Rio Grande National Forest

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Roads Analysis Report

Rio Grande National Forest

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Table of Contents

APPENDICES

MAPS

Executive Summary

Introduction

This report documents the information and analysis procedure used for the Rio Grande National Forest (RGNF) roads analysis. This analysis is designed to provide decision-makers with critical information to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, are in balance with available funding for needed management actions, and meet the objectives of the Forest Plan. This analysis and report is not a decision document. All road-related decisions must go thorough an additional NEPA process with public involvement.

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.

1. Setting up the analysis
2. Describing the situation
3. Identifying the issues
4. Assessing benefits, problems and risks
5. Describing opportunities and setting priorities
6. Reporting—Chapters 1-5 of this report

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 issues and analysis questions; the answers can help managers make choices about road system management.

Key Parts of this Report

There are several key parts to this report. These include the tables and maps displaying inventoried road and resource information and locations and a description of how those roads are to be managed. This information will be used to inform future project specific road management decisions. There are also lists of opportunities to address road related issue, issues developed from the public and internally to be considered during road analysis, and the findings of this analysis.

Tables

Tables in the report display information for the inventoried road system and road affected resources by watershed including value and risk matrix categories identifying the potential minimum road system. In sub-forest scale analysis, specific road management decisions will be made using this information.

Maps

This report also includes the following maps:

- Map 1 – Inventoried Road System - A map displaying the existing inventoried level 1 through 5 road system, with the road numbers.
- Map 2 – Forest Plan Management-Areas – A map displaying the Forest Plan Management-Areas which provide the “zoning” for the Forest related to roads.

- Map 3 – Watersheds – A map displaying 6th-level watersheds on the RGNF with concern summary ratings.
- Map 4 – Soils – A map displaying roads and soil information including soil hazards and ratings.
- Maps 5, 6, and 7 – Wildlife – Wildlife maps which show critical habitats for deer, elk, lynx, and Rio Grande cutthroat trout.
- Map 8 – Lands - A map showing roads, land ownership, rights of way, and lands without permanent access.
- Map 9 – Recreational Opportunity Spectrum – A map showing the Recreation Opportunity Spectrum (ROS) on the Forest
- Map 10 – Suitable Timber and Range Allotments – A map showing the inventoried roads along with areas on the Forest classified as Suitable Timber and the current range allotments.
- Map 11 – Fire/Fuels – A map displaying the inventoried roads with fuels and fire risk information.
- Map 12 – Road Segments within Mapped Backcountry/Roadless Areas – A map displaying the road segments falling within mapped Backcountry Management-Areas or roadless areas which will need mapping corrections in the Forest Plan.

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Opportunities for addressing road management issues and priorities

Chapter 5 of this report contains opportunities and suggestions for addressing road management issues and priorities related to construction, reconstruction, and decommissioning which should be considered in sub-forest scale analysis.

Major social and environmental issues, concerns, and opportunities to be addressed in project level decisions.

Many issues and concerns were identified during this analysis which should be addressed at the project level. The major ones include:

- Environmental issues including concerns about the health and condition of some watersheds as a result of road impacts, effects of roads on wildlife, silvicultural concerns about the current and future health of the forest, and road access for fuel reduction projects and fire suppression, especially in the urban interface areas.
- There is an increasing demand for year-round access to private inholdings which can have environmental and social effects.
- Social issues include recreational opportunities on roads, public access to forest resources, unclassified road use and development, trespass from private property, safety, and wilderness encroachment.
- Some counties and members of the public have expressed a concern about road-related decisions being made without public involvement. All road-related decisions must go through the NEPA process which includes public involvement.
- There are opportunities to work with counties and other agencies in road management. There are varying opportunities for the counties and other agencies to work with the Forest in developing Road Maintenance Agreements for shared road maintenance and eligibility of county roads for federally funded road improvements.

Roads Analysis Report

The product of this analysis is a report for line officers that documents the information and analyses used to identify opportunities and set priorities for future National Forest road systems. The key products of this roads analysis to be used in sub-forest or project scale analyses include:

- A watershed rating assessment for all of the 6th-level watersheds on the forest including a map.
- A terrestrial and riparian wildlife assessment.
- A map that displays the existing inventoried road system with its management categories on the Forest.
- A road risk versus value matrix that identifies four categories of roads evaluated on a road-by road basis.
- A road risk versus value graph based on the road matrix.
- A narrative response to the standard questions in Chapter 4 of FS-643, as well as a supplemental scenery question (Region 2).
- Each of the issues outlined with opportunities for addressing the issue
- An appendix that includes the public comments on this report.

Sub-forest or Project Scale Analyses

This forest scale analysis provides the framework for future sub-forest site-specific analyses. During sub-forest scale roads analysis, the team should first review this report including the watershed and wildlife assessments and maps. This review will provide the forest-wide context; and it will help determine how roads may be affecting watershed health and wildlife habitat in the analysis area and help guide road-related decisions.

During project road analysis, all classified and unclassified roads within the analysis area should be mapped and inventoried. The inventoried road system map will help identify the roads system, but additional GPS field work and inventory updates may be necessary.

Individual road information and the road value versus risk matrix should then be reviewed, validated and updated based on the site-specific analysis. Changes to the risk and values of these roads may result in changes to the road graph (see below). The results of these road valuations can be used to develop road management alternatives for these roads, including relocation, upgrades, increasing or decreasing the maintenance levels, and possible decommissioning.

During Step 4 of a sub-forest or project scale analysis, the appropriate questions in Chapter 4 should be reviewed and additional site-specific information included, as needed. For example, at the sub-forest scale, the economic questions can better assess road-related costs and benefits. The road risk versus value matrix provides annual and deferred maintenance costs by individual road to help assess road-related costs for economic analyses.

All road-related decisions from sub-forest scale roads analyses are to be documented in Road Management Objectives (RMO) and INFRA and GIS databases updated.

Please see Chapter 5 for a more detailed explanation of guidelines and use of the roads analysis results.

Key findings

In general, the existing inventoried road system is adequate for existing and future management needs. Although some additional road construction or reconstruction may be needed to provide access for Forest Plan implementation, the system provides the access needed for resource management and recreation use on the majority of the RGNF.

Approximately half of the road system is considered high value and low risk, about 17 % of the road system has high value and high risk; and only a small portion of the backbone road system (750 miles) was found to be low value. This suggests that the RGNF has developed a road system to meet most of the access needs, although there are opportunities to reduce the resource impacts or annual and deferred maintenance costs.

Key findings related to specific issues addressed in this roads analysis are listed in the following table.

Issues, Opportunities, and Guidelines

The forest scale issues are identified in Chapter 3 in this analysis and then integrated with opportunities and guidelines to address them in Chapter 5. The following table summarizes the issues and opportunities to address them.

Table 1. Issues and a summary of opportunities/guidelines including the Chapter 4 resource questions which address the issue.

Issue	Opportunity/Guideline	Chapter 4 Resource Questions
1. Some roads may not be under the appropriate jurisdiction, and the right-of-way atlas may not reflect current jurisdiction.	Clarify current jurisdiction and update road atlas to reflect current jurisdictions, ROWs and INFRA. Once jurisdiction is clarified, identify roads where jurisdiction seems inappropriate. Work with counties etc. to transfer jurisdiction as needed; i.e., roads that access subdivisions. Require jurisdiction verification as part of sub-forest scale RAPs. Consider RS2477 developments.	GT3, SI5, CH1-3
2. Road maintenance funding is not adequate to maintain roads and signs to standard.	Prioritize funding to address critical health, safety, and resource needs Reduce annual maintenance costs by correcting deferred maintenance work items. Re-evaluate road maintenance levels to balance costs and benefits. Consider reducing maintenance level, where possible, to help reduce costs.	GT4, Chapter 2, EC1-3
3. Road access may not be adequate for future management needs.	Identify specific areas where road access is inadequate for resource management needs.	GT2, EF3-4, PT1, TM2-3
4. Rights-of-way across private land may not be adequate to access the forest as ownership and land uses change. Historic access across some of these lands could be closed off to the public. While this is not a change in legal status, it gives the appearance of shutting off large tracts of public land.	Identify right-of-way acquisition opportunities during all sub-forest scale RAPs. Communicate with county planning commissions regarding updated subdivision requests and land-use changes. Update the right-of-way atlas to help clarify legal access vs. historic use.	SU1, RR1, GT3, GT2

Issue	Opportunity/Guideline	Chapter 4 Resource Questions
5. There are increased demands for access across the Forest to private inholdings which may affect the road system and resources.	When issuing special use permits for road use, take into account effects to the road integrity, resources (wildlife etc), and changes in use patterns. There may also be additional safety concerns. Develop conditions for access such as allowing access only to the permittee to reduce wildlife impacts, Include private property access as part of sub-forest scale RAPs.	WU1, GT2, GT3, SU1, SI1, AQ1-2, AQ4, TW1-4, UR/RR3, SI4-5
6. There are potentially adverse environmental impacts from the current road system and its use. Roads causing adverse impacts should be prioritized for evaluation at the project scale.	Use the table which identifies watersheds with the highest concerns for affecting resources to prioritize sub-forest scale analyses. Consider road closure, relocation, reconstruction, maintenance, or enforcement to reduce adverse impacts.	AQ 1-6, AQ8-12, AQ14, GT3, TW1-4, SI3
7. Higher road densities have greater potential to adversely affect resources and encourage illegal use.	Prioritize sub-forest scale analyses to focus on watersheds with the greatest concerns to wildlife and watershed. Develop a process for inventorying and managing both classified and unclassified roads.	AU2, GT4, AQ1-2, AQ4, AQ6, AQ9-10, AQ12, AQ14, TW1-4
8. Ineffective closures and illegal use may have adverse affects on resources.	When designing roads, consider future access needs and design the roads so that they can be effectively closed as needed. Consider the most appropriate closure method to meet objectives on a site-specific basis. Develop and implement enforcement plans. Coordinate Forest and Travel Plan Maps to better show boundaries of RNA, Wilderness, and Backcountry Areas to facilitate big game retrieval policies.	AU2, GT4, RR1-2, TW1-4
9. Management of the road system may be affecting big-game movement during hunting seasons.	Develop road and travel management strategies to reduce motorized use affecting big game movement during hunting seasons. Consider strategies such as temporary closures based on season or time of day.	TW2-3

Issue	Opportunity/Guideline	Chapter 4 Resource Questions
10. Both off-highway vehicles (OHVs) and highway vehicles are used on the same roads and occasionally at the same time, which can be a safety problem.	Clarify which roads are open to OHVs depending on state, county, and Forest Service regulations. Work with the State and Counties on traffic use. Address safety and traffic compatibility concerns on roads open to OHVs. Consider strategies such as signing and roadside clearing to improve sight distance. Develop and implement enforcement strategies.	GT4, WU1, AU2, RR1, SI5
11. Roads may be promoting illegal motorized use into Backcountry and Wilderness areas.	Continue an education plan including signing at trailheads and community involvement. Develop and implement an enforcement plan. Assess the effectiveness of closures and redesign as necessary. Improve posting of RNA, Wilderness, and Backcountry Area boundaries. Increase law enforcement, especially during hunting season	GT3, AU2, UR/RR5, UR/RR7
12. Road management objectives (RMOs) are not current and need to be updated.	Continue to review and update RMOs (with line officer signatures) for any project affecting roads.	GT3-4, AU2
13. Roads are important to fulfill public recreational needs.	Consider the public needs when conducting project analysis. This includes consideration of the spectrum of recreational use, the opportunity for loops, and the requirements for special events.	UR1/RR1
14. Roads are an important factor in the compatibility of recreational experiences.	Consider the compatibility of recreational experiences during project analysis. These include uses such as ATV and snowmobiles, hunters and snowmobilers, and different types of uses on snow-groomed roads.	UR1/RR1, RR1/RR3
15. Road management may not be compatible between different agencies with road jurisdictions such as the Forest Service, BLM, Park Service, the State and counties.	Assess the compatibility of Forest Service road management with the road management by adjacent agencies.	SI 1,2,5
16. Management of unclassified roads.	Develop a strategy to inventory, manage, and monitor unclassified roads and use.	AQ 1-6, AQ 8-12, AQ 14, GT 3, TW 1-4, SI 13.

Issue	Opportunity/Guideline	Chapter 4 Resource Questions
17. OHV use on trails	Continue to monitor and assess OHV use on trails and adjust the travel plan as needed. Provide enforcement.	GT 4, WU 1, AU 2, RR 1, SI 5, WU 1

Recommendations

Chapter 5 identifies opportunities and guidelines for each issue, as well as for overall management of the road system. In reviewing the issues and opportunities in Chapter 5, there are some recurring themes. The following highlights some of these recurring themes and opportunities to address them.

- Current road funding is not adequate to maintain the existing road system. The Forest has identified some opportunities to reduce annual and deferred maintenance costs but needs to explore additional opportunities.
- Developing and maintaining an effective education program would address several illegal use issues. The education program should include signing at strategic locations, as well as community oriented programs.
- Use an integrated interdisciplinary approach to roads analysis. Include the appropriate resources specialists. An integrated approach will reduce the impacts to resources, help maintain a current database, and ensure that all opportunities are considered.
- Reference this Forest roads analysis but identify specific issues and opportunities when conducting sub-forest scale analyses to provide for a more comprehensive approach to travel management planning. Use the appropriate scale when doing sub-forest roads analysis.
- Several of the databases pertaining to roads need to be updated (i.e., RMOs, jurisdiction, and right-of-way atlas). A formal process to update and maintain these databases would provide better information for sub-forest scale analyses.
- Changes in land uses for private lands adjacent to the Forest and private land inholdings are affecting legal and illegal access to the forest. This changing use can affect many resources including recreation use, wildlife security, and watersheds. Access objectives should be reviewed and updated to reflect the changing uses of the road system.

Chapter 1 The Roads Analysis Process

Background

In August 1999, the Washington Office of the USDA Forest Service published Miscellaneous Report FS-643 *Roads Analysis: Informing Decisions about Managing the National Forest Transportation System*. The objective of roads analysis is to provide decision-makers with critical information to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions.

In October 1999, the agency published Interim Directive 7710-99-1 authorizing units to use, as appropriate, the road analysis procedure embodied in FS-643 to help land managers make major road management decisions. The Rocky Mountain Region of the Forest Service then published a roads analysis guidance document as a supplement to Appendix 1 of FS-643. This document provides guidance concerning the appropriate scale for addressing the roads analysis.

On March 3, 2000, the Forest Service proposed revising 36 CFR Part 212 to shift emphasis from transportation development to managing administrative and public access within the capability of the lands. The proposal was to shift the focus of National Forest System road management from development and construction of new roads to maintaining and restoring needed roads and decommissioning unneeded roads within the context of maintaining, managing, and restoring healthy ecosystems.

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. Consistent with changes in public demands and uses of National Forest System resources and the need to better manage funds available for road construction, reconstruction, maintenance, and decommissioning, the final rule removes the emphasis on transportation development and adds a requirement for science-based transportation analysis. The final rule is intended to help ensure that additions to the National Forest System road network are those deemed essential for resource management and use; that construction, reconstruction, and maintenance of roads minimize adverse environmental impacts; and that unneeded roads are decommissioned and restoration of ecological processes are initiated.

Objectives of the Forest Roads Analysis

Level and Type of Decision-making the Analysis Will Inform

This forest scale roads analysis puts the road system into the context of forest resource management on the Rio Grande National Forest (RGNF). In addition, this roads analysis will be used to support sub-forest scale and project level analyses. This analysis will:

- Include the effects of road management proposals on environmental and social issues.
- Evaluate transportation rights-of-way acquisition needs.
- Integrate with other non-Forest Service transportation systems (e.g., state and county roads).

- Explore the transportation investments necessary to implement the Rio Grande Forest Plan and meet resource management goals and objectives.
- Assess the current and projected funding levels available to support road construction, reconstruction, maintenance, and decommissioning.

