lassen NF's Land and Resource Management Plan discusses road densities in terms of Low, Medium and High habitat capability (Table 2) for five Management Indicator Species (see Appendix O of the LRMP). These are:

Table 2: Forest Plan Road Densities by Habitat capability

Species	Road Density (miles/sq mile) ***High*** Habitat Capability	Road Density (miles/sq mile) ***Medium*** Habitat Capability	Road Density (miles/sq mile) ***Low*** Habitat Capability
Black Bear	0-0.5	0.5-5.0	>5.0
Fisher	0-0.5	0.5-2.0	2.0-3.0
Marten*	<1.0	<2.0	<3.0
Mule Deer	<2.5	2.5-6.0	>6.0
Pronghorn	<2.0	2.0-4.0	>4.0

* Figures are for paved roads only (LRMP page O-13)

Also, on page 4-17, the LRMP states, "Areas with road densities of 2 miles per square mile or higher will be evaluated for habitat effectiveness. Roads and travel networks will be assessed for existing and future needs. Roads no longer needed for administrative purposes will be closed to enhance wildlife habitat, and to protect water quality and soil productivity. Some roads may be obliterated and the land restored to a near natural gradient."

The network of roads across the Forest has altered and continues to alter vegetative communities and habitat for wildlife species. Human use facilitated by the road network has also influenced habitat use by wildlife species. Direct and indirect effects of the road network include habitat loss, fragmentation and degradation, reduced

effectiveness of near-road habitats, mortality due to vehicular collisions and mortality and disturbance due to recreation use, such as hunting. Roads may also act as a barrier to wildlife movements. On the Lassen National Forest, roads also impact habitat by allowing access for personal-use fuel wood harvests, resulting in the loss of snags and downed logs. On a positive side, roads provide access to a wide range of habitat improvement projects and wildfire suppression activities. Roads also provide opportunities to the public to enjoy non-consumptive activities associated with a wildlife resource, such as birding or other viewing of wildlife species.

Commodity Production (TM), (MM), (RM)

The Lassen is known as a timbered Forest. About 73 percent of it is forested with commercial conifers, including 770,110 acres (68 percent), which were classified as available and suitable for timber production in the 1993 Land and Resource Management Plan (LRMP). Since that time there have been three significant plan amendments on the forest, which has changed, many land allocations. Currently there is a review ongoing of the elements and basis for the Sierra Nevada Forest Plan Amendment and the associated Environmental impact Statement. Some concerns may delay certain actions and, therefore, limit projections as to how the road system will be used and impacted by the plan revision.

Part of Sierra Nevada Forest Plan Amendment moving forward however is the Administrative study which will examine how variables (owl populations, prey base, fire behavior, vegetation, terrestrial bird community) respond to three different forest management regimes involving varying levels of group selection, defensible Fuel Profile Zones (DFPZ), and area treatments. This work will examine the response variables over a range of spatial and temporal scales. As this plan is currently being analyzed some sense of the impacts to the road system are beginning to emerge. Generally the scope and intensity of the administrative study will demand a very intense and high utilization of the transportation system.

The Lassen National Forest is in the third year of a five-year pilot project, which also amended the Forest Plan. This amendment banned timber harvest on 526,400 acres, adopted riparian protection guidelines, and proposed resource management in the Plumas, and Lassen National Forest and the Sierraville Ranger District of the Tahoe National forest. The plan includes a network of firebreaks, approximately one-fourth to one-half mile wide and of varying lengths along roads, ridge tops, and meadows. The breaks are to be constructed on 40,000 to 60,000 acres annually for five years. They are designed to reduce the potential for fire and provide a relatively safe area for firefighters. The road system is again targeted for intensive activity. There will be obvious challenges to select roads that accomplish fire and fuels objectives, and which at the same time provide protections for other resources.

General Public Transportation (GT), (PT)

Communities and other private landowners depend on the Forest road network for wildland and structure fire suppression services as mentioned above. In addition, the interconnected system of county, state and Forest roads also serves as an escape route for area residents in the case of fire emergency. The backbone road system on the Lassen (maintenance levels 3-5) provides suitable conditions for passage of all emergency vehicles and public traffic. The Skyway county road 171 and designated Forest Highway, is an example of a recent proposed upgrade to a road critical for fire ingress and egress for the community of Paradise.

Many other Forest roads on the Lassen are narrow, winding one-lane roads in steep terrain. Anticipation of traffic needs on Forest roads can help to resolve safety concerns, for firefighters as well as the public. Because of the objective level to which these roads are

maintained (maintenance level 1 and 2), certain conditions may exist that are not conducive to emergency traffic. Roads in some areas become overgrown, and rockfall and wind throw often block vehicular access. Level one roads can be open to emergency vehicles, but generally require substantial time and mechanical work. Also, turnarounds for lowboys are not typical of roads designed primarily for timber access.

The Forest is involved in a **cost-share program** with three major timberland owners: Collins Pine, Sierra Pacific Industries, and Roseburg. The cost-share program is an arrangement whereby individual landowners share in the construction, reconstruction, and maintenance for roads of common interest. Costs and maintenance responsibilities are shared on the basis of commensurate use according to a formula based on tributary timber volumes, recreational use, and other public and administrative uses. These costs are tracked and documented in supplements to the agreement. To date there have been 19 supplements in these three Road agreements covering 144.25 miles and at a total cost of $592,891.

Road management on the Lassen considers the needs of all parties in the cost share arrangement. Typically, the interests of the industrial landowners are focused on access for timber management, whereas the Forest Service needs to consider public access and management of other forest resources. Close cooperation among parties is essential to roads analysis and a thorough evaluation of road management options.

The Lassen has exchanged road easements with two other timberland owners Beaty and Associates, and Fruit Growers Supply. The Lassen does not have a Cost-share arrangement with these companies at this time. This means that any exchange of easements, agreements for improvements, or maintenance would not have the benefits of established protocol. In the R-5 Road Right of Way Construction and Use Agreement Cost -Share workbook there are criteria upon which a decision to enter into a Cost-Share arrangement are based. These criteria include the ownership pattern, anticipated roads use, cooperator financial status, and ability to grant reciprocal easements. The two non cost-share partners have not met the criteria sufficiently that the Forest Supervisor is compelled to enter into such an agreement.

Administrative Use (AU)

Law enforcement. Managing the forest involves certain responsibilities such as the protection of resources, facilities, Forest users and Forest employees. The Forest's four major law enforcement problems are (1) theft of timber, primarily firewood, (2) vandalism and removal of cultural resources, (3) building security, and (4) marijuana cultivation. Three problems of lesser magnitude are (5) arson, (6) trespass fires and (7) civil disorder. These are listed in the Forest's 1983 law enforcement plan.

The road maintenance level 3, 4, and 5 road system on the Lassen National Forest generally provides access for investigative and enforcement activities. These roads provide access to developed and dispersed recreation sites. They also provide access to the many developed trailhead-parking areas for the trail system that provides backcountry access. While the road system provides access to perform investigative and enforcement activities, it also provides access for the increasing public use of the National Forest System lands.

Law enforcement is generally made more difficult in proportion to the number of miles of road. Access for the most part contributes to the wide dispersal of illegal activities.

SPECIAL EMPHASIS AREAS: The forest has four types of existing or potential areas: a) Experimental Forests, b) Research Natural Areas, c) National Natural Landmarks, and d) Special Interest Areas. There are 31 of these areas on the forest ranging in size from 10 to 43,737 acres. They each have their own management direction and requirements for Forest Development Roads.