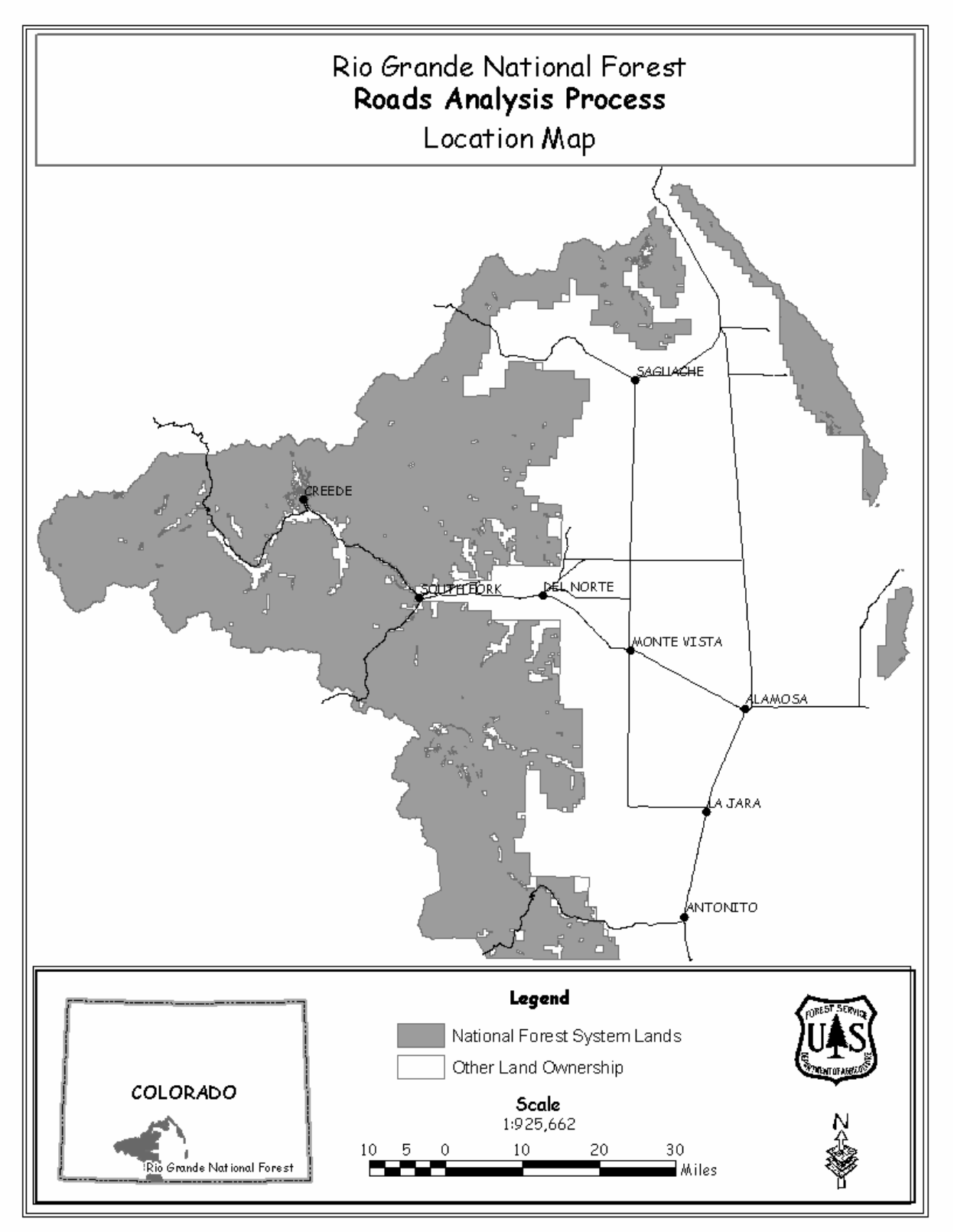
The analysis is intended to identify and prioritize opportunities that address resource concerns and/or road maintenance.

Scale/Analysis Area

The analysis is:

- Conducted at the forest scale for the Rio Grande National Forest (approximately 1.852 million acres) in south central Colorado, Region 2 of the National Forest System (see Figure 1).
- Considers all inventoried roads.
- Uses 6th level watersheds.
- Is spatial or Geographic Information System (GIS)-based whenever possible.
- Is based upon existing available information.

Figure 1. General location map of the Rio Grande National Forest.



Process

This roads analysis used a six-step process. The steps are designed to be sequential, with the understanding the process may require feedback and iteration among steps over time as an analysis matures. 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 issues and analysis questions for which the answers can help managers make choices about road system management. The following six steps guided the process.

Step 1. Setting up the analysis

Step 2. Describing the situation

Step 3. Identifying the issues

Step 4. Assessing benefits, problems and risks

Step 6. Reporting—Roads Analysis Report

Products

The product of this analysis is a report for decision-makers and the public that documents the information and analyses used to identify concerns and opportunities for the management of the Rio Grande National Forest road system. The report includes discussion, tables, and maps of the inventoried road system for the Forest, and risks and opportunities for each road and watershed.

Key parts of this report will include:

- An inventory and map of all inventoried roads and a description of how those roads are to be managed.
- Guidelines for addressing road management issues and priorities related to construction, reconstruction, maintenance, and decommissioning.
- Significant social and environmental issues, concerns, and opportunities to be addressed in project level decisions.
- Documentation of the input from the public and other governmental agencies and jurisdictions.

Documentation

This report documents the information and analysis procedure used for the RGNF roads analysis. The report contains tables of road information for each 6^{th} - level watershed on the Forest. It also contains tables with recreation values, resource values, watershed assessments, wildlife assessments, and road costs. It also includes maps of the inventoried road system, the Forest Plan Management Areas, watershed and soils, wildlife and fish habitat, land ownership, Recreation Opportunity Spectrum (ROS), Suitable Timber and Range allotments, fire/fuels, and roadless mapping errors. The report provides management guidelines and opportunities for future actions that may impact the Forest roads system.

Analysis Plan

The main analysis process considers all 2414 miles of inventoried roads under Forest Service jurisdiction in the Rio Grande National Forest roads database. A two-step, integrated approach that considers issues, data, and information was used to systematically address all roads in a single analysis.

Step 1 considers the following:

- Issues
- Road location.
- Annual and deferred maintenance costs
- Recreation use values.
- Resource management values.
- Wildlife risk.
- Watershed and Threatened, Endangered, and Sensitive (TES) and aquatic species risk

The items listed above are evaluated and assigned a low (1), medium (2), or high rating (3) for each inventoried road. Recreation use and resource management are considered values of the road system. Watershed, wildlife, and maintenance costs are considered risks of the road system.

In Step 2, the value and risk ratings are each grouped into a single low, medium, or high rating. This results in each road having a set of descriptive coordinates that indicated their value and risk (e.g., high value, low risk). The descriptive coordinates are used to identify how the road system will be managed. The descriptive coordinates for each road are plotted on a graph; the four quadrants on the graph represent the following categories:

- Category 1 – High Value, Low Risk
- Category 2 – High Value, High Risk
- Category 3 – Low Value, High Risk
- Category 4 – Low Value, Low Risk

The results of this exercise are listed in the Road Management Category column in Appendix C – Road Matrix Table. High and low values and high and low risks are easy to plot into their associated quadrants. Medium values and medium risks are collected along an x-axis or y-axis and defaulted into the adjacent quadrant so that effectively no medium categories are possible in the final allocation (see Road Risk-Value Graph in Chapter 5 for final results).

Once the roads are assigned to one of the four categories, recommendations for future actions are based on those four categories. This simplifies the final product and makes it possible to map the potential minimum road system.

Resource-specific analyses provide the data that appears in the Road Matrix Appendix C (e.g., watershed risk, recreation use value) and the information to answer the resource questions in Chapter 4 – Assessing Benefits, Problems, and Risks.

Information Used

The following information sources were considered in the analysis:

- *Rio Grande National Forest Revised Land and Resource Management Plan,* as amended.
- *Rio Grande National Forest Trail Allocations, Motorized and Non-Motorized.*
- Roadless area inventory for the 1996 Rio Grande Forest Plan revision and Backcountry Management-Areas
- *An Assessment of the Range of Natural Variability* (Forest Plan Revision FEIS Appendix A)
- Economic assessment for 1996 Rio Grande Forest Plan revision
- Social assessments for the 1996 Rio Grande Forest Plan revision.
- Annual and deferred maintenance costs in INFRA.
- INFRA travel routes.

- *Timber Suitability Amendment to the Forest Plan 2000.*

The following Geographic Information System (GIS) data was used:

- Roads (all inventoried roads maintenance levels 1-5).
- 6th-level watersheds.
- Streams and riparian areas.
- Geological hazards.
- Soil map units.
- Forest Plan Management - Area prescriptions.
- Recreation Opportunity Spectrum (Forest Plan desired condition).
- Developed recreation sites.
- Land status - ALP
- Occurrence of TES aquatic species.
- Forest Plan Research Natural Area and Special Interest Areas
- Colorado Natural Heritage database.
- Insect and disease risk.
- Fire management units.

Public Involvement

A base of knowledge about public issues already exists and was used to identify concerns and opportunities. Numerous public scoping efforts related to road and travel management have preceded this analysis. Public input into the revision of the Forest Plan and subsequent amendments, along with comments received since the Forest Plan revision on specific roads were considered in defining issues and opportunities.

The public was notified of this analysis in the fall quarterly SOPA. A notice of the availability of this report and a request for comments will be mailed to the SOPA mailing list and published in a public notice in *The Valley Courier*. This report will also be posted on the Rio Grande National Forest website. Public comments will be posted in Appendix H of the report. This Roads Analysis is considered a living document and will continue to be revised as needed. It is a part of the RGNF public road atlas. This Roads Analysis is not a NEPA analysis with an action proposal resulting in a decision. Future road actions with road-specific decisions will require additional public scoping and involvement.

The Forest Service road system connects to or has jurisdictional overlap with many other governments and agencies. This report will be made available to tribal governments, local county governments including the County Commissioners and County Road and Bridge Superintendents, the Park Service, Bureau of Land Management, and the US Fish and Wildlife Service. Many of these governments and agencies have mutual shared opportunities and issues.

Interdisciplinary Team Members

This analysis and report was prepared in an interdisciplinary process with the following Core and Extended Interdisciplinary Team members. A special note of thanks is given to Ann Marie Verde and the Routt National Forest Roads Analysis Team for their support in preparing this report.

The Core Interdisciplinary Team:

Bob Dalrymple	Team Leader	Supervisor's Office
Elaina Graham	GIS Specialist	Supervisor's Office
Stanley Mattingly	Forest Engineer	Supervisor's Office
Phil Reinholtz	Hydrology	Supervisor's Office

Extended Interdisciplinary Team members:

Christie Achenbach	Public Affairs	Supervisor's Office
Kelly Clum-Ortiz	Landscape Architect	Supervisor's Office
Theodore Floyd	Fire Management	Supervisor's Office
Gary Frink	Transportation Planner	Supervisor's Office
Diann Gese	Minerals	Supervisor's Office
Dale Gomez	Wildlife	Divide District
Antonio Lucero	District Representative	Conejos Peak District
Art Marcilla	District Representative	Divide District
John Murphy	Timber	Supervisor's Office
Pat Prentice	Lands	Supervisor's Office
John Rawinski	Soil Scientist	Supervisor's Office
Gary Snell	Range	Supervisor's Office
Vincent Spero	Archeologist	Supervisor's Office
Greg Thompson	Recreation	Supervisor's Office
John Trujillo	District Representative	Saguache District
Barry Wiley	Fisheries Biologist	Supervisor's Office

Chapter 2 Describing the situation

The Analysis Area

Understanding the Rio Grande National Forest

The following is a brief description of the Rio Grande National Forest. A more complete description can be found in the FEIS and Revised Land and Resource Management Plan, as amended.

Physical Environment

The Rio Grande National Forest (RGNF) occupies a unique setting in south-central Colorado. The Forest surrounds and forms the backdrop for the San Luis Valley, one of the largest mountain basins in the world. The RGNF consists of about 1,852,000 acres of National Forest System land which makes up 13% of the National Forest System lands in Colorado. The RGNF abuts the Continental Divide and the headwaters of the Rio Grande River originate in the Forest. Elevations range from about 7,800 feet in the foothills to more than 13,000 feet in the San Juan Mountains, along the Continental Divide. A few peaks in the Sangre de Cristo range exceed 14,000 feet.

The Forest has diverse topography consisting of river valleys, rolling foothills, and dramatic mountain ranges. Precipitation amounts and patterns vary greatly due to the topographic differences. The lower elevations of the Forest are quite arid while the higher elevations can receive a great deal of snowfall.

Biological Environment

Common vegetation types on the RGNF, generally from lowest to highest elevations, include sagebrush, grass, oakbrush, Pinyon-juniper, Douglas-fir, ponderosa pine, aspen, lodgepole pine, spruce/fir, and alpine tundra.

The Forest has suffered a long term drought over the past several years and is currently experiencing widespread insect epidemics in several of the different forest zones. The Forest has also recently experienced a large scale fire associated with the urban interface.

The RGNF has habitat for almost 300 species of mammals, birds, reptiles, amphibians, and fish. Threatened or Endangered animal species suspected or known to occur on the Forest include bald eagle, Mexican spotted owl, Canada lynx, southwestern willow flycatcher, and the Uncompahgre fritillary butterfly.

Social and Economic Environment

People are an important part of the Forest ecosystem. People's needs, uses, and attitudes affect all forest resources. People and communities are tied to the Forest in many ways. Forest management is of concern to people living in communities near the Forest, as well as those using the Forest. Proximity to forest resources, such as scenery, wildlife, and clean water, is what makes many communities adjacent to the Forest desirable places to visit and live.

Counties containing lands covered by the RGNF include Hinsdale, San Juan, Archuleta, Alamosa, Conejos, Mineral, Rio Grande, and Saguache. These counties are generally characterized by their low population

densities, high unemployment, and low per capita income. While there are no Forest lands in Custer and Costilla counties, people there rely on the Forest for recreation and forest products.

For the past several decades, the local economies have been changing from a long-term dependence on agriculture, including timber processing and mining to a higher degree of dependence on recreation and tourism.

Under the current Forest Plan, approximately 51% of the RGNF falls in non-development Management-Area prescriptions. Recreation is the predominate use of these areas. The other 49% of the Forest falls in development Management-Area prescriptions which allow some degree of development.

Recreation

Outdoor recreation is a primary resource on the Forest and tourism is a main source of income for the area. Scenery is a major attraction on the RGNF. The Forest has two designated Scenic Byways, the Silverthread and Los Caminos Antiquos, along with an abundance of roads and trails. In addition, there are approximately 70 outfitter and guide tour services that give people the opportunity to experience the Forest.

There are also a number of historical scenic areas, including the Bachelor Loop, near Creede; the Bonanza Loop, near Villa Grove; and the Cumbres and Toltec Scenic Railroad, near Antonito. Tucked within the foothills are many unique rock formations like the Natural Arch and Summer Coon Volcanic Areas. There are several canyons of rounded rock formations such as Penitente, Witches, Sidewinder, and the Rock Garden canyons, known worldwide by avid rockclimbers, which lie on adjacent BLM lands.

The Forest offers a wide variety of recreation opportunities, with an emphasis on dispersed recreation. There are about 393,076 acres of designated Wilderness and additional 530,722 inventoried roadless acres. There are over 1280 miles of trails, most of which are available to hikers, horseback riders, and mountain bikers. Over 65 % of the 2414 miles of inventoried roads are open to motorized public use. There are 36 developed campgrounds and 85 trailheads. The Wolf Creek ski area is located on the Forest at the top of Wolf Creek Pass. Other major recreational activities include hunting, ATV use, and snowmobiling.

Developed recreation includes all recreation activities that take place on a developed recreation site. Managed capacity is estimated at 6,750 people-at-one-time. Demand is expected to remain within the capacity over the next 10 years.

Locatable Minerals

Locatable minerals are those valuable deposits subject to exploration and development under the Mining Law of 1872 and its amendments. Approximately 30% of the Forest can be classified as having high-to-moderate potential for locatable minerals. Past locatable mineral production was concentrated in the mining districts of Platoro, Carson, Jasper, Spar City, Summitville, Creede, and Bonanza. Of the major mining districts in the Forest, none are active today, except for reclamation efforts at Summitville, Creede, and Bonanza.