Protection (PT)

The forest has responsibility for protecting 933,000 acres of National Forest land and 280,000 acres of private land. This is accomplished through an average expenditure of 1.6 million which funds 14 fire engines and suppression crews, an attack plane, air tanker facilities, a helitack crew, and a regional Hot Shot crew. Recent trends have included an increase emphasis on suppression forces to what is called a Most Efficient Level or MEL. The suppression forces available for protection include the California Division of Forestry (CDF), and Hand crews from the Department of Corrections. Most of these modules require access from the ground and are heavily dependent upon roads.

Recreation (UR), (RR), (PV), (SI), (CR)

Lassen National Forest offers a year-round variety of recreation opportunities, including camping, hunting, fishing, hiking, horseback riding, driving for pleasure, picnicking, snowmobiling, skiing (alpine and cross-country), and off-highway vehicle use.

Maintaining a viable road system is the key to our ability to provide diverse recreational experiences in a safe, convenient, environmentally responsible and cost effective way. Major routes generally consist of Forest Service maintenance level 3, 4 and 5 roads that provide access to large areas across the Forest and to significant recreational destinations such as campgrounds, picnic sites, and trailheads. Safe, well maintained, and signed travel ways contribute to a more satisfying recreation experience for forest visitors.

Dispersed Recreation: The Forest provides a wide variety of high quality dispersed recreation opportunities. An estimated 40% of total recreation use is considered dispersed recreation. The most popular activity is motorized recreation travel, followed by fishing, camping, hunting, and hiking/walking.

Most of the Forest is open to off-highway vehicles with minimal travel restrictions. Off-Highway vehicle (OHV) drivers especially use the 36 miles of designated four-wheel drive trails in two semi-primitive motorized areas: the High Lakes and Front Country OHV Areas. Wheeled OHV use is expected to increase significantly over the next decade. Winter oversnow use by both wheeled vehicles and snowmobiles is also increasing. The Lassen National Forest has the largest groomed snowmobile trail system in the State with seven staging areas across the forest for vehicle parking.

Generally, access to dispersed recreation opportunities are from travel routes that concentrate use on roads with increasingly lower maintenance levels. In most cases, the road system is adequate to meet user demands. With increasing frequency user created roads for convenience are expanding access beyond the roads provided. Areas with concentrated fuel-wood, mushrooms, or other forest products and riparian areas generally receive the heaviest impact. Areas that offer challenge to four-wheel drives (steep, rocky terrain) and areas that offer more remote camping experiences are also on the increase. Once identified as a concern, a combination of signage and use of natural barriers generally reduces further access.

The Forest plays an important role in the lives of residents and visitors to the area. Long-time residents and newcomers prefer the natural setting and resources that the Forest provides.

All social groups utilize the Forest for recreation, hunting, and fuel wood gathering. The groups differ however, in their demands, and in their concerns for how the road system is managed. Responses to the questionnaire sent out to the public regarding the forest scale roads analysis reveal the wide spectrum of needs and desires for recreational use of the National Forest that are gained or diminished by roads. People cite the benefits of roads, while almost equal numbers point to the risks or the undesirable consequences roads can bring. Finding a balance that satisfies most people will continue to be a challenge.

Economics (EC)

Between 1960 and 1990, the forest emphasized road construction to support timber related land management objectives. These roads were constructed with the expectation in part, that timber based land allocations would generate funding for annual road maintenance on a long-term basis. However, lands now available for timber harvest have decreased dramatically and that expectation is nowhere near today's reality. Meanwhile increased use by the public of National Forest roads for recreation has created additional revenues to local communities and business. For the Forest this use has impacts that need a commensurate response in annual appropriations to insure user safety, and resource protection.

BUDGET

The Forest budget allocation for planning, construction, and maintenance of roads has been averaging $1,200,000 per year from 1991 to 2000. There has been no discernable trend in the funding for road maintenance; rather it has been up and down. However, the annual cost to maintain the entire road system to standard is considerably higher than the amount allocated by Congress in any given year. In prior years, congressionally appropriated road funding was supplemented by road construction and maintenance work performed by timber purchasers through the commercial timber sale program. This program has declined steadily and is a mere fraction of the program of a decade ago.

From 1998 through 2000, the Forest conducted road condition surveys to determine the actual cost of maintaining the road system to standard. Upon analysis of the data collected, it becomes obvious that the Forest is substantially underfunded for the size of the road system it manages (see table below). Due in large part to this funding shortfall, there is a need to identify and prioritize the **minimum** road system necessary for access to and management of the National Forest. Chapter 5 outlines opportunities for achieving the minimum road system.

Table 2. Summary of needed funds for road maintenance and operations (2000 $'s)

Maint. Level	Total Miles	Annual Maintenance		Deferred Maintenance	
		$/mile	Total $	$/mile	Total $
1	279	400	111600	2625	$732,375
2	2,674	625	3,342,500	5800	$15,509,200
3	706	3,950	8,366,100	17,200	$12,143,200
4	0.1	N/A	0		0
5	24	10,500	1,260,000	135,200	$3,244,800
Total	**3683.10**		**$13,080,200.00**		**$31,629,575.00**

Source: 1998-2000 Road Condition Surveys. Dollars in table 2 are an average between 1999 and 2000 surveys

N/A *Sample size and forest total not significant*

Maintenance is the act of keeping fixed assets (i.e. roads), in an acceptable condition. Maintenance includes preventative maintenance of normal repairs, replacement of parts and structural components, and other activities needed to preserve a fixed asset so that it continues to provide acceptable service and achieves its expected life. Maintenance includes changes made to satisfy changes to laws, regulations, codes or other legal requirements, as long as the original intent or purpose of the fixed asset has not changed; nor does it change the capacity or useful life of the asset. Maintenance excludes activities aimed at enlarging/expanding the capacity of a fixed asset or otherwise upgrading it to serve needs different from, or significantly greater than those originally intended.

The **annual maintenance** costs are estimates of routine work plus annualized costs for work, which is accomplished periodically and for capital recovery on structures. Annual road maintenance is work performed to maintain serviceability or repair failures in the year which they occur. This includes preventive and/or cyclic maintenance performed in the year in which it is scheduled to occur. Annual maintenance work items are work items that are considered **critical** for user safety, forest mission and resource protection such as condition surveys, vegetation removal, drainage maintenance, and surface maintenance and, regulatory and warning signs.

Deferred maintenance is maintenance that was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period. Deferred maintenance needs may be categorized as **critical or non-critical** at any point in time. Continued deferral of non-critical maintenance will normally result in an increase in critical deferred maintenance. Deferred costs also represent a current account backlog of non-routine maintenance and capital recovery accumulations.

The reasons for maintenance are the following.

- **Health and Safety** a requirement that addresses a threat to human safety and health that requires immediate abatement.
- **Resource Protection** a requirement that addresses a threat or risk of damage, obstruction, or negative impact to a natural resource.
- **Mission Need** a requirement that addresses a threat or risk to carrying out the mission of the organization.

The priorities for maintenance are the following.

- **Emergency Need** an urgent maintenance needs that may result in injury, illness, or loss of life, natural resource, or property; and must be satisfied immediately.
- **Critical Need** a requirement that addresses a serious threat to public health or safety, a natural resource or the ability to carry out the mission of the organization.
- **Noncritical need** a requirement that addresses potential risk to public or employee safety or health, compliance with codes, standards, regulations etc., or needs that address potential adverse consequences to natural resources or mission accomplishment.

The existing situation on the Lassen with respect to budget is that there are likely critical and non-critical maintenance needs being deferred on a regular basis. This growing backlog for abatement of Health and Safety, Resource Protection and Mission needs must be

addressed. Line officers and forest managers face difficult decisions and must make tough choices as to how limited funds should be expended. There are two choices for responsible management of the transportation system; one is to increase the funding to meet needs or two reduce the needs. It is likely that both must happen.

WATERSHED ASSESSMENTS

The tables below will show the current status of watershed assessments on the Forest. The table will indicate complete or not complete which is not necessarily based on the protocols described below. Over the last few years the levels of intensity of survey for different areas has varied due to the availability of time and/or expertise for a given project, and in some cases because of changing management direction. The protocols or applications of the various surveys currently being used on the Lassen are discussed below.

An indication of complete means that a satisfactory effort has been made to some protocol. An indication of partial means that not all current protocols have been satisfied. An indication of N/A means that the survey was not conducted or not needed.

A map showing the locations of the planning areas is located at the end of ***Appendix B***.

Protocols

Road hazard Assessments are done using a straight line plan view form which documents the roads design or drainage features (i.e. ditches, culverts, inslope vs. outslope etc.) The Road hazard assessments are typically done for all roads in the planning area.

Win survey (Watershed Improvement Needs) document erosional sources outside of roads, including skid trails, landings, borrow sources, streams, and dispersed recreation sites. Win surveys are done at all sites where there is evidence of erosion (rills, gullies).

Soil Transects measure soil quality standards for soil porosity, soil cover and large woody debris in a sample grid within project area work sites (i.e. harvest units). These transects are selected to cover dominant soil types in each sub watershed.

Fish Passage inventory are done according to procedures outlined in California Salmanoid Stream Habitat Restoration Manual by Ross N. Taylor and Michael Love. The inventory is typically done at all stream crossings with fish bearing stream reaches.

Stream surveys are intended to identify overall stream condition and health. In 2002 the forest adopted the streamscape Inventory method developed on the Almanor Ranger District. Surveys are conducted on all streams in the sub watershed both perennial and seasonal. Attributes measured include percent canopy cover, riparian vegetation type, width to depth ratio, large woody debris, pool frequency, and channel type to name a few.

Stream Crossing inventories capture all relevant data (i.e. culvert size, fill volume, diversion potential etc.) The crossings inventoried include all perennial and seasonal stream crossings.

HFQLG PROJECTS 2000

Project Name	Road Hazard	WIN Survey Soil Transects	Fish Passage	Stream Surveys	Stream Crossings	Acres
Almanor						
Prattville	N/A	Partial	N/A	Partial	N/A	6,489
Jonesville	Partial	Partial	Complete	Complete	N/A	7,176
Mineral	Complete	Partial	Complete	Complete	Partial	29,093
Eagle Lake						
Pegleg	Complete	N/A	N/A	N/A	N/A	46,192
Cone Crater	Complete	Complete	N/A	Complete	N/A	1,417
Hat Creek						
Pittville	N/A	N/A	N/A	N/A	N/A	37,712
Blacks Ridge	Complete	Complete	N/A	Complete	Complete	23,802
North Coble	Complete	Complete	N/A	Complete	Complete	28,816
Big Jacks	Complete	Complete	N/A	Complete	Complete	43,738

HFQLG PROJECTS 2001

Project Name	Road Hazard	WIN Survey Soil Transects	Fish Passage	Stream Surveys	Stream Crossings	Acres
Almanor						
Creeks	Partial	Partial	N/A	Partial	Partial	68,426
Eagle Lake						
Champs Gooch North	Complete	Complete	N/A	Complete	Complete	95,264
Champs Gooch South	Partial	Partial	N/A	Partial	Partial	25,080
Hat Creek						
South Station	Complete	Complete	N/A	Complete	Complete	37,701

HFQLG PROJECTS 2002

Project Name	Road Hazard	WIN Survey Soil Transects	Fish Passage	Stream Surveys	Stream Crossings	Acres
Eagle Lake						
Ebey	Complete	Complete	N/A	Complete	Complete	16,376
Hat Creek						
Cabin	Complete	Complete	Complete	Complete	Complete	18,078
North 49	Complete	Complete	N/A	Complete	Complete	42,336
South Bunch	Complete	Partial	N/A	Complete	Complete	34,940

HFQLG PROJECTS 2003

Project Name	Road Hazard	WIN Survey Soil Transects	Fish Passage	Stream Surveys	Stream Crossings	Acres
Almanor						
TU1 & TU11	Partial	Partial	N/A	Complete	Partial	69,674 44,297
Eagle Lake						
Susan River	Planned	Planned	Planned	Planned	Planned	North @ 57,571 Central@ 20,881 South @ 10,338
Champs Gooch South	Partial	Partial	Planned	Partial	Partial	25,080
Butte	Planned	Planned	Planned	Planned	Planned	38,650
Hat Creek						
Backbone	Planned	Planned	Planned	Planned	Planned	64,531

Watershed Implementation

Watershed assessments or watershed analysis is a broad level ecosystem analysis tool intended to provide context and information to line officers regarding the effects and impacts of management decisions on resources as management plans are implemented. WA is intended to influence or direct land management decisions.

Roads analysis is very similar to WA but slightly narrower in focus. It is an integrated ecological, social and economic approach to transportation planning, addressing both existing and future roads. In order to take fullest advantage of the similarities between these analyses, they should be done concurrently whenever possible. RA is intended to influence or direct land management decisions.

Restoration treatments and programs would be based on landscape/watershed analysis. The landscape/watershed analysis would identify areas of greatest benefit relative to cost and the greatest likelihood of success. Watershed Restoration work when it involves roads will typically include one or more of the following items…

- Outsloping
- Constructing Dips
- Replacing culverts with ford crossings
- Culvert inlet modifications
- Subsoiling (landings and roads)
- Decommissioning
- Road realignment

Other watershed restorations projects include thinning for aspen improvement, willow planting adjacent to streams, water source improvement, stream restoration, and subsoiling for soil quality restoration.

CIP/Watershed Improvement/Engineering/ERFO

Project name	Watershed Assessment	Roads Analysis	Implementation	Cost
Yellow Creek II FY2001	N/A	N/A	Permeable Fill Ford Crossing Stream Restoration	$400k
Yellow Creek I FY 1999	N/A	N/A	Meadow and stream restoration	$85k

KV 2001

Project name	Watershed Assessment	Roads Analysis	Implementation	Cost
Ruffa	N/A	N/A	Stream, landing, and soil restoration, road decommissioning	$40K
Shanghai	N/A	N/A	Stream, landing, and soil restoration, road decommissioning	$40K

Calfed (includes grant funds, QLG, Fisheries, Engineering, 10% and watershed funds)

1999 to 2002

Project name	Watershed Assessment	Roads Analysis	Implementation	Cost
Deer Creek **Mill Creek**	Complete	Complete	• Outsloping • Dips • Ford crossings • Culvert inlet modifications • Subsoiling (landings and roads) • Decommissioning	1999 @ $100K 2000@ $200K 2001@ $200K 2002@ $400K
Antelope	Complete	Complete	Proposed for 2003-2005	$670k

10% Funds and County RAC

Project name	Watershed Assessment	Roads Analysis	Implementation	Cost
Soldier Creek FY 1999	N/A	N/A	Convert Road to Trail	10% and WIN $50K
Onion Summit FY2000	Complete	Complete	For out-year rock placement needs	$300k
Bear Wallow FY 2000	Complete	Complete	Retrofit pipe for 100 year storm event	$30K
East Turner FY 2000	Complete	Complete	Construct headwall	$30K
Onion Summit Rocking FY 2002	Complete	Complete	• Outsloping • Dips • Rocking	$100k
Deer/Mill Creek Trails FY2002	Complete	Complete	Trail reconstruction	$100K
Soldier Creek FY2002	N/A	N/A	• Rocking • Water source	$50K
Wilson Lake FY 2002	Complete	Complete	Road Realignment	$75K