Leasable Minerals

There is a high potential for the occurrence of leasable minerals, such as oil and gas, on about 46% of the Forest. Leasing interest has been high in the past, as much as 600,000 acres have been leased. However, only five exploratory wells were drilled. All wells have been plugged and abandoned.

Forest Health

Populations of some insects and diseases across the Forest are currently higher than previously known levels. Much of the Forest landscape contains late-successional single-species stands that are susceptible to insect and disease attack. The recent drought and mild winter temperatures have stressed trees and allowed insect populations and disease infestations to increase above endemic levels in all forest cover types on the RGNF.

The most common pests are Ips beetle, mountain pine beetle, spruce beetle, Douglas-fir beetle, spruce budworm and dwarf mistletoe.

Timber Production

Timber harvest is an important component of forest management. The Forest Plan projects a Total Sale Program Quantity (TSPQ) of 6,299 MCCF/year or 22.8 MMBF/year at the full budget level. TSPQ at the experienced budget level is projected at 2,713 MCCF/year or 11 MMBF/year. TSPQ is comprised of hardwood and softwood sawtimber, fuelwood, posts and poles, salvage, and house logs. The sawtimber Allowable Sale Quantitiy (ASQ) is 5,180 MCCF/year or 21MMBF/year at the full budget level and 7,713 MCCF/year or 11 MMBF/year at the experienced budget level.

However, actual timber production off of the RGNF has been much lower than these quantities. The current forest insect epidemics and recent catastrophic fires may result in an increased salvaged timber supply.

Livestock Grazing

Permits are required for livestock grazing on the Forest. There are about 582,000 acres of land considered suitable for livestock grazing on the RGNF, with a capacity of about 102,000 head months.

Special Forest Products

The gathering or collection of special forest products, such as herbs, mushrooms, rocks, small trees and shrubs, floral products, etc. are permitted on a case-by-case basis.

The National Forest Transportation System

General Description

The transportation system on the Rio Grande 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 gas pipeline and power transmission projects. 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.

There are currently 2414 miles of inventoried, classified[1] National Forest System (NFS) roads on the Rio Grande National Forest transportation inventory. The three Ranger Districts, Conejos Peak, Divide, and Saguache, share management of the road system. The Colorado counties of Conejos, Rio Grande, Alamosa, Saguache, Mineral, San Juan and Hinsdale have roads that are within or provide access to the National Forest.

Thirty-two percent (771 miles) of the NFS roads are managed and maintained for public use with low-clearance vehicles (passenger cars). 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 levels (also referred to as maintenance levels) used by the Forest Service to determine the work needed to preserve the investment in the road. These maintenance levels are described in *FSH 7709.58 – Transportation System Maintenance Handbook*. Levels 3, 4, and 5 provide access for passenger car traffic and make up the backbone of the Forest transportation system. Table 1 summarizes the miles of Maintenance Level 3 through 5 roads under Forest Service jurisdiction.

[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.

Table 1 Miles of inventoried maintenance level 3, 4, and 5 roads (USFS jurisdiction) by Ranger District (miles).

Maintenance Level	Conejos Peak	Divide	Saguache	Forest Total
3	187.8	432.0	132.5	752.3
4	0	2.4	0	2.4
5	0	15.8	1.5	17.3
Total	187.8	450	134	772
Percent of Forest	25%	58%	17%	100%

The remaining 1643 miles of inventoried NFS roads are either restricted from motor vehicle traffic use (maintenance level 1) or 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.

The definition of jurisdiction has been subject to different interpretations over the years, which has led to some inconsistent entries in the INFRA database. "Jurisdiction is the legal right to control or regulate use of a transportation facility derived from fee title, an easement, an agreement, or other similar method. While jurisdiction requires authority, it does not necessarily reflect ownership" (FSM 7705). This analysis will focus primarily on roads under Forest Service jurisdiction. Roads under other jurisdictions will be included where they are needed to show the connection to the National Forest System Roads (NFSR).

Unclassified[2] roads on National Forest System lands are identified in the field during project analysis. The majority of these roads have been user-created by off-road vehicle traffic. The RGNF does not have an accurate inventory of unclassified roads. They are generally identified during project level analyses.

Meeting Forest Plan Objectives

The national objectives for the transportation system (FSM 7702) are incorporated into the Forest Plan by reference. These objectives are:

1. To provide sustainable access in a fiscally responsible manner to National Forest System lands for administration, protection, and utilization of these lands and resources consistent with forest plan guidance.
2. To manage a Forest transportation system within the environmental capabilities and restrictions of the land.

[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 road or trail, and those roads that were once under permit or other authorization and were not decommissioned upon termination of the authorization).

3. To manage Forest transportation system facilities to provide user safety, convenience, and efficiency of operations in an environmentally responsible manner and to achieve road related ecosystem restoration within the limits of current and likely funding levels.

The Forest Plan monitoring questions related to roads:

- Are outputs of goods and services being produced at a rate consistent with the projections in the Supplemental Table S-2 of the FEIS (report annually, evaluate every five years)?
- Are the costs of implementing programs occurring as predicted in the Supplemental Table S-3 of the FEIS (evaluate every five years)?

The Supplemental Table S-2 has the following outputs to monitor: road maintenance, road construction, road reconstruction, and road decommissioning. Table 2 is a summary of the miles projected in the FEIS and the actual accomplishments.

Table 2. FEIS projected road miles (experienced budget level) and actual accomplishments (1998-2002).

Activity	Projected Miles in 1997 FEIS at Experienced Level	Actual Accomplishments (average from 1998-2002)
Roads maintained (about 1/3 or 500 miles are maintained on a 3-yr cycle including roads maintained through Schedule A agreements)	942 miles/year	690 miles/year
Road construction	1.3 miles/year	0 miles/year
Road Reconstruction	3.8 miles/year	3.9 miles/year
Road decommissioning	10 miles/year	5.0 miles/year

Source: Forest Monitoring and Evaluation Report (note: "roads maintained" does not include deferred maintenance needs).

The majority of the planned new construction consists of local roads which would be closed after use. Arterial and collectors are the roads 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. Local roads distribute traffic from arterials and collectors to end destinations on the Forest. Little new construction within the arterial and collector system is anticipated.

Projected road construction and reconstruction have not been met for the first five-year period of the plan. Declining timber sales and reduced capital investment programs are the primary reasons for not meeting Forest Plan expectations.

A review of the existing road maintenance levels by functional class is shown in Table 3. Periodic updating of the Road Management Objectives (RMOs) to reflect the current and objective use of the road can help prioritize road maintenance funding.

Table 3. Inventoried maintenance levels of Forest arterial and collector roads (miles).

Maintenance Level	Arterial	Collector	Local	Totals
1	0	10	560	570
2	14	338	720	1072
3	217	415	120	752
4	0	1	1	2
5	12	4	2	18
Total Miles	243	768	1403	2414

Source: Infra database

Federally Designated Forest Highways and Scenic Byways

The analysis area contains five Forest Highways designated under the Public Lands Highways program of the Transportation Equity Act for the 21st Century (TEA21). These routes are state, county, or Forest Service-owned roads qualifying for federal funding for improvement or enhancement. They provide access to and within the National Forest. Colorado State Highways 149 and 17 are also designated State Scenic By-ways. These roads are listed in the Table 19. 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.

Budget

The RGNF budget allocation for planning, construction, and maintenance of roads has been averaging $725,000 per year from 2000 to 2003. However, the annual cost to maintain the entire road system to standard is considerably higher than the amount allocated by Congress. 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 2002, the Forest conducted road condition surveys to determine the actual cost of maintaining the road system to standard. Work items were also recorded to determine the cost of road maintenance deferred in previous years due to lack of funding. Finally, road improvement work necessary to bring the roads up to the desired maintenance level was identified and documented. Analysis of the data collected showed that the Forest is substantially under-funded for the size of the road system it manages (see Table 4).

Table 4. Summary of estimated funding needs for road maintenance and operations.

Maintenance Level	Total Miles	Annual Maintenance		Deferred Maintenance		Capitol Improvements	
		$/mile	Total $	$/mile	Total $	$/mile	Total $
1	566,3	1035.65	586,489	3457.09	1,957,699	--	--
2	1075.7	1137.92	1,224,061	40028.86	43,059,195	--	--
3	752.3	4154.70	3,125,581	117,560.54	88,455,840	--	156,200
4	2.4	5009.56	12,023	100,469.00	241,126	--	--
5	17.3	5638.34	97,543	36,972.00	639,616	--	--
Total	2414	2090.18	5,045,697	55,565.00	134,353,000	--	156,200

Source: Forest INFRA Condition Surveys as of September 2003. Average $/mile determined using only those roads for which costs have been entered into INFRA. There are many miles of maintenance level 1 and 2 roads for which cost information is not available in INFRA. Total maintenance $ column calculated by multiplying total miles by average $/mile. Capital improvements costs are difficult to obtain due to the fact that very little data for roads on the Forest has been entered into INFRA.

The experienced budget level from the Forest plan for annual maintenance is projected at $1,442,000 per year using $2090/mile. The desired condition budget level was projected as $1,969,000 per year using the $2090/mile. Historic budget for the road program in the last five years has roughly been about $600 - $700k. Due in large part to this funding shortfall, there is a need to identify and prioritize the potential minimum road system necessary for access to and management of the National Forest.

Rio Grande, Mineral, Hinsdale, Saguache and Conejos counties and the State of Colorado have signed agreements to perform portions of certain maintenance functions on Forest Service roads. The work performed by the counties contributes to the annual road maintenance accomplishments for the Forest. The counties are funded to perform this work through State of Colorado allocations of the Highway User Gas Tax receipts. Table 5 displays the current mileage of roads under the jurisdiction of the Forest Service being maintained by county organizations.

Table 5. Miles of road on the Rio Grande National Forest roads (maintenance level 3-5) being maintained in part by counties (or covered by agreements with counties).

County	Miles Maintained		
	Maintenance Level 3	Maintenance Level 4	Maintenance Level 5
Conejos	145.2	0	0
Hinsdale	44.7	47	0
Mineral	129.3	2.4	0
Rio Grande	169.7	0	3.2
Saguache	140.3	0	0
State of Colorado	12.2	0	0

Chapter 3 Issues

Identifying Issues

The IDT developed the following list of preliminary forest-wide issues from public involvement in the Forest Plan revision and subsequent projects. Many issues were considered. Most are site-specific and are listed in the concerns and opportunities section to be considered at the project roads analysis scale.

Evaluation of the standard resource questions in Chapter 4 identifies the effect each issue has on different resources and the opportunities or guidelines to address these issues. Chapter 5 discusses the issues in detail and provides opportunities to address the issue. Issues raised by public comment to this report will be included in Appendix H.

Issues carried forward in this Forest roads analysis

1. Some roads may not be under the appropriate jurisdiction, and the right-of-way atlas may not reflect current jurisdiction.
2. Road maintenance funding is not adequate to maintain roads and signs to standard.
3. Road access may not be adequate for future management needs.
4. Rights-of-way across private land may not be adequate to access the forest as ownership and land uses change.
5. There are increased demands for year-round access across the Forest to private inholdings, which can affect the road system, resources, and winter use patterns.
6. There are potentially adverse environmental impacts from the current road system. Roads causing adverse impacts should be prioritized for evaluation at the project scale.
7. Higher road densities have greater potential to adversely affect resources and encourage illegal use.
    a. Higher road densities, including unclassified road density, have higher potential for adversely affecting resources. High road densities, especially when roads are open to motorized vehicles, may be fragmenting habitat for some species, degrading the quality of big game hunting, creating conflict between non-motorized and motorized users, and affecting watershed health.
    b. Higher road densities may promote illegal use of existing unclassified roads, which may increase road densities by the creation of new unclassified roads and additional illegal use.
8. Ineffective closures can result in illegal use (see issue above), which can then have adverse effects on resources.
9. Use of the road system may be affecting big-game movement during hunting seasons.
10. Small all-terrain vehicles (ATVs) and highway vehicles use the same roads, occasionally at the same time. This can be a safety problem.
    a. Roads that transition from one jurisdiction to another have inconsistent regulations governing the use of ATVs. This creates confusion for the public users and for law enforcement personnel.

11. The location of some roads may be promoting illegal motorized use into wilderness areas.
12. Road management objectives (RMOs) are not current and need to be updated.
13. Roads are important to fulfill public recreational needs.
14. Roads are an important factor in the compatibility of recreational experiences.
15. Road management may not be compatible between different agencies with road jurisdictions such as the Forest Service, BLM, Park Service, the State and counties.
16. Management of unclassified roads.
17. ATV use on trails

Issues to consider during project roads analysis.

Some issues were identified but were not carried forward as forest-wide issues. These are summarized below with reasons for not being carried forward. These issues should be considered during project analysis when applicable.

1. Connections from USFS to other state and federal lands are not adequate.

   Disposition: In general, road connections are adequate between USFS and other state and federal lands across the Forest. There may be opportunities to improve trail connections between USFS and other state and federal lands on a site specific basis, but road connections generally appear to be adequate.

2. Private landowners adjacent to, or within, National Forest System lands are assuming exclusive access to the Forest. This may promote illegal use from private lands.

   Disposition: This is a site specific enforcement issue regarding illegal use and access rather than an issue directly associated with the road system. The other aspects of this issue are covered under number four above.

3. The standard of roads newly constructed for single-entry silvicultural purposes and managed as restricted use, may be too high.

   Disposition: Roads should be built only to the standard necessary to meet access needs while protecting resources. This is inherent in good transportation planning and is not a forest-wide issue.

4. There is inadequate parking for winter use.

   Disposition: This issue does not specifically pertain to the road system, although it is associated with it. The issue is covered in part under number six (above) as inadequate parking can result in resource concerns. This issue should be considered during sub-forest scale analyses. There may be opportunities to utilize existing roads to accommodate additional parking needs.

5. Members of the public often do not understand why permittees etc. are allowed to use restricted roads for maintenance purposes etc., while the general public is not.

   Disposition: This is a public perception issue. USFS manual and handbook direction define when and for what purposes exceptions are made. The Forest Plan and road management decisions outline authorized purposes for administrative access.

6. The policy for the use of restricted roads for administrative purposes is not consistent across the Forest.

   Disposition: Using restricted roads for administrative purposes depends on the site-specific reasons for the road restrictions. The road management objectives should include pertinent information and consistent documentation; Issue Number 12 above partially addresses this.

Chapter 4 Assessing benefits, problems, and risks

Introduction

This section is presented in a Question/Answer format following the guidelines in the 2002 version of the R-2 Roads Analysis Supplement to FSM-643 which provides direction and suggestions for different scale analysis for each question. The IDT followed the overall guidance, but answered most of the questions at the forest scale to provide background information for each question for referencing and citing purposes during future project scale roads analyses. This should help expedite and support the project level planning.

Current Road System Benefits, Problems, and Risks

Aquatic, Riparian Zone, and Water Quality (AQ)

Analysis of the aquatic questions in this forest scale roads analysis focused on identifying watersheds where there is a high risk of watershed function and/or aquatic species being affected by the road system. This will help prioritize those watersheds on which to focus project analyses. All inventoried roads were considered (maintenance levels 1-5). Looking at all of the inventoried roads allowed a broad scale assessment of the risk to watershed function associated with the entire road system rather than just the arterials and collectors. The broad forest scale analysis provides the basic framework for watershed or project level analyses. Project scale analyses will identify site-specific areas being affected by the road system and opportunities to address these concerns.

Map analysis was used to determine which roads are at the highest risk of affecting watershed function and aquatic habitat. These roads are identified in the Appendix C road matrix.

AQ 1: How and where does the road system modify the surface and subsurface hydrology of the area?

The hydrology of the Rio Grande National Forest is snowmelt dominated. Effects to the surface and subsurface hydrology occur mostly during spring runoff and major thunderstorm events during the summer monsoon season. Both the physical components of the road system and management of the road system affect the surface and subsurface hydrology.

Roads expand the channel network, convert subsurface flow to surface flow, and reduce infiltration on the road surface. All of these factors affect the overall hydrology in a watershed, particularly the quantity and timing of flow.