HFQLG 2001

Project name	Watershed Assessment	Roads Analysis	Implementation	Cost
Jonesville	Complete	N/A	• Outsloping • Dips • Ford crossings • Subsoiling (landings and roads) • Decommissioning • Road realignment	$55k
Prattville	Complete	N/A	Stream, landing, and soil restoration, road decommissioning	$30K
Pegleg	N/A	N/A	• Road decommissioning	$6k

HFQLG 2002

Project name	Watershed Assessment	Roads Analysis	Implementation	Cost
Blacks Ridge	Complete	N/A	• Outsloping • Dips • Ford crossings • Subsoiling (landings and roads) • Decommissioning • Road realignment	$300K
Cone Crater Aspen	Complete	N/A	• Thinning for Aspen improvement	$85k
Pegleg Aspen	N/A	N/A	• Thinning for Aspen improvement	$50k

Proposed Outyear HFQLG Implementation

Project name	Watershed Assessment	Roads Analysis	Implementation	Cost
Blacks Ridge	Complete	N/A	• Outsloping • Dips • Ford crossings • Subsoiling (landings and roads) • Decommissioning • Road realignment	$300K
Cone Crater	Complete	Partial		$50K
North Coble	Complete	Partial		$100K
Big Jacks	Complete	Partial		$200K
Cabin	Complete	Complete		$400k
Southstation	Complete	N/A		
North 49	Planned FY03	Planned FY03		
South bunch	Planned FY 03	Planned FY03		
Ebey	Planned FY 03	Planned FY03		
Champs Gooch	In-progress	In-progress		
Susan River	Planned FY 04	Planned FY 04		
Prattville	Complete	N/A		

Chapter 3 IDENTIFYING CONCERNS

PUBLIC CONCERNS

On January 28, 1998 in an Advance Notice of Proposal Rulemaking (ANPR) (63FS4350), the Forest Service announced its intent to revise regulations concerning management of the National Forest Transportation System and comments were invited. Some of these comments were echoed here on the Lassen National Forest and our Forest Scale Roads Analysis. They include:

Concerns for protection

- The Forest Service received numerous comments questioning the agency's ability to effectively manage forest resources for long-term forest health and wildfire suppression while reducing road access.

Concerns for recreation

- Others were concerned about the potential reduction in the number of roads open to the public and the effect fewer roads would have on public access and recreation use on national forests and grasslands.
- A few expressed concern that the agency would use road maintenance costs or a lack of funding to justify road closures.

Concerns for aquatics

- Respondents expressed a wide range of opinions on the amount of road decommissioning that should occur. Some stated strong feelings that all unauthorized and environmentally damaging roads should be decommissioned immediately.

Concerns for scale and process

- Several individuals indicated a preference for road decisions to be made at the National level, in the belief that decisions at the national level would better ensure broad representation for all Americans. Others suggested that road decisions are best made at the local level by those most knowledgeable about resource issues, and these respondents objected to the proposed service-wide policy.

Agency response to these comments can be found in Federal Register/Vol. 66, No. 9/Friday, January 12, 2001/Rules and Regulations. The Roads Analysis Process on the Lassen recognizes the legitimacy of these concerns, and will use them to establish the context in which we will be working.

Terminology

To reduce confusion over use of the term "issue" in the context of Forest Plan revision and the National Forest Management Act with environmental issues in the context of National Environmental Policy Act (NEPA) we will to use the term "issue" to describe a point of discussion, debate or dispute about an environmental effect of a proposed action. Our planning and analytical activities associated with Roads Analysis will use the term concerns, to target areas for problem solving. The solution set for problem solving in the roads analysis process will be called opportunities.

MANAGEMENT CONCERNS

Management staff on the Lassen National Forest shares the concerns expressed by the public with respect to roads. In addition to this information the Lassen provides the direction support and training necessary to keep employees abreast of the latest research findings on environmental effects associated with roads. Our development of landscape and watershed assessments, environmental documents, and participation in forest plan amendments has contributed greatly to our corporate knowledge of both the benefits and risks of managing a large road system. Some of the concerns that we feel need to be addressed at the forest and watershed scale in roads analysis are:

Concerns for ecosystem function

- Roads serve as conduits for noxious weed introductions

Concerns for aquatics

- Inappropriate road design can lead to chronic sedimentation
- Not all water sources for road maintenance and fire protection meet Best Management Practice (BMO) requirements.
- Cinder pits on the forest do not have plans for operation and restoration

Concerns for terrestrial wildlife

- High road densities may compromise habitat quality for certain species

Concerns for recreation

- Increased recreational use has brought motorized and non-motorized uses into conflict

Concerns for economics

- Even with the focus on designating a minimum road system, current forest budgets do not cover routine and non-routine road maintenance costs.
- No provisions are in place that acknowledge or fund a capital recovery account for structures and other improvements

Concerns for general public transportation

- Some arterial and collector roads are not being maintained to the standards specified in the highway safety act.
- Not all roads with exchanged easements are covered under cost share
- Access to utility corridors not entirely accounted for and designated
- Some critical health and safety maintenance items are deferred (e.g. roadside brushing)

Concerns for protection

- Dead end and mid slope roads often present hazards for firefighters
- Lack of maintenance to roads can restrict firefighter access (e.g. windfall, rockfall)

Concerns for commodity production

- Temporary roads do not always get closed and/or stay closed after commercial use
- Changing land allocations and management direction for vegetation management make long term planning for road access more difficult.

Questions and additional information needs

Continued interaction with the public, other agencies and stakeholders is crucial to our process. Additional information is always welcome in order to be sure that we fully understand the concerns. We have developed a list of questions that are designed to focus comments and concerns and to facilitate our understanding. The list of questions we created for this purpose can be found in ***Appendix A***.

Visit the Lassen National Forest WEB page for a complete and updated version of our forest scale roads analysis.

http://www.r5.fs.fed.us/lassen/engineering/roads_analysis.html

Selection of Indicators

An indicator is a sign or signal that relays a complex message, potentially from numerous sources, in a simplified and useful manner, (Jackson, Kurtz, and Fisher, Evaluation Guidelines for ecological Indicators May 2000). The indicators established by the Roads Analysis ID team, are intended to produce a measure or model that enables them to characterize the current status of need or resource risk on a given road. The model will also enable ID team members to track or predict significant change.

The following ***Table A*** illustrates how we proposed to transition from concerns to indicators. Our hope is that the display of benefits and risks along side the related indicators will help to reinforce the linkages within the process and the logical sequence of a scientific approach. Full development of indicators by area of concern is found in ***Appendix D***.

Table A: INDENTIFYING CONCERNS

Step 3 Selecting Indicators

This table is designed to help set up the scientific assessment and is the starting point for surfacing concerns. The use of indicators allows the comparison of conditions on one road with another in some repeatable, quantifiable way.

ECOLOGICAL, SOCIAL CONSIDERATIONS	BENEFITS AND EFFECTS	ROADS ANALYSIS PROCESS QUESTIONS	SELECTED INDICATORS
Ecosystem Functions and Processes (EF)	Ecological attributes unique to the Lassen Introduction and spread of exotic plant, & insect, species	EF (2) EF (3)	**Presence of Noxious Weed/Insects** • None present or adjacent • Only low priority species present • High priority species present **Habitat Vulnerability** • High cover/low disturbance • Moderate cover/moderate disturbance • Low cover/high disturbance **Frequency of distribution vectors** • Few current vectors • Moderate current vectors • Abundant current vectors
Aquatic, Riparian Zone and Water Quality (AQ)	Aquatic Riparian • Erosion • Sediment • Loss of riparian	AQ (1), AQ (2)	• Hydrologic connectivity • Road gradient • Road density • Slope Class • Soil Type/Geology • Number of stream crossings /mile • Miles within RHCA
Terrestrial Wildlife (TW)	Habitat loss and fragmentation (i.e. direct effects) Disturbance from road use	TW (1), TW (2), TW (3)	Road density (miles/sq mile) • By mtc. Level • By sub watershed • By Habitat capability
	Habitat loss and fragmentation	TW (1)	Habitat quality and quantity (acres) • Cover types • Vegetation type • Seral stage
	Loss or degradation of unique features or habitats	TW (4)	Unique features or habitats (acres)
Note: Indicators are variables or information that are considered useful in predicting an effect or in determining a relative value or need.			