The channel network is expanded by road ditches, which create stream channels in previously undisturbed portions of the hillside. Road ditches also intercept subsurface flow and convert it to surface flow. An expanded channel network augments peak flows since water traveling as concentrated surface flow reaches the channel faster than water traveling as subsurface flow (Wemple et al. 1996). Reduced infiltration contributes to additional surface runoff since water does not infiltrate for storage in the soil profile, but rather runs off as overland or surface flow. Storage and movement of water through the soil profile as subsurface

flow regulates and sustains baseflows. When roads disrupt these processes, more water becomes available during peak flows, and less water is available to sustain baseflows.

While the effects of roads on the hydrology of an area depend largely on local factors, road density is an indicator of the road system's relative potential for modifying surface and subsurface hydrology; the higher the road density, the greater the potential for the road system to affect the hydrology. Road density was calculated for each 6th-level watershed, and watersheds were classified as having high, medium, or low potential for hydrological effects based on relative road densities (see Appendix A -2 – Watershed Road Data). Road density was calculated for all roads and for Level 1-2 roads within the watersheds.

Level 3-5 roads generally receive regular maintenance and are assumed to not significantly affect aquatic resources. Level 1-2 roads receive less maintenance and generally less use. As a result, these roads have a higher potential of inadequate or improperly maintained drainage, and problem areas may go unnoticed. Many level 1-2 roads were built between 1950 and1970 and did not incorporate all the current watershed conservation practices. For this reason, it was assumed that the level 1-2 roads have the greatest potential for affecting aquatic resources; this assumption is consistent with field reconnaissance. The aquatic specialist report identifies the range of values that represent the low, moderate, and high ratings for road densities as well as other parameters used in questions AQ 1 to 4, AQ 6, and AQ 9.

Table A-3 in Appendix A summarizes the ratings by major river basin for each factor. The first number indicates the number of watersheds with a high, moderate, and low rating for that category, and the second number indicates percent of the 6th-level watersheds in that river basin with that rating; the last row summarizes the entire Rio Grande National Forest.

The following is a list of opportunities/recommendations for roads that significantly modify the surface and subsurface hydrology:

- Design roads to minimize interception, concentration, and diversion potential.
- Design measures to reintroduce intercepted water back into slow subsurface pathways.
- Use outsloping and drainage structures to disconnect road ditches from stream channels rather than delivering water in road ditches directly to stream channels.
- Evaluate and eliminate diversion potential at stream crossings.

The unrestricted use of roads during wet weather and winter can result in rutting and churning of the road surface. Runoff from such damaged road surfaces carries a high sediment load. The damage and maintenance cycle for roads that are frequently used in winter can create a disturbed road surface that is a continuing source of sediment. Snowplowing can affect spring runoff processes by developing berms on the edges of the road prism which trap and concentrate water on the road surface rather than allowing water to flow across the road prism. This further reduces dispersed flow of water down the hillside and increases the concentrated surface flow that reaches the channel faster than subsurface flow.

The following are opportunities for minimizing the effects of winter snowplowing on hydrological processes:

- Consider surfacing measures such as rocking, armoring, or paving to protect the integrity of the road surface.
- Construct and maintain breaks in snow berms created by snowplowing to allow water to drain off the road.
- Consider soil type and slope steepness when spacing breaks in the snow berm; do not locate snow berm breaks on steep areas or in areas with erosive soils.
- Do not locate snow berm breaks at relief culvert locations, as this will add to water already being concentrated by the road surface and road ditches.

- Mark culvert locations prior to snowfall, and then keep culverts and ditches functional during and after plowing operations.

Issues addressed: 5, 6, and 7

AQ 2: How and where does the road system generate surface erosion?

Surface erosion is highly dependent on soils, road surfacing, road grade, age of the road, traffic volumes, and the effectiveness and spacing of drainage structures. The greatest surface erosion problems occur in highly erodible terrain, particularly landscapes containing shales, sandy soils or fine-textured volcanic materials. Studies have found that sediment delivery to stream systems is highest in the initial years after road construction, although raw ditchlines and road surfaces with little binder can remain chronic sources of sediment.

Drainage structure, function, and spacing are key design elements to minimize the amount of surface flow, which directly affects surface erosion. The Water Conservation Practices Handbook (FSH 2509.25) provides guidelines for spacing drainage structures. Drainage structure spacing is specified in the WCP by soil particle size classes. Spacing should be close together on silt-sand soils with little to no binder on steep slopes, but can be further apart on gravel road surfaces with moderate binder and little to no fines on flat or minimum grades.

The soil types on the RGNF have been mapped, characterized and digitized. Most of the soils have been approved through the correlation process. In the approved soil map units, there is a soil erosion hazard rating that was estimated using the K Factor, which is the inherent erodibility of the soil and a slope factor. The map unit rating is given in terms of High, Moderate, and Low Potential Erosion Hazards. When roads are constructed through these soil materials, they become exposed to erosive elements, and can affect the road surface, the frequency of maintenance, and the degree of soil erosion through and past drainage structures and into channel systems.

To evaluate surface erosion potential, the percent of each watershed with soils having High Erosion Hazard ratings were considered (see Appendix B – Sensitive Soil Assessment, Acres of Soils with Hi Erosion Hazard). This information is presented by 6th level watersheds. The soil erosion and mass movement hazard was analyzed using the administrative boundary of the RGNF, which included small areas of isolated private lands.

Sensitive soils are defined by the Inland West Watershed Assessment criteria for watershed vulnerability. Watershed vulnerability is based on both high mass movement and high erosion hazards soils. The criteria are presented in Table 6.

Table 6. Watershed Risk Rating Criteria.

Sensitive Soil by Watershed Risk Rating	Criteria
Low	A minor part (<20%) of the watershed has sensitive soils (defined as high erosion potential and/or high mass movement potential).
Moderate	A moderate part (20-50%) of the watershed has sensitive soils
High	A major part (>50%) of the watershed has sensitive soils

Appendix B also shows where high erosion potential soils intersect with existing road segments. The resulting road lengths (in miles) are presented. In general, watersheds may have a range of 0.00 miles up to 38.57miles of roads in sensitive soils. The criteria for the risk of road miles in sensitive soils areas follows: 0-5 miles=Low; 5-10 miles=Moderate and >10 Miles=High. Table 7 below summarizes the number of watershed by each risk class.

Table 7. Number of Watersheds in Risk Classes for Sensitive Soils

Risk Class of Road Miles in Sensitive Soils	**Number of 6th Watersheds in this Class**
Low	135
Moderate	26
High	24

Sensitive soils are also analyzed for each road segment. If the summary of a road length has more than 50% in sensitive soils, it is assigned a rating of High risk. Moderate risk is 20 to 50% of the road has sensitive soils; Low is <20% has sensitive soils.

The primary opportunities to reduce surface erosion identified in a subforest scale roads analysis include:

- Increasing the number and effectiveness of drainage structures according to the WCP Handbook or Forest-developed spacing guides.
- Improving the road surface by gravelling roads at stream crossings.
- Closing and restoration techniques on roads identified by site-specific analysis for closure.
- Snowplowing can further increase the potential for surface erosion by concentrating dispersed flow on the road surface as described under AQ 1. Opportunities to reduce the effects of snowplowing on surface erosion are similar to those described under AQ1 with the following additions:
- Require equipment used to plow snow to have shoes or runners, which keep the blade a minimum of two inches above the road surface.
- Allow use of the road only during dry or frozen conditions to minimize rutting.

Issues addressed: 5, 6, and 7

AQ 3: How and where does the road system affect mass wasting?

Road-related mass wasting results from 1) improper placement and construction of road fills and stream crossings, 2) inadequate culvert sizes to accommodate peak flows, sediment loads, and woody debris, 3) roads located on soils prone to mass wasting, and 4) water diversion onto unstable hillslopes. Mass wasting may also occur due to natural events that can impact roads adversely.

The RGNF has soil types which are subject to mass movement. The soils are mapped into soil map units which include a Mass Movement Potential Rating of High, Moderate, Low or Very Low. The ratings are based on the degree of mass movement indicators in a given soil type, such as hummocky topography, scarps, tension cracks in soils, known unstable formations, jack-strawed trees, and pistol-butted trees, which indicate soil creep.

Mass movement can affect roads or be affected by roads. Natural occurring mass movement can block roads, interrupt the drainage pattern, and increase erosion and sedimentation from a given landform. Roads can exacerbate slope instability, causing large blocks of landslide materials to move. The effects on soil and water resources are similar, whether mass movement is triggered by roads or occurs due to natural events.

Table 8 shows the number of 6th - level watersheds within road mile categories in high mass movement potential areas on the RGNF. This analysis evaluates mass movement hazard rating of high with the road network by 6th level watershed. If more than 50% of the existing roads occur on soils with high mass movement potential, then the likelihood of mass movement impacts from roads is increased and this potential rating is high. If 25 to 49 percent of the roads are on high mass movement potential, the rating is moderate. If less than 25% of the road network is on high mass movement potential, then the risk is considered low.

Table 8. Watersheds containing Road Miles in High Mass Movement Potential Areas.

Road Miles in High Soil Mass Movement Potential Areas	**Number of 6th Level Watersheds**
No miles	80
Less than 1 mile	80
1-3 Miles	17
More than 3.0 Miles	8

Project scale analyses provide the opportunity to identify site-specific areas having mass movement concerns. The forest-scale analysis helps identify watersheds where additional road construction may cause mass wasting. It also identifies watersheds where maintenance costs can be expected to be higher due to unstable soils. Opportunities to address existing roads in areas with mass wasting potential include:

- Identifies watersheds where roads may contribute to soil and water impacts
- Road relocation to an area with more stable soils.
- Relocation of drainage structures so that the outlets are on less sensitive areas which may include flatter slopes and locations with better-drained soils.
- Expect higher road maintenance costs on unstable soils

Issue addressed: 6

AQ 4: How and where do road-stream crossings influence local stream channels and water quality?

Road-stream crossings have the potential to directly and indirectly affect local stream channels and water quality. Poorly designed crossings directly affect hydrologic function when they constrict the channel, are misaligned relative to the natural stream channel, or when improperly sized culverts are installed. Road-stream crossings also act as connected disturbed areas where water and sediment are delivered directly to the stream channel. Connected disturbed areas are defined as "high runoff areas like roads … that discharge surface runoff into a stream or lake … connected disturbed areas are the main source of damage in all regions" (FSH 2509.25-99-2).

The density of road-stream crossings in each 6th - level watershed was used to determine those watersheds where road-stream crossings pose the highest risk to local stream channels and water quality. The results are summarized in Appendix A-2. Watersheds were determined to have a high, medium, or low priority for further evaluation through project scale roads analyses (see Appendix A-1).

Opportunities to improve concern areas include:

- Design crossings to pass all potential products including sediment and woody debris, not just water.
- Realign crossings that are not consistent with the channel pattern.
- Change the type of crossing to better fit the situation; for example, consider bridges or hardened crossings on streams with floodplains, and consider bottomless arch culverts in place of round pipe culverts.
- Add cross-drains near road-stream crossings to reduce the connected disturbed area.
- Reduce the number of road-stream crossings to minimize the potential for adverse effects.

On roads where snowplowing occurs, plowing snow directly into the stream channel at road-stream crossings could result in the development of ice-dams. These ice-dams reduce channel capacity and the ability to convey water. This can result in culvert failure and/or cause channel migration as water is forced out of the channel and around the ice-dam. Channel migration can result in the development of a braided channel since areas outside the channel may not be resistant to the erosive forces of water.

Opportunities to address road-stream crossings where snowplowing occurs include:

- Mark all culverts prior to snowfall. Ensure that the culverts are open and functioning throughout the winter and at the beginning of spring snowmelt.
- Remove all snow fills and restore the natural stream crossing on any low-water crossing prior to spring snowmelt to prevent the development of ice-dams.

Issues addressed: 5, 6, and 7

AQ 5: How and where does the road system create potential for pollutants, such as chemical spills, oils, deicing salts, or herbicides, to enter surface waters?

The potential for pollutants to reach stream channels occurs wherever roads run adjacent to, or cross, streams or floodplains. Mechanisms for pollutant transport to a stream system include direct input into surface water (usually from spills) or runoff from snowmelt or rainfall. Most of the level 3-5 roads are in proximity to a waterway at some point. The location may only be at a bridge crossing, or perhaps the road parallels the channel for some distance.

Forest-administered roads at greatest risk for accidental spills are those used for management activities such as timber harvesting, oil and gas development, and snowmobiling. Log haulers and other heavy equipment associated with harvest and road activities carry sufficient fuel and oil to cause localized water quality problems should an accident occur. This is minimized by stipulations in timber sale contracts that specify haul speeds, fueling practices, weather or road moisture limitations, and other aspects of the operations. Forest road maintenance crews are also trained to utilize safe areas and procedures for refueling heavy equipment. The potential risk of accidental spills lessens as use of the road decreases.

Due to commercial traffic, chemical and oil spills have the greatest chance of occurrence along U.S. Highway 160. The stream system at the greatest risk is the South Fork Rio Grande and its tributaries.

Spills related to snowmobiles, ATVs, and motorcycles most often occur during refueling, frequently at trailheads. The greatest risk on the Rio Grande National Forest are on FSR 345 near Gerrard Gulch, FSR 390 (Pass Creek), FSR 410 (Big Meadows Reservoir road), FSR 118 (Truijillo Meadows Road), FSR 513 (Rio Hondo Reservoir Road), and CR 14 (Pinos Creek), where refueling of recreational snowmobiles occurs.

Magnesium chloride (MgCl) application as a de-icing agent on highways or dust abatement agent on dirt roads occurs within the RGNF administrative boundary. During the winter, magnesium chloride (MgCl) is applied regularly as a de-icing agent on US 160 over Wolf Creek Pass. When de-icing salts are used, the frequency of applications is generally higher, and the chemicals do not bind with the soils (or pavement in the

case of de-icing). For these reasons, the use of these salts for de-icing purposes has a higher potential for affecting water quality than use of salts for dust abatement.

Concerns regarding the application of magnesium chloride include reduced water quality and aquatic biota impacts from chlorides and trace metals. According to an evaluation of de-icers (Fischel 2001), chloride de-icers have a relatively low toxicity to fish and aquatic invertebrates. However, this report also recommends further evaluation of acute toxicity concentrations of de-icers on fish and invertebrates.

A recent study on I-70 in near the Eisenhower Tunnel in Colorado found that the use of magnesium chloride for de-icing is highly unlikely to cause adverse effects to water quality or aquatic organisms at distances greater than 20 yards from the highway (CDOT 1999). A similar study along I-70 on the west side of Vail pass found a substantial increase in chloride concentrations below the highway where deicing salts were used relative to control streams, but the concentrations were still within state water quality standards (Lorch 1998).

While no specific information was gathered to compare the application rates and frequency of de-icing on US 160 as compared to I-70, it is a reasonable assumption that both frequency and application rates are equal or higher on I-70 and that the results from the I-70 study should be applicable to the RGNF. Highways on which de-icing salts are used would have the highest risk of affecting water quality, but these effects are generally localized, do not exceed water quality standards, and become diluted as the salts move downstream through the system. The location and use on US 160 poses a high risk of magnesium chloride reaching those stream systems it crosses because the material acts as a film over the asphalt surface and is easily washed into the drainages during snowmelt or rain.

The Forest through agreements with Hinsdale and Mineral Counties annually applies magnesium chloride as dust abatement on National Forest Roads 520, 515, 516, 410, 550, and 523. Magnesium chloride is also applied on main roads during timber sales where dust and/or road maintenance is a problem; the applications harden an unsurfaced road thereby reducing the need for maintenance.

The application of magnesium or calcium chloride for road dust abatement may affect water quality, but past studies have found that the effects can only be detected after many years of repeated, year-round application (Heffner 1997). Unlike its use as a de-icer on paved roads, magnesium chloride as a dust abatement measure is less likely to be transported by runoff into a stream channel or body of water because it adheres to the road surface. During application, however, spillage into surface waters adjacent to a road can occur. Typically, magnesium or calcium chloride is only applied 1-2 times per year on roads requiring it (generally, maintenance level 4 and higher roads). This factor should be considered when upgrading the maintenance level to 4 or higher. This may be a concern in areas where aquatic threatened, endangered, and sensitive species are present. For road upgrades that would attract more traffic and possibly require dust abatement or road hardening, the Forest should consider the cumulative and potential water quality impacts of materials such as magnesium chloride.