ECOLOGICAL, SOCIAL AND ECONOMIC CONSIDERATIONS	BENEFITS AND EFFECTS	ROADS ANALYSIS PROCESS QUESTIONS	SELECTED INDICATORS
Economics (EC)	Road system effects to agency's direct costs and revenues Costs associated with road surface stabilization	EC (1), EC (2) EC (1)	**Annual Traffic Related Maintenance** • Cost/mile & cost/mile/ADT **Annual Non-traffic Related Maintenance** • Cost/mile by mtc. level **Deferred Road Maintenance** • Cost/mile Safety Resource Protection Economic Analysis
Commodity Production: Timber Mgt. **(TM)** Range Mgt.: **(RM)**	Timber Biomass Mushrooms Range	TM (1) TM (2) TM (3)	**Management Direction** • Determined by land allocation • By silvicultural system • By entry interval **Commodity Value** • Potential product quantity (acres/mile) • Potential product quality ($/acre) • Market rates ($, miles) • Extraction costs (acres/mile, reconstruction and construction costs) **Resource Maintenance** • Post harvest mitigation treatments (#/yr) • Non-commodity mtc. Of vegetation structure, (fuel ladder, fuel load, stocking control) **Range Indicators** • Number, location, size of allotments • Type of access needs and season of use

Note: Indicators are variables or information that are considered useful in predicting an effect or in determining a relative value or need.

ECOLOGICAL, SOCIAL, AND ECONOMIC CONSIDERATIONS	BENEFITS AND EFFECTS	ROADS ANALYSIS PROCESS QUESTIONS	SELECTED INDICATORS
Water Production (WP) Special Forest Products **(SP)** Special Use Permits **(SU)**	Access to facilities that enhance water uses • Diversions • Impoundments • Distribution	WP (1) WP (2) WP (3)	Type of Facility • Impoundment • Drinking Water • Hydroelectric Frequency of Access • Does not require routine maintenance • Requires annual inspections • Requires routine maintenance Type of Access • Direct road access not required • Multiple access routes to facility • Provides only access to facility Timing of Access • Seasonal • Year round
General Public Transportation (GT)	Seamless road system Connections with other road systems and jurisdictions	Community access GT (1)	Population of community Number of roads serving egress Standard of road Road jurisdiction
	Safety of road users	GT (4)	Safety • Rock fall • Site distance • Accident reports • Wash boarding
	Use of roads for law enforcement activities	AU (2)	Number of miles of road Road density
	Shared Road Use	GT (2)	Cost Share Areas Private ownership Jurisdiction
Administrative Use **(AU)**	Special Emphasis Areas	AU (1)	Type of area Season of use Number of roads that access the activity Number of trips required (ADT)

Note: Indicators are variables or information that are considered useful in predicting an effect or in determining a relative value or need.

ECOLOGICAL, SOCIAL AND ECONOMIC CONSIDERATIONS	BENEFITS AND EFFECTS	ROADS ANALYSIS PROCESS QUESTIONS	SELECTED INDICATORS
Protection: (PT) **Fuels Management** **Fire Suppression** **Firefighter Safety** **Human Ignition**	Roads provide for safe and economical hazardous fuel reduction	PT (1) PT (3)	**Strategic** Suitability as Defensible Fuel Profile Zone (DFPZ) • Locations for strategic deployments (i.e. safe areas, drop zones, helispots) • By Topography (related to safety) • Proximity to water • Acres treated DFPZ, barren areas • Road density within Threat and defense zones (values at risk) • Condition class **Safety** • Ingress-egress (e.g. dead end road vs. collector) • Traffic service level • Turnarounds **Hazardous Fuel Treatment** • Acres available • Condition class • Proximity to urban
	Initial attack effectiveness Firefighter safety Fire spread Potential for human caused ignition	PT (2)	**Access**…to the fire • Locations of ground to be access from the air (acres) • Location to be accessed from the ground (acres) • Slope Position • Land allocation • Proximity to suppression resources (i.e. response time) • Road Service level (i.e. single lane, intervisible turnouts) incl. mtc level high clearance vs. smoothly graded. History of starts Dispersed uses
Note: Indicators are variables or information that are considered useful in predicting an effect or in determining a relative value or need.			

ECOLOGICAL, SOCIAL AND ECONOMIC CONSIDERATIONS	BENEFITS AND EFFECTS	ROADS ANALYSIS PROCESS QUESTIONS	SELECTED INDICATORS
Protection: (PT) Effects on air quality (airborne dust emissions)	Air quality Visibility Human health concerns	PT (4)	Road Miles of unpaved surface
Recreation: **(RU)** **(RR)** **(PV)**	Road-Related Recreation	RR1, RR2, RR3, RR4 RR5, UR1, UR2, UR3, UR4, UR5, PV1, SI1, SI2, SI6	**Access to developed Recreation sites** • 250 PAOTs or more • 125-250 PAOTs • under 125 PAOTs **Access to dispersed sites** • designated on map • seasonal camps • evidence of past use **ROS class consistency Risk** • consistent • inconsistent **Social Concerns** • high political interest • access to traditional site • economic activitiy or value • congressionally designated feature • seasonal dispersed use

Note: Indicators are variables or information that are considered useful in predicting an effect or in determining a relative value or need.

ECOLOGICAL, SOCIAL AND ECONOMIC CONSIDERATIONS	BENEFITS AND EFFECTS	ROADS ANALYSIS PROCESS QUESTIONS	SELECTED INDICATORS
Recreation: (RU) (RR) (PV)	Dispersed driving related recreation • Woodcutting • Bird watching • Hunting	RR2, EC2, SI1, PV4, S12, S19, EC3	**Passive Uses** • Access to congressionally designated feature • Access to traditional gathering site • Access to scenic vista • Proximity to Byway or all American Road
	Effects of roaded access and closures on minorities, ethnic or low income groups	CR (1)	**CR and Environmental Justice** • Access to non-fee camping • Proximity to communities • Forest orders
Special Use permits			• Number of and description of existing agreements and permits • road standards required for use • seasonal requirements (i.e. operational)
Note: Indicators are variables or information that are considered useful in predicting an effect or in determining a relative value or need.			

There are 71 Roads Analysis Process Questions and they are described in Misc. Report FS-643, USDA Forest Service Roads Analysis: Informing Decisions about Managing the National Forest Transportation System, in Appendix 1. This reference is available via the Washington Office WEB site, and with San Dimas…. etc.

The questions that this ID team did not choose to address for the purpose of this forest scale roads analysis are listed below with a brief description as to why it they were deemed not appropriate.

- Question EC-3 was considered outside the scope of this analysis

Step 4 ASSESSING BENEFITS, PROBLEMS AND RISKS

INTRODUCTION

For the purpose of this roads analysis, a road-by-road assessment of maintenance level 3-5 roads will not be started at this time. The team felt after developing their indicators and given a very short timeframe that using existing information to evaluate each road would result in numerous data gaps. These data gaps would provide a very low level of confidence in the existing assessment for almost all areas of consideration and make the process of identifying opportunities ineffective.