Roads create the potential for the spread of noxious weeds. As such, control of noxious weeds along roads located near streams and water bodies presents a risk of the herbicide reaching surface water. Risks are minimized if herbicide is applied properly according to strict federal and State standards.

Issue addressed: 6

AQ 6: How and where is the road system "hydrologically connected" to the stream system? How do the connections affect water quality and quantity?

To answer this question, hydrologic connectivity was evaluated and assigned a rating for each watershed and for each road segment.

Watershed Ratings: The road system is hydrologically connected to the stream system through an extended channel network (see AQ 1) and where there are connected disturbed areas (see AQ 2 and 4). This includes

road-stream crossings, as well as areas where roads are adjacent to stream courses and there is an insufficient buffer strip between the road or road drainage structures and the stream system. As discussed in AQ 1, the extended channel network can increase peak flows. As discussed in AQ 4 and 5, water quality can be degraded where connected disturbed areas increase sediment and/or pollutant delivery to the stream system. Connected disturbed areas on sensitive soils (high surface erosion potential, highly erodible soils, high or moderate mass movement potential) are the most likely to deliver sediment to the stream system. The ratios of road miles within 200 feet of a stream per square mile of watershed area were used as an indicator of the potential for hydrologic connectivity. A value rating was assigned based on this potential:

- High value – watershed rating falling into the upper 25 percentile of calculated values
- Moderate value – watershed ratings within the 50 -75 percentile of calculated values
- Low value – watershed rating with less than the 50 percentile of calculated values

Road ratings: The road matrix identifies the potential risk of all roads for being connected to the hydrologic system and affecting watershed health and aquatic species. Individual roads were rated in three categories: 1) percentage of their total length within 200 feet of a stream; 2) number of road crossings/mile; and 3) percentage of their length within sensitive soils. For each category, a value was assigned as follows:

- High value: A substantial portion of the road segment (50% or greater) is within 200 feet of a stream so that it is hydrologically connected, road crossings/mile are 4 or greater, or 50% or more of the road lies within sensitive soils.
- Medium value: 20-50% of the road segment is within 200 feet of the stream system, road crossings/mile are greater than or equal to 2 but less than 4, 20-50% of the road lies within sensitive soils.
- Low value: Less than 20% of the road segment is within 200 feet of the stream system, road crossings/mile are less than 2, less than 20% of the road lies within sensitive soils

Values were assigned to each category and a total derived. Roads were assigned a low to high rating based on these totals: 1-3 (Low rating), 4-6 (Moderate rating), 7-9 (High rating).

All the factors identified in AQ 1-4, and AQ 9 were used to develop an overall watershed rating (see Appendix A-1). The overall rating represents the potential for hydrologically connected areas which can affect both water quality and water quantity.

A second overall watershed rating was developed for watersheds with Rio Grande cutthroat trout (RGCT), a TES species. These watersheds were considered more sensitive to the effects of roads. Table 9 identifies the number of 6^{th}-level watersheds by major river basin with a high rating of the road system affecting overall watershed function. This includes the one watershed which was upgraded from moderate to high due to the presence of RGCT.

Table 9. Sixth-level watersheds by major river basin with overall high ratings.

River Basin	Total number of 6th-level watersheds	6th level watersheds with overall high ratings		6th level watersheds with overall high ratings when considering RGCT presence	
		#	%	#	%
Alamosa	24	4	17	5	21
Conejos	23	6	26	6	26
Rio Chama	4	1	25	1	25
Saguache	41	22	54	22	54
San Luis	17	1	6	1	6
Upper Rio Grande	74	19	26	19	26
Upper San Juan	1	0	0	0	0
Upper Gunnison	1	0	0	0	0

Watersheds with high concern ratings would be the priority for subforest scale analysis. Analysis at this smaller scale would identify site-specific problem areas and opportunities for reducing the effects of the road system on water quality and quantity, and aquatic habitat. Table 10 identifies watersheds with a high rating due to physical factors: road density for both level 1-5 roads and level 1-2 roads only, density of road-stream crossings, density of roads within 200 feet of stream channels, and miles of road on sensitive soils. Each factor was rated and given a value: high = 3, moderate = 2, low = 1. Watersheds with ratings greater than 10 were considered to be within the high concern level.

Table 10. Watersheds with high summary ratings based on physical factors.

6th Level HUC	Watershed Name	Watershed Area (sq. mi.)	Total Watershed Rating
Alamosa River			
130100020502	Wightman Fork	15.87	11.00
130100020202	East Fork Pinos	21.50	12.00
130100020304	North Channel on Rio Grande	16.98	12.00
130100020201	Upper Pinos Creek	23.96	15.00
Conejos River			
130100050403	Lower Fox Creek	5.05	11.00
130100050503	Cumbres Creek	4.93	11.00
130100050603	Rito Hondo	16.09	11.00
130100050504	Lower Rio de los Pinos	23.28	12.00
130100050501	Upper Rio de los Pinos	17.84	13.00
130100050502	North Fork Rio de los Pinos	7.64	13.00
Rio Chama			
130201020201	Wolf Creek	7.54	13.00
Saguache Creek			
130100040501	Houselog Creek	28.25	11.00
130100040801	Ford Creek	16.37	11.00
130100040802	Findley Gulch	9.65	11.00
130100040904	Coolbroth Canyon	2.50	11.00

6th Level HUC	Watershed Name	Watershed Area (sq. mi.)	Total Watershed Rating
130100041102	Elephant Rocks	12.09	11.00
130100040401	Upper Sheep Creek	29.73	12.00
130100040402	Antelope Creek	5.45	12.00
130100040601	Upper Jacks Creek	4.71	12.00
130100040803	Poison Gulch to Laughlin Gulch on Saguache	8.58	12.00
130100040102	Horse Creek	17.52	13.00
130100040201	Johns Creek	16.11	13.00
130100040302	Squaw Creek west of Saguache	11.09	13.00
130100040404	Taylor Canyon	6.19	13.00
130100040502	Mill Creek	16.43	13.00
130100040503	Fourmile to Lone Tree on Saguache	9.86	13.00
130100040603	Lower Jacks Creek	2.46	13.00
130100040901	South Fork Carnero Creek	43.99	13.00
130100040202	California Gulch	23.05	14.00
130100040205	Luders Creek	21.97	14.00
130100040301	West Park Creek	12.01	14.00
130100040403	East Pass Creek	12.08	14.00
130100040902	Middle Fork Carnero Creek	17.93	14.00
San Luis Creek			
130100030101	Upper San Luis Creek	10.68	13.00
Upper Rio Grande			
130100010604	Cliff Creek	2.14	11.00
130100010702	Lower Miners Creek	16.59	11.00
130100011201	West Alder Creek	21.42	11.00
130100011309	South Fork	28.82	11.00
130100011404	Lower Embargo Creek	8.90	11.00
130100011506	Wolf Creek	11.18	11.00
130100010305	Road Canyon	32.54	12.00
130100010603	Workman Creek	1.90	12.00
130100010607	Lime Creek	15.29	12.00
130100010612	Dry Gulch/Rio Grande	22.50	12.00
130100011103	Coller Wildlife on Rio Grande	21.97	12.00
130100011501	Bear Creek	14.58	12.00
130100011507	Twin Mountains	4.56	12.00
130100010802	West Willow Creek	19.02	14.00
130100011303	Pass Creek	22.22	14.00
130100011305	Park Creek	41.06	14.00
130100011307	Beaver Creek	51.02	14.00
130100011502	Willow Creek	15.72	14.00
130100011505	Shaw Creek	7.01	15.00

A second overall risk rating was developed for watersheds where Rio Grande native cutthroat trout (RGCT) were present. These watersheds were considered more sensitive to the effects of roads even if the physical factors alone did not place them in the high risk category. Only one watershed was upgraded due to the presence of Rio Grande cutthroat trout. This is displayed in Table 11.

Table 11. Watersheds upgraded to a high summary rating due to the presence of Rio Grande cutthroat trout.

6th Level HUC	Watershed Name	Watershed Area (sq. mi)	Total Rating Without RGCT	Total Rating With RGCT
Alamosa River Drainage				
130100020504	Spring Creek to Terrace on Alamosa	41.79	9.00	12.00

Opportunities to address concern areas identified in project scale analyses are the same as those in AQ 1 to 4. Additional opportunities include relocating roads adjacent to stream channels to a position higher on the hillslope away from streams.

Issues addressed: 6 and 7

AQ 7: What downstream beneficial uses of water exist in the area? What changes in uses and demand are expected over time? How are they affected or put at risk by road-derived pollutants?

Downstream beneficial uses of water in the area are identified by the Colorado Department of Public Health and Environment under Regulation No. 31 (5 CCR 1002-31). They include:

- Recreation (Class 1 – Primary Contact; Class 2 – Secondary Contact).
- Agriculture.
- Aquatic life (Class 1 – Cold Water Aquatic Life; Class 1 – Warm Water Aquatic Life; Class 2 – Cold and Warm Water Aquatic Life).
- Drinking water supply.

Under Colorado's Regulation No. 31, the highest level of water quality protection applies to waters considered "outstanding" state or national resources. No stream segments in the Rio Grande Basin are currently listed since the designation was not available during the last comprehensive review.

An intermediate level of protection applies to waters not designated outstanding or use-protected. These waters fall under the anti-degradation review process and must be maintained and protected at their existing quality, unless the state determines that lower water quality is necessary for important economic or social development. All of the stream segments on the Forest fall under the anti-degradation review process.

Changes in classification and designated uses may occur over time as knowledge of certain water bodies increase or as stakeholders petition the Colorado Water Quality Control Commission. Classifications can be either upgraded or downgraded through this public process with commensurate changes in protected designated uses.

Demands for most water uses are on the rise. With increases in population, public and private lands recreation, agriculture, and industry; controversy over appropriate uses of water will continue to grow.

Several streams and reservoirs within the Rio Grande National Forest are listed as impaired on the Colorado 303(d) list. None of these waterbodies are impaired due to roads; rather they are impaired due to pollutants from historic and recent mining activities. The following Table 12 identifies water segments within the Rio Grande River Basin and parameters that the State Water Quality Division proposes for inclusion on the 2004 303(d) list.

Table 12. Streams and lakes on the Colorado 303(d) list (CDH, 2002) within the Rio Grande Basin.

Watershed Basin	Watershed Segment	Portion	Parameters
CORGAL03a	Alamosa River, Alum Creek to Wightman Fork	All	Al, Pb, Zn
CORGAL03b	Alamosa River, Wightman Fk. to Fern Creek	All	pH, Al, Cu, Zn
CORGAL03c	Alamosa River, Fern Creek to Ranger Creek	All	pH, Al, Cu, Zn
CORGAL03d	Alamosa River, Ranger Creek to Terrace Reservoir	All	pH, Cu, Zn
CORGAL05	Wightman Fork above Summitville	All	pH
CORGAL08	Terrace Reservoir	All	Cu
CORGAL09	Alamosa River, Terrace Reservoir to HWY 15	All	Cu
CORGCB09a	Kerber Creek above Brewery Creek and tributaries, except those in segment 8	All	Ag, Cd, Pb
CORGCB09b	Kerber Creek, Brewery Creek to San Luis Creek	All	Cd, Cu, Zn
CORGRG04	Rio Grande River, Willow Creek to Alamosa County line	Cd Willow Creek to Wagon Wheel Gap, Zn Willow Creek to Del Norte	Cd, Zn
CORGRG07	West Willow Creek from Park Regent Mine to confluence with Rio Grande	Willow Creek from confluence of E and W Willow Creek	pH
CORGRG30	Sanchez Reservoir	All	Hg

Those watersheds with streams on the Colorado 303(d) list and with high road risk ratings should be the priority for evaluating the effects of the road system on watershed function and identifying opportunities to improve water quality through road-related projects.

Issues addressed: 6 and 7

AQ 8: How and where does the road system affect wetlands?

Roads can affect wetlands directly by encroachment and indirectly by altering hydrologic surface and subsurface flow paths. Encroachment results in a loss of wetland area directly proportional to the area disturbed by the road. Alteration of the hydrologic flow paths can affect wetland function with the effects

extending beyond the area directly affected by the road. The Watershed Conservation Practices Handbook (FSH 2509.25) provides measures to protect wetlands.

During project-level analyses, opportunities to reduce the effects of the road system on wetlands include the following:

- Relocate roads out of wetland areas.
- Where relocation is not an option, use measures to restore the hydrology of the wetland. Examples include raised prisms with diffuse drainage such as french drains.
- Set road-stream crossing bottoms at natural levels of wet meadow surfaces.

Issues addressed: 6 and 7

AQ 9: How does the road system alter physical channel dynamics, including isolation of floodplains, constraints on channel migration, and the movement of large wood, fine organic matter, and sediment?

Roads can directly affect physical channel dynamics when they encroach on floodplains or restrict channel migration. Floodplains help dissipate excess energy during high flows and recharge soil moisture and groundwater. Floodplain functions are compromised when roads encroach on, or isolate, floodplains, and this can increase peak flows. When peak flows increase, more water is available for in-channel erosion, which, in turn, affects channel stability. Restricting channel migration can cause channel straightening which increases the stream energy available for channel erosion; this can also result in channel instability. Altering channel pattern affects a stream's ability to transport materials, including wood and sediment.

The miles of road within 200 feet of a stream course were used as an initial indicator of where the road system might be affecting physical channel dynamics. These concerns are greatest on reaches with floodplains where the streams naturally meander, which are typically lower gradient reaches. Table 6 summarizes the number of watersheds with high, moderate, or low risk of the road system affecting channel dynamics. Appendix A-1 lists the rating for each watershed.

Issues addressed: 6 and 7

AQ 10: How and where does the road system restrict the migration and movement of aquatic organisms? What aquatic species are affected and to what degree?

Migration and movement of aquatic organisms are primarily restricted at road-stream crossings with culverts. Generally, the restriction is on upstream migration, although downstream migration can also be affected. This results from hanging culverts, high flow velocities in culverts, and inadequate depths for fish migration. In some locations, migration barriers are desirable to protect native species. While culverts can affect the migration of amphibian species, the greatest concern is the effect on fish species. Many resident fish species migrate upstream and downstream during their life cycle seeking a variety of aquatic habitats, which might include spawning, rearing, or hiding habitat. Although these migrations may be less than a mile, they can be very important for the long-term survival of the species and maintenance of the population.

We evaluated the potential for migration barriers associated with classified roads by identifying those streams that contain Rio Grande cutthroat trout and have high road-stream crossing densities. These watersheds where Rio Grande cutthroat trout are present should be considered high priority for site-specific project analysis. Some populations of nonnative trout species, primarily brook trout, rainbow trout and brown trout, may also be affected by culvert road crossings. A culvert inventory and assessment for fish/amphibian passage should be conducted during the project road analysis.

Opportunities to address road crossings which are restricting movement of aquatic organisms include:

- Reset the culvert to eliminate the limiting factor.
- Replace the culvert with an alternative crossing such as bridge, hardened low-water ford, or bottomless arch culvert.

Roads can also serve as management tools. Currently, the Forest has one population of Rio Grande cutthroat trout protected by a road culvert which is intended to serve as a barrier to prevent the upstream migration of nonnative salmonids.

Issues addressed: 6 and 7

AQ 11: How does the road system affect shading, litterfall, and riparian plant communities?

The road system directly affects riparian communities where it impinges on riparian areas. Roads can indirectly affect riparian communities by intercepting surface and subsurface flows and routing these flows so that riparian areas dry up and the riparian vegetation is replaced with upland vegetation. Riparian communities play a vital role in providing shade. Removal or degradation of these communities can affect stream stability and water temperatures which, in turn, affect aquatic habitat. The Watershed Conservation Practices Handbook (FSH 2509.25) provides measures to protect riparian areas.

Anecdotal information indicates that the interior of culverts can provide local hiding cover for trout, particularly at low flows. Culverts are generally not considered a significant source of hiding cover unless the riparian communities, which typically provide shading and hiding cover, have been significantly degraded.