We provide instead at this scale a process that can be followed at the watershed, lanscape or project level. This process uses a scorecard for each area of consideration that allows documentation of the how each indicator was weighted for each road. A spreadsheet is then used to capture a total team rating that can reveal areas of concern and suggest relative priority. The Resource Risk/Access Need matrix in figure 2 helps to make this distinction.

Figure 2

Access Need \ Resource Risk	High	Low
High	**High degree of concern** (High Priority)	Low degree of concern (Ideal Situation)
Low	Moderate degree of concern (High Priority)	Low degree of concern (Lower Priority)

The matrix points to degrees of concern and relative priority. For example if we find in the evaluation of a given road that we have a high contrast in objectives (i.e. high need and high risk), the matrix would indicate that we most likely have a high degree of concern. Conversely if there were a low need and low risk there would be a low degree of concern. The condition of low risk and high need is obviously the most desirable condition. Finally, high risk combined with low need suggests action needs to be taken and the opportunities associated with this condition would not likely meet with controversy. This matrix of course oversimplifies most real life situations and should only be used as a visual model.

SYNTHESIS OF BENEFITS AND RISKS

The scorecards can be found in ***Appendix E***. They illustrate how Interdisciplinary Team Members can combine their respective ratings for a road with the ratings applied from other team members on the same page. This facilitates a better perspective on the overall situation and helps to prepare team members for the collaborative process of problem solving. For example team members representing access needs should be tracking what the resource risks are and vice versa. This tool also serves as crucial documentation of the individual professional evaluations that brings a higher degree of credibility to the roads analysis process.

The spreadsheets in ***Appendix F*** are where the ratings from each area of consideration are compiled in one place. The array of these ratings allows a quick determination of the degree of concern as described above. The following page provides an example of how the spreadsheet would be used. Road 25N05 is chosen and a rating applied from each area of consideration. In this example a high rating in aquatics is contrasted with a high rating for commodity. This contrast denotes a high level of concern is likely. In this mock example, say the high aquatics rating came from the indicator “connectivity” which in this case reflected the condition of this road where the road is insloped the entire length. The road also happens to cross several live streams that support native fish. As we pursue this concern into step 5, the example will show one “solution” to be outsloping the road. This would lessen the concern from aquatics and change the rating to medium. This in turn reduces the level of concern to moderate. Again we need to emphasize that the solution is just one possible road management opportunity to be explored.

Road Benefit and Risk Synthesis

Step 4

	Ecological, Social, and Economic Considerations (indicators)									
Road Number	Ecosystem	Aquatic	Wildlife	Economics	General	Commodity	Water pro-	Protection	Recreation	Concern
25N05	medium	high	low	low	medium	high	low	medium	medium	High
25N05										
25N05										
25N27										
26N02										
26N02										
26N19A										
26N26										
26N26										
26N27										
26N31										
26N31										
26N40										
26N40										
26N40										
26N40										

Chapter 5 DESCRIBING OPPORTUNITIES AND SETTING PRIORITIES

INTRODUCTION

The assessment of the benefits, problems and risks for the current road system described in the previous chapter is the starting point to describing what is desirable or acceptable for a given road. The ID team should be working with line officers and utilize public feedback whenever possible to gain a feel for this. The actual balancing of benefits and risks is finally undertaken in our process at this step. This is where our solution set of opportunities is put forward and from which technical recommendations for specific road related problems can be made.

OPPORTUNITIES TOWARD A MINIMUM ROAD SYSTEM

Opportunities to improve Aquatics

- Outsloping roads to prevent concentration of water
- Prevent diversion of stream flows with improved design (i.e. diversion prevention dips)
- Decommissioning or realignment of roads that are degrading habitat
- Improve capacity for flow in culverts including bedload and debris

Opportunities to improve Recreation

- Increase or restore areas in near stream zones where vehicles are restricted
- Increase non-motorized…convert roads to trails
- Increase motorized…designate and design to meet OHV soil conservation standards

Opportunities to improve Protection

- Reduce risk of human caused fire in high hazard terrain/fuels through road closures
- Improve road service levels to strategic locations (i.e. widen, provide for turnarounds, improve surface)

Opportunities to reduce road maintenance costs

- Change maintenance levels downward (e.g. lvl 3 to lvl 2, etc.)
- Reduce road standards (i.e. replace culverts with low water crossings)

Opportunities to improve terrestrial wildlife

- Reduce road densities (decommission)
- Reduce traffic (road restriction, level 1)

Opportunities to improve commodity production

- Improve arterial and collector road service levels

Opportunities to improve general public transportation

- Require authorized, permitted operations utilizing NFS roads to pay a fair share of road maintenance costs, (including surface rock replacement)
- Improve road related dialogue with counties to more efficiently use taxpayer funds.

- Expand Cost share areas to include all major routes in the forest with exchange of easements

Opportunities to improve economics

- Provide for a collection account from annual appropriations to provide capital recovery for structures and high cost improvements

APPLICATIONS

The employment of the generic opportunities described above need now only a strategy or parameters for their use. The listing below is a start on those limits or boundaries currently being used to determine what, where and when these opportunities are appropriate.

Reconstruction is appropriate when…

- Necessary to provide safe access for combined uses (e.g. commercial and public travel)
- To bring an existing road into compliance with current standards and guides for protection of aquatic and riparian values
- Needed to accommodate a new critical vehicle (i.e. chip vans)

New permanent road construction is appropriate when …

- It provides access for vegetation management (i.e. facilitate efficient haul, administration, and post haul activities).
- Ground based access for vegetation management is determined to be most cost efficient.
- Road crosses sensitive areas (i.e. Archeological site, wet areas, etc.) and engineering design controls are needed to protect resources.
- Area served requires frequent entries.
- Steep slopes (i.e. cut and fill requires control for compaction, side cast)

Temporary construction is appropriate when…

- Area served is expected to require infrequent access.
- Area is relatively flat and only small cut and fill is required
- Few or no drainages are crossed and affected resource specialists have evaluated potential crossing impacts.
- Sub watersheds already have high equivalent roaded areas (ERA's); road density or cumulative effects are near thresholds.
- The road will be ½ mile or less
- There is an obvious termini

Decommissioning is appropriate when…

- Existing roads are determined to be in excess of needs based on area transportation analysis (i.e. for timber access), and no other management needs are identified. (for example through roads analysis, no developed recreation or fire access is needed).
- Existing classified or unclassified roads are degrading, retarding or preventing attainment of aquatic conservation strategy goals.
- Existing roads are in conflict with the objectives of the area. (i.e. wildlife concerns)
- Unneeded roads determined through logging systems analysis to be less efficient than existing alternative access or proposed new access to manage individual

timber stands or an area. Unneeded roads are also determined through "roads analysis" to be unnecessary to achieving current and anticipated management objectives and public use of National Forest System (NFS) lands, (e.g. fire suppression, recreation, etc.)