Opportunities to address concern areas found in watershed or project level analyses include:

- Relocate roads out of riparian areas.
- Restore the hydrology in riparian areas that have been dewatered by the road system.

Issue addressed: 6

AQ 12: How and where does the road system contribute to fishing, poaching, or direct habitat loss for at-risk aquatic species?

High traffic roads adjacent to streams with fish are the most likely to contribute to fishing and poaching. Fishing regulations on the Rio Grande National Forest are established by the Colorado Division of Wildlife. The Division has imposed special regulations for many of the Rio Grande cutthroat trout waters and has placed signs identifying special regulation waters along roads adjacent to Rio Grande cutthroat trout streams. Poaching is not generally considered an issue on the Rio Grande National Forest and does not significantly affect aquatic populations and at-risk aquatic species.

The road system contributes to direct habitat loss where mass movements associated with roads directly impact stream channels (AQ3), where sediment is delivered directly to the stream channel through connected disturbed areas (AQ6), at road-stream crossings (see AQ4), and where the road system is restricting channel migration and isolating floodplains (see AQ9). Areas of particular concern are watersheds with Rio Grande cutthroat trout populations identified as having high-risk potential in AQ3, AQ4, AQ6, and AQ9. Opportunities to address problem areas would be similar to those previously identified.

Roads often create barriers to water flow and root propagation, which can indirectly result in alterations to adjacent plant communities; this has the potential to indirectly affect amphibian habitat. Soil compaction, soil and landform disturbances, and reduced live root systems associated with road construction alter the local hydrology, thus indirectly affecting amphibians and their habitat. Another indirect effect of roads comes from

fragmentation of aquatic populations, which ultimately results in population losses given a prolonged period of isolation.

Issues addressed: 6 and 7

AQ 13: How and where does the road system facilitate the introduction of non-native aquatic species?

The introduction of non-native species occurs primarily through stocking of non-native fish. The Colorado Division of Wildlife coordinates stocking locations with the Forest Service to ensure that non-native aquatic species are not being introduced into waters containing native fish species or waters that provide high quality habitat for native species reintroduction. Roads help facilitate stockings in many streams and reservoirs on the Forest. Primary stocking locations on the Forest include: Beaver Creek Reservoir, Big Meadows Reservoir, Tucker Ponds, Shaw Lake, Road Canyon Reservoir, Love Lake, Rio Grande Reservoir, Continental Reservoir, Trujillo Meadows Reservoir and Platoro Reservoir.

In addition to known stocking areas, introduction of non-native aquatic species could occur at any location where the road system crosses a stream or wet area and sufficient habitat exists to support a species long enough for it to migrate to a more desirable habitat. The road system may also provide a mechanism for other invasive aquatic species to become established. Current concerns focus on invasive aquatic plants that may be moved from water to water on boats or other equipment.

The current road system indirectly contributes to the spread of diseases such as whirling disease and chytrid fungus by providing access to streams and wet areas. Waders or other fishing equipment used in an infected water body, then used in a different water body can transfer these diseases if they are not properly cleaned; this is more likely to occur in areas with road access. Whirling diseases could potentially wipe out populations of cutthroat and rainbow trout and the chytrid fungus could do the same to boreal toads and other amphibian species.

AQ 14: To what extent does the road system overlap with areas of exceptionally high aquatic diversity or productivity or areas containing rare or unique aquatic species or species of interest?

The road system generally has moderate overlap with areas of exceptionally high aquatic diversity or aquatic species of interest. The primary species of interest include Rio Grande cutthroat trout and western boreal toad. Those projects that have a high risk of resource damage associated with roads and containing sensitive aquatic populations would be a priority for more detailed watershed- or project-level analyses.

This analysis also identified specific roads which crossed streams, or were located within the water influence zone of streams, with sensitive species populations and have the potential to affect these populations (see Appendix C – Road Matrix Table).

Issues addressed: 6 and 7

Terrestrial Wildlife (TW)

TW 1: What are the direct and indirect effects of the road system on terrestrial species habitat?

Direct Effects

The general direct effects of roads on wildlife include direct mortality, habitat loss, population isolation, edge effects, and habitat fragmentation.

Direct mortality

Some species are more prone to vehicle collisions than others. Baker and Knight (2000) demonstrated that forest carnivores (e.g. marten and lynx) are especially vulnerable to road mortality because they have large home ranges that often include road crossings. Larger, mobile species such as deer and elk are also more prone to vehicle collisions particularly during winter, migration periods and early spring green up when they often feed adjacent to highways and road greenbelts. Instances of collisions with these species are more common on highways than on forest roads due mostly to higher rates of vehicle speed on highways, a greater amount of traffic on highways, and the statistic that most wildlife-vehicle collisions most often occur at dawn, dusk or night, at which time vehicle use of forest roads is generally low.

Forest roads pose a hazard to small mammals and slow-moving species such as amphibians and reptiles. Species such as rabbits, red squirrels and chipmunks are commonly run over on forest roads while crossing from one side to the other.

Red Squirrels and other small mammals are most commonly impacted by direct road mortality on the Rio Grande.

Habitat loss

Road construction removes previously existing vegetation from the road prism. The construction of roads usually results in a loss of habitat for those wildlife species obtaining food or shelter in the vegetation prior to removal. Taken alone, the impact of habitat loss compared to habitat available is small for most species on the RGNF. However, the following discussion of the effects of roads on wildlife illustrates that the presence of roads can have numerous impacts on various wildlife species beyond the direct impacts associated with direct mortality and habitat removal.

Population isolation

For species with low mobility (some amphibians and small mammals) or which are extremely sensitive to human disturbance (e.g. wolverine), certain kinds of roads impede the movements of individuals, thereby reducing their ability to disperse, mate or otherwise interact. Roads with high traffic volumes and larger road prisms are more likely to isolate populations than smaller, low-use roads. Such a barrier to movement may

result in a gene flow barrier and can split populations of interbreeding individuals into two or more smaller populations. These smaller, isolated populations are then at greater risk of remaining viable (Gaines et al. 1997).

The two main risks to an isolated population are a reduced genetic pool and reduced ability to recover from either natural or unnatural population fluctuations. Whether the population fluctuates up or down, an isolated population also has a smaller area of habitat to support it. If conditions cause an increase in individuals, the smaller area cannot accommodate the needs of the increased population as easily as a larger contiguous area. When conditions change for the worse, the isolated population is at greater risk of being lost rather than declining and then recovering.

On the RGNF there are 185 6th -Level Watersheds. Of these watersheds, approximately ½ have a relatively high road density (>1.00 mi/mi2) and thus have a higher likelihood of impacting species mobility and contributing to population isolation than watersheds with lower road densities. Appendix D (Fragmentation and Disturbance Concern Column) shows those roads located within watersheds with relative high road densities.

Edge effects

Some wildlife species are affected not only by the habitat loss incurred by the road system, but also by the altered environment within a certain distance of the road system. This altered forested environment along an edge offers different microclimatic conditions (Vaillancourt 1995) and reduced security from predators for certain wildlife species compared to an interior forested environment (Chen 1992, Vaillancourt 1995). The barren characteristic of a road allows increased light, wind, rain, and visual penetration into the forested environment bordering the road. The visual penetration results in a greater predation risk to animals in forested ecosystems. This risk is described in more detail in the Indirect Effects section of Question TW 1.

The relationship of wildlife to edge is complex because certain wildlife species experience edge effects only within relatively short distances from the edge where other species experiences edge relatively far from the edge. The response of a single species to an edge feature may vary depending on the cover type, density of vegetation, percent canopy cover, and other variables in the environment bordering on the road (or other edge feature). For instance, a densely forested cover type would allow light, wind, and rain to penetrate a shorter distance than a sparsely forested cover type. In general, a sparse forest would have a larger edge effect around its roads than a dense forest.

A study on the Medicine Bow National Forest (Vaillancourt 1995) measured edge effects for several variables (i.e. canopy cover, sunlight intensity and stem density) and generally found thresholds of effects at distances of 30-50 meters from the edge. Impacts were still measurable deeper into the forest, but there were not enough sites greater than 70 meters from an edge for an adequate sample size. Additional research demonstrated edge effects more than 240 meters into the forest (as summarized in Baker 2000).

Habitat fragmentation

Certain wildlife species experience negative impacts not only from the loss of habitat, but also from the fragmentation of their habitat. Such animals might overcome some habitat removal by increasing their home range to include additional suitable habitat but, at some point, the home range would become too large and the habitat too fragmented for individuals of the species to persist in the affected area. The fragmentation of their habitat means the individual animals must travel longer distances to seek prey and shelter. Territorial species may be limited in how much they can enlarge their home range because neighboring individuals of the same species will defend their boundaries, thus preventing home range expansion of a given individual. Habitat fragmentation also forces animals to travel in open areas where they are more vulnerable to predation risk.

Indirect Effects

Roads indirectly impacts wildlife by increasing the presence of edge species (both plant and animal) and increased human disturbance reducing habitat effectiveness.

Increases in edge species

On the Rio Grande NF, the road system is a vector for the spread of Canada thistle (*Cirsium arvese*), oxeye daisy (*Leucanthemum vulgare*), yellow toadflax (*Linaria vulgaris*) and other noxious weeds. In addition to increases noxious weeds, the roads on the Forest can provide an avenue by which edge-associated birds and mammals can penetrate an otherwise interior forest environment. These generalists species (e.g. jays, crows, red-tailed hawks, great horned owls, coyotes, foxes and bobcats) out compete interior habitat specialists. Although the addition of edge-dwelling species may increase the species richness or overall number of species in a given area, it often reduces the abundance of habitat specialists (Beauvais 1997, Anderson et. al. 1977).

Great Horned Owls are an example of a generalist species on the Forest which may be increasing due to increase creation of edge habitat by roads.

Edge-associated generalists reduce the abundance of interior habitat specialists by both direct predation and competition. When near roads, species such as the red squirrel and snowshoe hare are more vulnerable to avian predators like red-tailed hawks and great-horned owls that would not typically forage in a closed forest canopy. Furthermore, the edge effects from roads nullify the competitive advantage of certain habitat specialists (e.g. marten and lynx) by allowing habitat generalists access to what would normally be forest interior. Marten and lynx possess adaptations to travel through structurally complex forest and/or deep snow in order to out-compete habitat generalists like the great horned owl, coyote and bobcat. The presence of roads affects marten and lynx by artificially reducing the quality of their habitat and increasing their competitor's available habitat.

Increased human disturbance reducing habitat effectiveness

In addition to edge's contribution to reduced habitat effectiveness, human activities associated with roads often disturb wildlife, thereby further reducing habitat effectiveness. Disturbance, including noise, can result

in stress and displacement of animals (Cassirer et al. 1992, Ferguson and Keith 1982, Freddy et al. 1986), nest abandonment (Knight and Cole 1991), and interruption of breeding behavior (Boyle and Samson 1985). Constant disturbance can result in changes in behavior, abandonment of territory (Anderson et al. 1990, Knight and Cole 1991), and even death of animals (Leptich and Zager 1991). Disturbances can result from any one, or combination, of the following: foot traffic, motorized and non-motorized vehicles, horseback riding, hunting, or logging activities and can occur both on and off road. These human activities are described in more detail in Question TW3 below. See Appendix D for road risk ratings to wildlife.

Wildlife species that are sensitive to disturbance including noise disturbance, do best if they have security areas (Hillis et al. 1991) or in the case of nest or den sites, buffers around the site (generally ¼ mile for most species). The optimal size of the blocks or buffer depends on the species, the habitat quality, the site's topography and other factors.

Issues addressed: 6, 7, 8.

TW 2 and TW 3: How does the road system facilitate human activities that affect habitat? How does the road system affect legal and illegal human activities? What are the effects on wildlife species?

In general, the road system provides access for numerous human activities, both legal and illegal, that affect wildlife habitat and species on the Forest. Permitted firewood and post and pole collection, permitted miscellaneous product collection (moss rock, mushrooms, walking sticks, tree/shrub transplants, tree boughs, Christmas trees, etc.) on and off road use by motorized vehicles (including snowmobiles), hiking, camping, mountain biking, horseback riding, skiing, accidental fire ignition, wildfire suppression, Forest vegetation management (logging and prescribed fire/fuels reduction projects), hunting and poaching are all facilitated by the road system and all affect wildlife habitat and/or species.

Firewood, post and pole and miscellaneous product collection

People collect firewood for localized camping and for heating their homes, post and poles mainly for fences and other miscellaneous products for personal consumption or yard/house decoration. Most of these activities occur within 200 feet of an existing road. Firewood collection results in a reduced number of snags and down logs. Snags and down logs provide habitat for many species on the Forest and provide nest sites for cavity nesting birds, forage in the form of insects for woodpeckers and other species including bats. Down logs provide cover and travel corridors for small mammals. Post and pole collection results in a reduced number of small, live trees along roads which provide cover for wildlife. Collection of other miscellaneous products can result in short term disturbance and removal of wildlife food and cover.

Motorized vehicles including snowmobiles

The use of motorized vehicles, including snowmobiles, can reduce wildlife habitat effectiveness by noise disturbance, stress and displacement of wildlife, nest abandonment and interruption of breeding behavior. Constant disturbance can result in changes in behavior, abandonment of territory (Anderson et al. 1990, Knight and Cole 1991) and even death of animals (Leptich and Zager 1991).

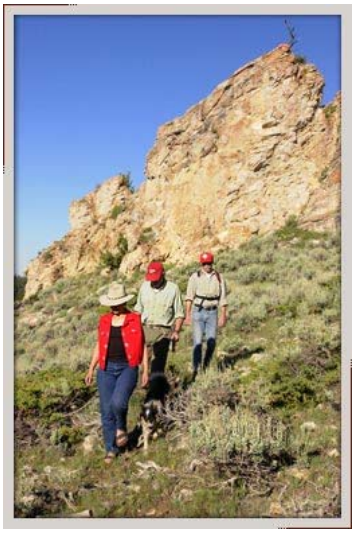
Snowmobile traffic can disturb wildlife during critical winter periods. Forest roads also serve in the winter as designated groomed trails or as artificially cleared paths for snowmobiles into areas which in many cases, would not be traveled in the winter. Roads indirectly affect wildlife habitat in the winter by providing a human-created pathway by which snow compaction activities are spread. For animals that do not migrate out of snow country, snow itself provides essential insulating habitat during the winter months. The tracks of compacted snow created by these machines can adversely affect wildlife in two different ways; by creating travel routes for competing carnivores and by impacting the environment under the snow.

Many Forest roads double as groomed snowmobile trails on the Rio Grande National Forest in the winter.

Compacted snow routes may facilitate the movement of competing carnivores (i.e. coyotes, bobcats, foxes) into lynx habitat (Buskirk et al. 2000). In the absence of roads and trails, snow depths and snow conditions normally limit the mobility of lynx competitors and predators. Snow compaction also can be detrimental to those species dependent on the insulating capacity of snow. For instance, amphibians and many small mammals hibernate below the frozen topsoil during the winter. The depth of frozen topsoil is correlated with the depth of the snow. When snow is compacted, the soil underneath will freeze deeper than if the snow were not compacted. This can directly impact hibernating wildlife. Some small mammals remain active all winter long by using the insulated environment in the space between snow and soil, known as the subnivian space (Jarvienen and Schmid 1971, Halfpenny and Ozanne 1989, Pruitt 1960). Snow compaction can either eliminate the subnivian space or reduce the temperature within this space, thereby increasing the energy expenditure required by small mammals to thermoregulate.

The branches, stems and seeds of noxious weeds frequently lodge in the undercarriage or bumpers of motorized vehicles and can be deposited from one area to another through the road system. Off road motorized vehicle use is becoming more prevalent and can result in the creation of new user created roads, further reducing wildlife habitat effectiveness.

Hiking, camping, mountain biking, horseback riding, and skiing.



Roads provide access for hikers, bikers, horseback riders and skiers. All of these activities, both on and off roads and trails, result in higher levels of disturbance to wildlife species. The presence of humans moving through the environment is perceived as a threat by some wildlife and results in wildlife disturbance. This disturbance can range from temporary displacement of individuals to abandonment of nests and territories.

Such wildlife may experience similar disturbance patterns as described above in Question TW 3, *Motorized vehicles including snowmobiles* and TW 1, *Reduced Habitat Effectiveness*. These activities may also trample habitat. They have the potential to serve as vectors for noxious weed dispersal.

Food scraps are often associated with these activities and can attract certain species to the area. The food reward can lead to the habituation of certain species to the presence of humans and can create nuisance wildlife.

Camping concentrates activity in specific locations and is facilitated by the road system because recreationists can access both developed and dispersed campsites throughout the RGNF. Food scraps are more concentrated at campsites than along trails and make nuisance wildlife more prevalent at these sites. Nuisance wildlife can range from gray jays or camp jays (*Perisoreus canadensis*) loudly calling around campers and stealing campers' food to black bears (*Ursus americanus*) damaging tents, backpacks, and other equipment in the pursuit of food scraps. Bear-camper interactions are a safety issue for both the campers and the bears. Problem bears may be trapped and relocated in an effort to reduce human-bear interactions. Other times, a threatened human may resort to shooting a bear in a threatening confrontation. Both the relocation and the killing of nuisance wildlife is an adverse effect to wildlife increased by the presence of roads on the Forest

Skiing results in snow compaction, which can have similar but less extensive effects than motorized compaction. The impacts of skiing do not extend to as large of an area as snowmobiling. Camping concentrates activity in specific locations and is facilitated by the road system because recreationists can access both developed and dispersed campsites throughout the RGNF.

Accidental wildfire ignition and wildfire ignition

Roads facilitate access to otherwise remote locations in the Forest. The increased number of people able to access the Forest directly translates to an increased risk of wildfire ignition by humans. A spark from a carburetor, cigarette, match, campfire or stove could start a fire that would not have occurred without the increased access allowed by roads. However, roads also allow faster, more effective fire suppression efforts and can act as firebreaks.

Forest vegetation management

Management of forests, including logging activity, prescribed fire and mechanical fuels treatments, are facilitated by the presence of roads. All of these management tools modify wildlife habitat. These treatments modify canopy closure, structural complexity, and understory richness. These treatments are positive for some species and negative for others.

Noise, traffic, dust and increased human presence associated with these activities can cause short term disturbance, stress and displacement of species, nest abandonment and interruption of breeding behavior.

Hunting and poaching

Both open and closed roads provide access for legal hunting as well as poaching. Effects to wildlife include human-caused mortality from legal hunting and poaching activities. Closed roads which have not been decommissioned or obliterated can provided increased access by humans, including illegal use of closed roads by ATVs. Illegal use both on and off road by ATVs is an increasing concern particularly during the hunting seasons. This activity is resulting in the creation of numerous user made roads and trails and increased disturbance, displacement and mortality of wildlife in areas previously providing security.

Issues addressed: 5, 6, 7, 8, 9

TW 4: How does the road system directly affect unique communities or special features in the area?

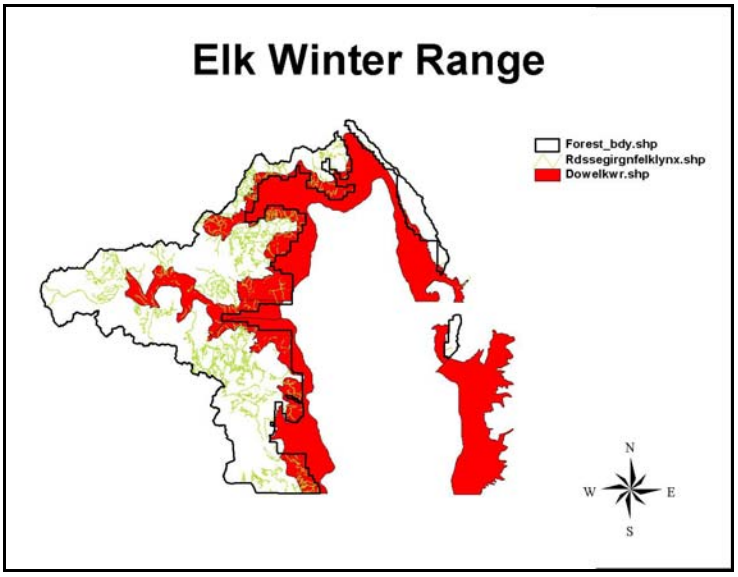
Some of the unique communities or special features on the RGNF include deer and elk winter range, lynx linkages, riparian areas within 200 feet roads and known TES (Threatened, Endangered and Sensitive) and MIS (Management Indicator Species) species nests or dens within ¼ mile of roads.

Deer and elk winter range

The RGNF contains approximately 300,000 acres of deer and elk winter range. These areas are managed to supply adequate amounts of quality forage, cover, and solitude for big game while on winter range. These areas consist of both forested and non-forested habitats, generally within the lower-elevation fringes of the Forest. In winter, human activities are managed so deer and elk can effectively use the area. Motorized travel, including snowmobiles, is restricted to designated roads and trails, except for ATV big-game retrieval.

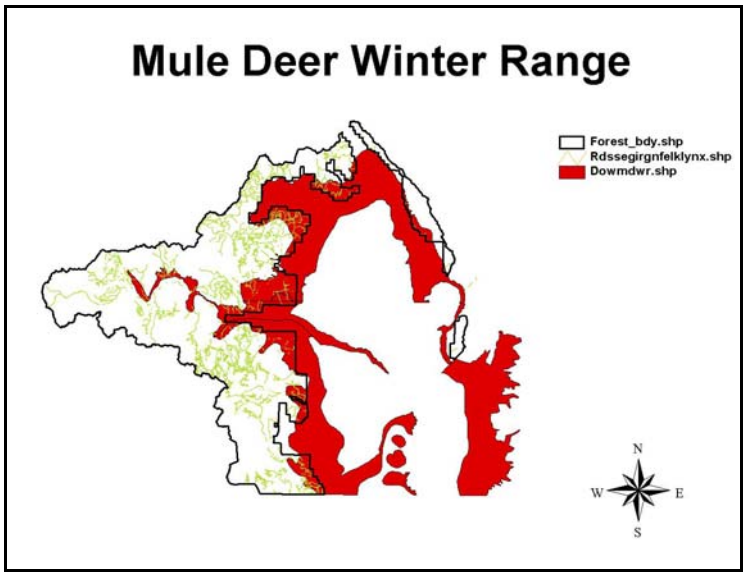
Roads provide entry points into deer and elk winter range. Deer and elk often tolerate vehicle use on roads as long as the use is consistent and predictable and areas of low road density are located in the winter range to serve as security areas. Off road use is common in many of these areas in the winter and is difficult to regulate. Off road use further stresses animals, while on winter range and often pushes animals into higher areas where snow is deeper and food less abundant. Maps 5 and 6 demonstrate the extent of deer and elk winter range on the RGNF.

Elk Winter Range.



Maps shows big game winter ranges both on the Forest and in the San Luis Valley as a whole to illustrate the importance of winter range on public lands.

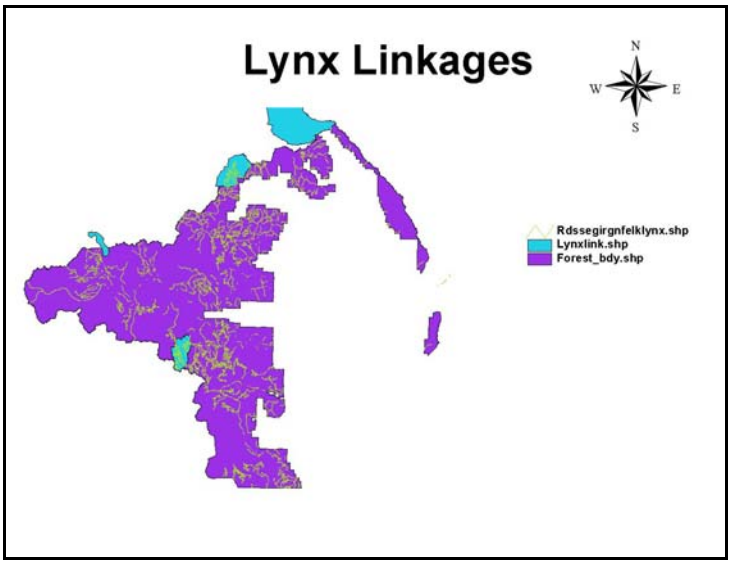
Mule Deer Winter Range.



Lynx Linkage Areas

Because of the fragmented nature of lynx habitat in the Southern Rockies, there are inherently important natural topographic features and vegetation communities that link primary lynx habitats together, providing for dispersal movements and interchange among individuals and subpopulations of lynx between the Rio Grande and neighboring National Forests. Landscape connectivity or lynx linkages, may take the form of narrow forested mountain ridges or plateaus connecting more extensive mountain forest habitats. Wooded riparian communities may provide travel cover across open valley floors between mountain ranges, or lower elevation ponderosa pine, pinyon-juniper woodlands or shrublands that separate high elevation spruce-fir forests.

On the RGNF there are four identified lynx linkage areas: 1) Wolf Creek Pass which links the west side of the San Juans with the east side 2) Slumgullion Pass which includes Spring Creek Pass and the Indian Creek areas and provides for north-south connectivity between Lake City to the Creede area 3) Cochetopa Hills which provides for north-south movement from the San Juans to the Sawatch Range and 4) Poncha Pass which connects the Sawatch Range to the Sangre de Cristo Range. Appendix D shows those roads which are located within lynx linkage areas.



Highways and roads impact lynx and other wildlife by fragmenting habitat and impeding movements. As traffic lanes, volumes, speeds and right-of-way width increase, the effects on lynx and other wildlife are magnified. As human demographics change, highways and roads tend to increase in number, size and traffic density. Special concerns should be given to the development of new roads and road upgrades (gravel roads being paved), and changes in road design, such as additions in the number of traffic lands, widening of rights-of-way, or other modifications to increase road and highway capacity or speed (Buskirk et. al. 2000).

Riparian areas

Riparian areas provide habitat for a wide variety of wildlife species on the Forest. Roads within 200 feet of these areas may impact the amount of use by wildlife in these sites and may also contribute to erosion and sedimentation of the riparian. Several TES and MIS species use riparian areas. Appendix D shows the relative percentage of each individual road located within 200 feet of riparian areas.

An example of a road adjacent to a riparian area in the Miner's Creek Drainage.

TES/MIS species nest or den sites

TES/MIS species nests or den sites near roads are a special concern. Collecting and maintaining this information is useful to managers to help conserve these species and is usually not in the best interest of the species for this information to be widely distributed.

For example, goshawks are generally tolerant of road use but are more sensitive to disturbance during nesting season and early post-fledgling. However, this information is typically not readily available to prevent illegal collecting of goshawk fledglings. Recording additional TES/MIS information into the GIS database and overlaying those sites into the Roads Database is an on-going project.

Goshawks are an example of a species in which information gathering is on-going and dynamic.

Special management designations

See AU 1 for a discussion on special management designations.

Related Questions: EF 1, AU 1

Issues addressed: 6, 7, 8

Ecosystem Functions and Processes (EF)

EF 1: What ecological attributes, particularly those unique to the region, would be affected by roading of currently unroaded areas?

Special management designations

The RGNF uses two types of special management designations or Management-area Prescriptions to identify and protect unique features on the land. These are Special Interest Areas (SIAs) and Research Natural Areas (RNAs). SIAs are designated based on the presence of unusual characteristics (i.e. botanical, geological, historical, paleontological, scenic, and/or zoological) in those areas. RNAs are established to provide examples of key natural ecosystems and environments for scientific study.

Building roads in unroaded portions of SIAs/RNAs could degrade or remove the habitat supporting the unusual botanical or zoological features for which some SIAs/RNAs were designated. The 1996 Rio Grande National Forest Plan addressed each of these special management designations and provided direction to protect their unique features.

EF 2: To what degree do the presence, type, and location of roads increase the introduction and spread of exotic plant and animal species, insects, diseases, and parasites? What are the potential effects of such introductions to plant and animal species and ecosystem function in the area?

Exotic and Noxious plants

Roads provide a primary corridor for the transport and spread of exotic and noxious weeds. Roads may influence the spread of exotic plants through direct transport via vehicles or indirectly by altering habitat and creating early seral, bare soil or patchy ground cover that favors weedy species. Canada thistle, *Cirsium arvense*, has a scattered patchy distribution across most of the Rio Grande National Forest. Roads that dissect more moist areas are particularly likely to spread Canada thistle. Other noxious weeds documented on the Rio Grande National Forest include leafy spurge, Russian knapweed, ox-eye daisy, hoary crest, perennial pepper weed, yellow toadflax, musk thistle. Noxious weeds have the potential to displace Proposed, Endangered, Threatened, and Sensitive (PETS) plants through competition for light, nutrient and water resources. The presence of exotic and noxious weeds has the potential to displace native plant species and have a negative impact on native wildlife.

Disease and parasites

Roads have the potential to spread diseases or parasites by the transportation of infected plant products or animals from one part of the RGNF to another or to adjacent private lands or vice versa**.** However, the road system is also not known to be aiding the spread of any forest parasites or pathogens at a landscape scale.

Animals and insects

Roads can increase the abundance of edge-associated species, which then can prey upon or replace forest-interior species. (Also see Question TW 1). However, the road system is not known to significantly affect the incidence of insects at a landscape scale.

Issue addressed: 3.

Related question: TW 1 and PT1

EF 3: To what degree does the presence, type, and location of roads contribute to the control of insects, diseases, and parasites?

In general, the presence and location of roads facilitates the control of forest insects, diseases, and parasites. Roads (regardless of type) provide access for efficient sampling, monitoring, and treatment (ground-based) of forest insects and diseases. Access is important for direct control (debarking or burning infested material) or indirect control (altering stand conditions to reduce the potential of significant impacts).

The areas on the Forest that are most heavily roaded are generally in Management Area Prescriptions that allow a full range of activities and emphasize timber harvest and the production of wood products. The presence, type and location of roads in these areas facilitates meeting the Forest Plan desired conditions for these Management Area Prescriptions. For example, the setting described for Management Area Prescriptions 5.11 (General Forest) and 5.13 (Forest Products) states "wildfires are suppressed and insect and disease populations are maintained at endemic levels, to protect commercial forest products." The presence, type and location of roads in these Management Areas is necessary to respond to insect and disease infestations and to protect the ecological and commercial values of the forest resources.

Areas on the RGNF where motorized access is limited include Wilderness areas and Backcountry Management-areas. One of the desired conditions for Wilderness is "the structure, composition, and spatial distribution of vegetation types are influenced and sustained by natural processes." One of the desired conditions for backcountry is "natural processes within the context of the range of natural variability (insects, disease, fire) are generally allowed to occur with minimal human intervention." Therefore, natural processes including insect and disease infestations are generally left untreated in these areas. Roads do not exist in these areas and are generally not needed to meet the desired conditions for these management areas. The catastrophic bark beetle epidemics currently occurring on the Forest and the increased risk of catastrophic wildfire may necessitate the re-evaluation of management treatments in Backcountry Management-areas

In areas where there is no vehicle access, field sampling or monitoring for insect and disease infestations would be more costly and likely to be significantly reduced or deferred. Effective implementation of ground-based vegetation treatments designed to control insect, disease, and parasites would also be limited to areas with road access. In cases where management is needed in areas without road access, alternative aerial methods for sampling, monitoring, and treatment may be able to replace conventional ground-base methods to control insect, disease, and parasite epidemics. However aerial methods have proven to be considerably less cost effective and may decrease the opportunity to maximize effective insect, disease, and parasite treatment with existing limited resources and funding.

Issue addressed: 3.

Related question: PT 1

EF 4: How does the road system affect ecological disturbance regimes in the area?

The dominant ecological disturbances found on the Rio Grande National Forest are wind, insect and disease, and fire. These three disturbances generally occur in a somewhat cyclical pattern with the presence of one often setting the stage for the occurrence of another.