Vehicle travel restrictions are appropriate when

- Single resource road needs for access are infrequent (i.e. vegetation management)
- Traffic on roads contributes to resource degradation or affects wildlife habitat
- There has been identified a need for more non-motorized recreation access in the area
- Fire protection needs are low
- Seasonal vehicle restrictions will protect other resource values

Reducing Maintenance Levels is appropriate when

- Road use Average Daily Traffic (ADT) is low
- Road costs due to traffic related maintenance are low
- Driver comfort is not a concern

Reducing Road Standards is appropriate when

- Speed of travel is not a concern
- Road Use is low
- Traffic volume and conflicts are low

LOGGING SYSTEMS PARAMETERS

Helicopter logging is appropriate when…

- Road construction costs are prohibitive and/or areas served are small (i.e. construction costs for roads are greater than logging cost associated with helicopter). Also assumes long term roading and management of the area has been considered.
- Access requires crossing sensitive areas, and not compatible with guidelines.
- Timber values are high

Ground based logging systems are applicable when…

- Operable on slopes up to 35% nominally, and may be less depending on soil types.
- No helicopter to multi-products, or thinning.
- Multi-product landings generally require 75-100' width, 150' at the widest, and are 150-200 ft. long. (this accommodates delimber, loader, chipper)

Describing Opportunities
Step 5

		Ecological, Social, and Economic Considerations (indicators)									
Road Number	Opportunity	Ecosystem	Aquatic	Wildlife	Economics	General	Commodity	Water pro-	Protection	Recreation	Concern
25N05	Outslope	medium	medium	low	low	medium	high	low	medium	medium	**Moderate**
25N05											
25N05											
25N27											
26N02											
26N02											
26N19A											
26N26											
26N26											
26N27											
26N31											
26N31											
26N40											
26N40											

Step 6 REPORTING

FOREST SUPERVISOR GUIDELINES FOR IMPLEMENTING ROADS ANALYSIS

The forest interdisciplinary team charged with producing a Forest Scale Roads Analysis has completed their work and I am pleased with their efforts. I realize there have been many others on the forest behind the scenes and providing support to this team who are also responsible for the quality of our product. I believe we have met and exceeded the minimum requirements and I am confident that what we have produced will help speed our analysis at the project and watershed scale, and will more importantly lead us to better decisions on the ground. To insure that we don't lose the momentum of this work I have the following expectations to insure we meet the intent of the new roads policy and the requirements for roads analysis.

I expect first of all that the process and methods for documentation established at the forest scale be followed at the watershed and project scale unless a new process is approved by me. I will be looking specifically for documentation of public involvement at the project level in regard to road management concerns, and well thought out solutions to these concerns brought forward in our proposed management activities. We need to be clear and up front with the public that not every project will solve all road concerns in a given area, but that we fully intent to chip away at problems when it is required, feasible and of course when problems arise.

I want this renewed focus on roads to revitalize our relationships with other government agencies, jurisdictions, and road partners. There are now many different opportunities to share in major improvements to a seamless road system that will have enormous benefits to the public if we take responsibility for a leadership role. I am expecting line officers on the forest to rise to this challenge and take advantage of these opportunities with our partners. We already have much experience and a reputation for innovative responses to public access needs and environmental protection. I expect this to continue.

There is a key philosophical approach that I need to share with those who will undertake roads analysis at the project and watershed scale. My approach is that a road must have a demonstrated and documented need in order to be a part of the National Forest Road System. Classified and unclassified roads both must meet this criteria to remain on or become part of the road system. If a road does not meet this test then it needs to be restored, that is decommissioned or converted to a trail. The test is the process we have just established. In this approach the burden of proof is shifted to the needs side of the equation and not the risk side. We will not keep roads on the landscape unless they are needed.

I realize that in completing this phase of roads analysis that we still have work left to do. I will be directing my staff to initiate the next phase of our work that will be to complete a road-by-road assessment of levels 3 through 5. This is needed to facilitate our submittals for Public Forest Service Roads, which is a potential funding source to reduce the deferred maintenance backlog and to bring our roads into full compliance with current standards and guides. There are other funding opportunities that we could explore once this road-by-road assessment is complete.

Finally, I should mention that our Forest Plan revision will be starting in a few years. I hope that everyone familiar with roads analysis and/or this coming planning will see the congruous and inseparable nature of these activities and work to coordinate these efforts. My commitment is to respond to any needs you have to help us all accomplish this.

Ed Cole

Forest Supervisor

REFERENCES

Agee, J.K. 1993. Fire ecology of Pacific Northwest forests. Washington, DC. Island Press. 493 p.

Atzet, Thomas and Robert E. Martin. 1991. Natural disturbance regimes in the Klamath province. In: Proceedings of the Symposium on Biodiversity of Northern California. Santa Rosa, CA

Baily, T.N.; Bangs, E.E.; Portner, M.F.; Malloy, J.C.; McAvinchey, R.J. 1986. An apparent overexploited lynx population on the Kenai Peninsula, Alaska. Journal of Wildlife Management 50(2):279-290

Banci, V. 1994. Wolverine. Pages 7-37 in: Ruggiero, L.F.; Aubry, K.B.; Buskirk, S. W.;[and others], tech. eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in the western United States. Gen. Tech. Rep. RM-GTR-254. Fort Collins, Co: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Bennett, A.F. 1991. Roads, roadsides and wildlife conservation: A review. Pages 99-118 in: Saunders, D.A.; Hobbs, R.J., eds. Nature Conservation 2: The Role of Corridors. Victoria, Australia: Surrey Beatty and Sons.

Coulter, M.W. 1966. Ecology and management of fishers in Maine. Ph.D. dissertation. Syracuse, NY: State University College of Forestry at Syracuse University. 183 pages.

Davis, Kenneth P. 1959. Forest Fire Control and Use. New York, NY. McGraw Hill Book Company. 584 p.

Elder, Don. R. 1998 (unpublished). Cumulative watershed effects from three models applied to 249 seventh-field watersheds on the westside of the Klamath National Forest. USDA Forest Service, Klamath National Forest, Yreka, CA.

Forman, R.T.T. 2000. Estimate of area affected ecologically by road system in the United States. Conservation Biology 14:31-35

Forman, R.T.T.; Hersperger, A.M. 1996. Road ecology and road density in different landscapes, with international planning and mitigation solutions. Pages 1-23 in: Evink, G; Garrett, P.; Berry, J. eds. In: Proceedings: Transportation and wildlife: reducing wildlife mortality and improving wildlife passageways across transportation corridors, Florida Department of Transportation/Federal Highway Administration transportation-related wildlife mortality seminar, April 3-May 2, 1996, Orlando, Fl. [place of publication unknown: publisher unknown].

Fortin, C.; Cantin,M. 1994. The effect of trapping on newly exploited American marten population. Pages 179-191 in: Buskirk, S.W.; Harestad, A.S. ; Raphael, M. G.;

Powell, R.A., eds. Martens, sables, and fishers: biology and conservation. Ithaca, NY. Cornell University Press.

Greenberg, C.H.; Crownover, S.H.; Gordon, D.R. 1997. Roadside soils: a corridor for invasion of xeric scrub by nonindigenous plants. Natural Areas Journal 17(2):99-109

Hann, W.J.; Jones, J.L.; Karl, M.G.; Hessburg, P.F.; Keane, R.E.; Long, D.G.; Menakis, J.P.; McNicoll, C.H.; Leonard, S.G.; Gravenmier, R.A.; Smith, G.G. 1997. Landscape dynamics of the basin. Vol. II in: Quigley, T.M.; Arbelbide, S.J. eds. An assessment of the ecosystem components in the interior Columbia basin. Gen. Tech. Rep. PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
Herger-Feinstein Quincy Library Group Forest Recovery Act. Final Environmental Impact Statement.

Hill, J.D.; Smith, J.D. 1984. Bats: A natural history. Austin, TX: University of Texas Press. 243p.

Hodgman, T.P.; Harrison, D.J.; Katnik, D.D.; Elowe, K.D. 1994. Survival in an intensively trapped marten population in Maine. Journal of Wildlife Management 58(4): 593-600.

Hornocker, M. G.; Hash, H.S. 1981. Ecology of the wolverine in northwestern Montana. Canadian Journal of Zoology 59(7):1286-1301.

Jones, J.L. 1991. Habitat use of fisher in north-central Idaho. M.S. Thesis. Moscow: University of Idaho. 147p.

Lonsdale, W.M.; Lane, A.M. 1994. Tourist vehicles as vectors of weed seeds in Kakudu National Park, northern Australia. Biological Conservation 69(3):277-283.

Lyon, L.J. 1983. Road density models describing habitat effectiveness for elk. Journal of Forestry 81:592-595.

Mader, H.J. 1984. Animal isolation by roads and agricultural fields. Biological Conservation 29:81-96.

Marcot, B.: Wisdom, M.J.; Li, H.W.; Castillo, G.C. 1994. Managing for featured, threatened, endangered, and sensitive species and unique habitats for ecosystem sustainability. Gen. Tech. Rep. PNW-GTR-329. Portland OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 39p.

Nagorsen, D.W.; Brigham, R.M. 1993. Bats of British Columbia. Vancouver, BC: UBC Press. 164 p.

Parker,G.R.; Maxwell, J.W.; Morton,L.D. 1983. The ecology of lynx *(Lynx canadensis)* on Cape Breton Island. Canadian Journal of Zoology 61: 770-786.

Reid, L.M.; Siemer, R.R.; Furniss, M.J. 1997 (unpublished). What do we need to know about roads? Manuscript at:
http;//www.rsl.psw.fs.fed.us/projects/water.4roads.htm

Rowland,M.M.; Wisdom M.J.; Johnson, B.K.; Kie, J.K. (In press). Elk distribution and modeling in relation to roads. Journal of Wildlife Management.

Ruediger, B. 1996. The relationship between rare carnivores and highways. Pages 24-38 in: Evink, G.; Garret, P.; Berry, J., eds. Transportation and wildlife: reducing wildlife mortality and improving wildlife passageways across transportation corridors. Proceedings of a symposium. Orlando, FL. Department of Transportation, Federal Highway Administration.

Terra-Burns, M.; Call, P.; Harris, C. 1997. Canada lynx in Idaho: past, present, and future. Boise, ID: Idaho Department of Fish and Game.

Thompson, I.D. 1994. Marten populations in uncut and logged boreal forests in Ontario. Journal of Wildlife Management 58(2): 272-280.

Tuttle, M.D. 1988. America's neighborhood bats. Austin TX: University of Texas Press. 96 p.

USDA, USDI. 2000. National fire plan: managing the impacts of wildfires on communities and the environment, A Report to the President in Response to the Wildfires of 2000. Washington, DC.

USDA. 2000. Forest roads: a synthesis of scientific information. Washington DC. 117 p.

USDA. 2000. A Cohesive Strategy

USDA September 1997. Ecological Subregions of California. Section and Subsection Descriptions. United States Department of Agriculture. Pacific Southwest Region. R5-EM-TP-005.

Vestjens, W.J.M. 1973. Wildlife mortality on a road in New South Wales. Emu 73: 107-112.

Wisdom,M.J.; Holthausen, R.S.; Wales, B.K. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia Basin: Broad-scale trends and management implications. Gen. Tech. Rep. PNW-GTR-485. Portland, OR: USDA Forest Service, Pacific Northwest Research Station.

Witmer, G.W.; Martin, S.K.; Sayler, R.D. 1998. Forest carnivore conservation and management in the interior Columbia Basin: issues and environmental correlates. Gen. Tech. Rep. PNW-GTR--420. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51p.

GLOSSARY

Arterial Road: Primary travel route that provide service to a large land area, usually connecting with public highways or other Forest Service arterial roads.

Community Capacity: The community's ability to sustain itself over time based primarily on the economic health and quality of social interactions and institutions.

Collector Road: Road that serves small land areas and usually connects with Forest Service arterials or public highways. They collect traffic from local roads and terminal facilities.

Deferred Maintenance: Work that can be deferred without loss of road serviceability until such time as the work can be economically or efficiently performed.

Demographics: The statistical data of a population, especially those showing average age, income, and education, etc.

Forest Roads: As defined in Title 23, Section 101 of the United States Code (23 U.S.C. 101), any road wholly or partially within, or 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.

Forest Transportation Facility: A classified road, designated trail, designated airfield, including bridges, culverts, parking lots, log transfer facilities, safety devices, and other transportation network appurtenances, under Forest Service jurisdiction that is wholly or partially within or adjacent to National Forest System lands.

Local Road: Single purpose road, connecting terminal facilities to collectors or arterials.

Maintenance Levels. The level of service provided by a specific road and the maintenance required for that road, consistent with road management objectives and maintenance criteria.

Maintenance Level 5: Roads that provide a high degree of user comfort and convenience. Normally are double lane, paved facilities, or aggregate surface with dust abatement. This is the highest standard of maintenance.

Maintenance Level 4: Roads that provide a moderate degree of user comfort and convenience at moderate speeds. Most are double lane, and aggregate surfaced. Some may be single lane. Some may be dust abated.

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. Some intermittent use may be authorized. When closed, they must be physically closed with barricades, berms, gates, or other closure devices. Closures must exceed one year. When open, it may be maintained at any other level. When closed to vehicular traffic, they may be suitable and used for nonmotorized uses, with custodial maintenance.

Objective Maintenance Level: 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.

Operational Maintenance Level: The maintenance level currently assigned to a road considering today's needs, road condition, budget constraints, and environmental concerns. It defines the level to which the road is currently being maintained.

National Forest System Road: A classified forest road under the jurisdiction of the Forest Service. The term "National Forest System Roads" is synonymous with the term "forest development roads" as used in 23 U.S.C. 205.

New Road Construction*: Activity that results in the addition of forest classified or temporary road miles (36 CFR 212.1).

Passive Use Value: This term includes the following two categories:
Existence Values: Things people appreciate without actually using them or even intending to use them.
Bequest Values: Things people want to remain available for others, such as their descendents, to use and appreciate.

Public Roads: Any road or street under the jurisdiction of and maintained by a public authority and open to public travel (23 USC 101(a)).

Private Road: A road under private ownership authorized by an easement to a private party, or a road that provides access pursuant to a reserved or private right

Public Lands Highways, Forest Highways A coordinated Federal Lands Highway Program includes Forest Highways, Public Lands Highways, Park Roads, Parkways, and Indian Reservation Roads. These are roads under the jurisdiction of and maintained by a public road authority or the Forest Service and open to public travel (23 USC 101).

Road*: A motor vehicle travelway over 50 inches wide, unless classified and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

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).

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 managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1). The regulations at 36 CFR 223.37 require revegetation within 10 years.

Road Decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state (35 CFR212.1)(FSM 7703).

Road Maintenance: The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective.

Road Management Objective (RMO) The purpose, use, operational, and maintenance level of road based on resource management objectives and access and travel management objectives.

Road Reconstruction: Activity that results in improvement or realignment of an existing classified road as defined below:

Road Improvement*: Activity that results in an increase of an existing road's traffic service level, expansion of capacity, or a change in its original design function.

Road Realignment*: Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway (36 CFR 212.1).

Roads Subject to the Highway Safety Act: National Forest System roads that are open to use by the public for standard passenger cars. This includes roads with access restricted on a seasonal basis and roads closed during extreme weather conditions or for emergencies, but which are otherwise open for general public use.

Minimum Road System: The road system necessary to meet resource and other management objectives adopted in forest plans, to meet applicable statutory and regulatory requirements, and, to the extent practicable, to minimize the adverse environmental impacts associated with road construction, reconstruction, decommissioning and maintenance. When identifying the minimum road system, responsible officials also must consider and be responsive to expected long-term road funding.