Wind

Although forest stands can become susceptible to the effects of wind and windthrow from creating openings in the forest canopy, it generally takes a sizeable opening in the canopy before these results become apparent. Forest roads generally do not create openings large enough to cause wind effects to change the forest. The overall impact of roads to the effects of wind on the Forest is negligible. The major wind-related impact to forest stands from roads would be associated with other management activities that occur connected to the

construction and use of the roads, such as silvicultural treatments that open up the canopy allowing wind to play a more significant role in shaping the adjacent, remaining stands.

Roads may facilitate the recovery of windthrown timber and control of bark beetles resulting from windthrow.

Insects and diseases

Generally, the road system is not known to significantly affect the incidence of insects and diseases at a landscape scale. The road system is also not known to be aiding the spread of any forest insect pest or pathogen at a landscape scale. Maintenance and/or new road construction can have an effect on the incidence of insects and diseases, through wounding trees, compaction, and leaving down trees as host for some pest species. However, mitigation practices can minimize these effects.

In general, roads may facilitate the management of insect and disease infestations.

Fire

Roads may have both positive and negative effects on the fire regime. Roads allow humans easy access to the forest which can result in an increase in human caused fires. Roads also allow rapid response time and access to fight natural and human caused fire.

For the purposes of this discussion, the RGNF can be categorized into two simple, broad fire regimes: 1) frequent, low-intensity fires at lower elevations, and 2) infrequent, high intensity fires at higher elevations. The first regime includes foothills to lower montane life zones and the second regime includes the upper montane to subalpine and alpine life zones.

Roads may serve as barriers in the lower elevation fire regime (low to moderate intensity fires). The reason for this is that these fires are generally small and confined to ground fuels so that a road could act as a barrier to fire spread. However, such fires may have slowed or halted naturally due to the diurnal change in temperature/humidity brought on by nightfall. Thus, the final size and ecological effect of such fires may not be entirely clear. Conversely, it is likely that roads have an insignificant impact on the higher elevation fire regime (high intensity fires). This is because these fires tend to be stand-replacing, crown fires that would be relatively unaffected by roads (i.e., fire spotting would not be constrained by a road).

Indirectly, roads allow ready access to humans into the Forest who at times ignite fires. Road density is generally higher at lower elevations compared to higher elevations. Thus, humans may have a greater opportunity to access more low-elevation lands with a corresponding greater opportunity to ignite fires. However, this affect may be somewhat offset by the rapid response time and access these lower elevation roads give to fire-fighting personnel and equipment.

Issue addressed: 3.

Related question: PT 1

EF 5: What are the adverse effects of noise caused by developing, using, and maintaining roads?

Noise from road construction, maintenance and use is generally at low levels on the RGNF. Road construction and maintenance noise occurs only occasionally and in short duration.

Wildlife species respond differently to different degrees of road use and construction/maintenance noise. Some species readily adapt to road use and associated noise, particularly if use is predictable both in volume and timing, while others are intolerant of disturbance and may be temporarily displaced or may abandon nests and territories. There are approximately 7 miles of inventoried road which fall into the ¼ mile nest zones of known goshawk nests. The adverse effects of noise on these nests is not known but does not seem to be a deterrent for nesting activity near roads. Also refer to Question TW 1: Indirect Effects – Increased human disturbance reducing habitat effectiveness and Questions TW 2 and TW 3 for more information regarding adverse effects of human disturbance including noise on wildlife. See UR/RR 3 for a discussion of the effects of noise on recreation use.

Related Questions: TW 1, TW 2, TW 3, UR/RR 3.

Economics (EC)

EC 1: How does the road system affect the agency's direct costs and revenues? What, if any, changes in the road system will increase net revenue to the agency by reducing cost, increasing revenue, or both?

At the forest scale, this question can be answered in broad terms. A detailed cost/benefit economic assessment is not feasible. This road analysis addressed this question by developing the Road Value versus Risk matrix and used this tool to determine which Road Management Category each road fell into.

The R2 Guidance for this question determined that there are three basic categories of roads: 1) roads that will always be open for obvious reasons, 2) roads that will be closed due to serious resource damage or annual budgetary constraints, and 3) roads that don't fall into either of the first two categories (the largest category).

When looking at all road maintenance levels, the R2 Guidance is appropriate. The RGNF roads analysis considers all objective maintenance levels (OML) while assessing the roads. This analysis has demonstrated that most of the OML 3, 4 and 5 roads should be kept open. Most of these roads were developed over the years for a variety of access needs, and considerable capital investments were incurred to construct these roads. Most of these roads have been analyzed at the time of their construction for use needs, construction design standards, environmental considerations, and economic assessment.

The challenge is to develop a process to sort out the roads that might not be meeting current and future access and land management needs, at least not at their current maintenance levels. The roads analysis process helps identify opportunities to reduce road maintenance costs on some roads. The analysis has also shown that even if funding was shifted from low value roads to higher value roads, the annual road maintenance funding for the RGNF is still significantly less than needed.

EC 2: How does the road system affect the priced and non-priced consequences included in economic efficiency analysis used to assess net benefits to society?

This question is more appropriately addressed at the sub-forest or project scale.

EC 3: How does the road system affect the distribution of benefits and costs among affected people?

This question is more appropriately addressed at a regional or landscape level. It is generally not appropriate at the project level.

Commodity Production (TM, MM, RM, SP, SU, WP)

Timber Management

TM 1: How does the road spacing and location affect logging system feasibility?

This question is most applicable at the sub-forest scale during project analysis. It is an important consideration, however, for determining timber suitability, management area allocations, and economic efficiency at the forest plan scale.

Timber sales to date on the RGNF have been logged with ground-based equipment. The trees are either felled by hand with chainsaws or cut mechanically with a feller buncher and then yarded to the landing with rubber tired grapple skidders or tracked dozers. Machine felling is much more common than hand-felling because it is safer, more productive, and less labor intensive. In general, a road spacing of 2,000-3,000 feet would be economical for ground-based skidding.

The cut-to-length logging system has been tried in Region 2. This system uses a mechanical processor that cuts, limbs, and bucks the logs to length, at the stump. The logs are then brought to the landing on a forwarder. It is possible to yard logs longer distances with a forwarder and thus the road spacing can be a little wider. However, due to high purchase price and relatively low cut volumes per acre, the cut-to-length system has not proven to be more economical than conventional rubber tired systems in this Region. If cut-to-length systems are required in timber sales to increase road spacing, stumpage values will be reduced and there will be a greater chance of uneconomical timber sales.

In general, close road spacing results in quick turn times and higher production that reduces yarding cost and increases stumpage value. Although closer road spacing can increase the total road cost due to more roads, this total cost can be reduced with the use of temporary roads.

Traditionally, cable logging systems are not common in Region 2. The location of a road is particularly important for cable logging. Roads are generally located above the unit and along the "slope break" to provide better deflection which is needed to reduce damage to resources and equipment. In the past, cable logging equipment and skills were not available in Colorado. However, new cable logging technology—tracked "yoaders" (excavators, feller-bunchers, or loaders retrofitted with winches, cables, and masts) and tong-throwers—may soon be available. A road spacing of 2,500 to 4,000 feet would accommodate small- and medium-sized yarders, including "yoaders."

Helicopter logging has been used in the Region on a limited basis. It is an extremely expensive system that does not work well on high elevation forests like the Rio Grande. This is because the payload capacity of a helicopter decreases as the elevation increases. The only way a helicopter system can be used economically on the Forest is to perform the helicopter logging at lower elevations and to have several other low-cost ground-based units in the timber sale to offset the cost. Helicopter logging feasibility is improved by locating roads and landing to provide downhill yarding and short yarding distances (less than ½ mile).

In general, the road spacing is adequate for logging systems used on the Rio Grande National Forest; however, there may be site-specific projects where road construction (temporary and specified) is necessary. Generally, road construction is only allowed where it is economically and technically necessary to achieve resource management objectives. The most efficient road spacing that would maximize timber stumpage values is generally not acceptable because it usually conflicts with other resource management objectives.

TM 2-3: How does the road system affect managing the suitable timber base and other lands? How does the road system affect access to timber stands needing silvicultural treatment?

Roads provide the primary access to the RGNF for planning, designing, and implementing a wide range of vegetation management activities to manage the suitable timber base and other lands. Most silvicultural treatments on the RGNF are accomplished through conventional ground-based methods requiring an adequate road system.

During the Forest Plan revision, specific consideration was given to areas with developed road systems when tentatively suitable lands were allocated to management area prescriptions that contribute to the ASQ. Past timber management has provided the basic network of roads to access the suitable timber base. As a result, the majority of the suitable land base has an established arterial and collector road system in place to facilitate necessary vegetation management.

Of the 745,252 acres identified as suitable for timber management in the Forest Plan FEIS, 11,719 acres (2%) were identified in stands within roadless areas. The 2000 Timber Suitability Amendment to the Forest Plan corrected editorial errors made between the Draft and Final Forest Plan EIS. The Timber Suitability Amendment corrections increased suitable timber lands by 8.5% and removed suitable timber lands from the Sangre De Cristo Wilderness Area. None of the lands affected were in roadless areas.

The FEIS projected at 13 miles of road construction and 38 miles of reconstruction at the desired condition level, along with 50 miles of road obliteration would occur in the first decade. A large part of the planned road construction and reconstruction was to provide access to suitable timberland. The majority of the planned construction and reconstruction would consist of local roads which would be closed after use.

Actual road construction has averaged less than 1.3 miles/year for the first five-year period of the plan, and actual road reconstruction averaged less than 3.8 miles/year. Projected road construction and reconstruction at the desired condition level has not been met for the first five-year period of the Forest Plan.

The timber management program uses all maintenance levels of road on the RGNF. The extent to which the road system accesses the suitable timber base was examined by comparing the spatial proximity of the current road system (objective maintenance level 1 – 5 roads) with the suitable timberlands. Ninety-three percent of the suitable acres are within 1 mile of a classified road. In general, this would indicate that the existing system, specifically the existing arterial and collector network, provides adequate access to the suitable timber base. There are a few areas where suitable timberlands outside inventoried roadless areas that lack adequate access such as the 5.13 MA within the old Trout Mountain Timber Sale Analysis Area.

Of the suitable timber base acres located more than one mile from a maintenance level 1 - 5 road, about half are located within Inventoried Roadless Areas (IRAs). Of the suitable timber acres within IRAs, 78% are located within 1 mile of a maintenance level 1 – 5 road. Some of this suitable timberland could be accessed through temporary road construction or by constructing or reconstructing local roads. Access to other suitable acres within IRAs would require the construction of collector systems. Some areas are roadless due to physical constraints (steep slopes, unstable soils), critical wildlife habitat, and/or lack of right-of-way (e.g., Troublesome Geographic Area). However, where road construction is possible, there are likely to be conflicts over any road construction in IRAs.

The final Roadless Area Conservation Rule was published in the Federal Register on January 12, 2001. The final rule prohibits road construction, reconstruction, and timber harvest in IRAs. A subsequent Administrative Order suspended implementation of the Roadless Conservation Rule. On May 4, 2001, the Secretary of Agriculture announced a reexamination of the Roadless Area Conservation Rule, with a public comment period that closed on September 10, 2001. The Forest Service issued two Interim Directives on July 27, 2001, reserving to the Chief of the Forest Service, with some exceptions, authority to approve timber harvest and road construction and reconstruction in roadless areas. Depending on the outcome of the Roadless Conservation Rule, a Forest Plan amendment may be necessary to change management area prescriptions and revise geographic area direction. Issue addressed: 3

Minerals Management

MM 1: How does the road system affect access to locatable, leasable, and salable minerals?

The Forest Service administers its minerals program to achieve the following:

- Encourage and facilitate orderly exploration, development, and production of mineral resources from National Forest System lands.
- Ensure that exploration, development, and production of mineral resources are conducted in an environmentally sound manner and that these activities are integrated with planning and the management of other National Forest recourses (FSM 2802).

Mineral resources are separated into three categories: locatable, leasable, and saleable.

Locatable Minerals

Locatable minerals are those minerals that may be located and removed from Federal lands under the authority of the General Mining Law of 1872 (as amended). The Forest Service does not manage the mineral resources on National Forest System lands. That authority rests with the Secretary of the Interior. Forest Service authority is directed at the use of the surface of National Forest System lands in connection to the operations authorized under the United States mining laws (30 U.S.C 21-54), which confer a statutory right to enter upon the public lands to search for minerals. Forest Service regulations at 36 C.F.R. 228, Subpart A provide that operations shall minimize adverse environmental impacts to the surface resources.

These regulations also address roads needed for mineral activities. Roads are to be constructed and maintained to minimize or eliminate adverse impacts to resource values. Unless otherwise authorized, roads no longer needed for mineral operations will be closed to normal traffic, bridges and culverts removed, and the road surface stabilized and reshaped to approximate the natural contour.

Under the general mining laws, the Rio Grande National Forest is available for locatable mineral exploration, development, and extraction. However, some areas within the Forest have been withdrawn from mineral entry; mineral entry or activity in these areas is not allowed. These areas include, but are not limited to, Congressionally designated wilderness areas, Research Natural Areas, National Recreational Areas, Administrative Sites, Special Interest Areas, etc. Table 13 lists the approximate acres withdrawn from mineral entry in the Rio Grande National Forest.

Table 13. Approximate acres withdrawn from mineral entry within the Rio Grande National Forest.

Management Areas	Acres
Research Natural Areas	10,813
Wild Rivers	567
Wilderness Areas	430,253

Throughout the Forest, those with mineral rights have access allowing them to work their claims; however, these routes may be closed to the general public. Arterial and collector roads are used to access individual claims, and access is addressed on an individual basis. The vast majority of roads constructed into mining claims are temporary. Where reconstruction/construction and reclamation are necessary for access, bonding is required as part of the Operating Plan.

Leasable Minerals

Leasable minerals are federally owned fossil fuels (oil, gas, coal, oil shale, etc), geothermal resources, sulfur, phosphates, and uranium. These minerals are subject to exploration and development under leases, permits, or licenses issued by the Secretary of the Interior, with Forest Service consent. The 1920 Mineral Leasing Act (as amended) and the 1989 Federal Onshore Oil and Gas Leasing Reform Act provide the authority and management direction for federal leasable minerals on National Forest System lands.

Some areas on the Forest are withdrawn from mineral leasing, including Wild and Scenic Rivers, National Historic Sites, Research Natural Areas, and other specific classifications. In these areas, the Forest Service recommends leasing activities only when terms and conditions can be applied that will protect the purpose for which the lands were classified. Table 14 lists the approximate acres authorized for leasing by category.

Table 14. Approximate acres available and authorized for leasing on the Rio Grande National Forest.

Type of Authorization	Acres
No Surface Occupancy	586,000
Controlled Surface Use	93,000
Timing Limitation	135,000
Standard Lease Terms	326,000

As much as 600,000 acres has been leased in the past within the Rio Grande National Forest. However, only five exploratory wells have been drilled. Road access for leasable minerals is generally planned and developed on an individual basis. Production of leasable minerals will require some high-standard haul roads. Existing arterial and collector roads are utilized to access the general location and are sufficient for that purpose. Transportation plans are generally developed as part of each leasable activity.

Salable Minerals

Salable minerals include mineral materials, otherwise known as “common varieties” which generally include deposits of sand, gravel, clay, rock or stone used for a number of purposes including road surfacing, construction materials, and landscaping. The disposal of these materials is by a materials contract or permit issued at the discretion of the Forest Service. All contracts contain requirements for reclaiming the sites, as much as practicable, to pre-mining conditions.

Existing arterial and collector roads are sufficient to gain access to the general location of salable minerals. The value of salable common variety minerals is very sensitive to transportation costs. Unlike locatable and leasable minerals the Forest Service has complete control over common variety minerals and is under no obligation to authorize their sale.

Range Management

RM 1: How does the road system affect access to range allotments?

The network of roads on the RGNF has positive effects on rangeland condition and positive effects on access to range allotments and administration of the grazing program. Until the 1970s, livestock driveways were considered "sacrifice areas" in the rangeland management discipline (Stoddart and Smith 1955). Now, sheep and cattle are typically transported to and from mountain allotments in trucks rather than trailed on stock driveways. Those historic stock driveways that are still in use have experienced a drastic reduction in livestock numbers. This reduction in livestock use along these stock driveways has improved the overall vegetative condition though local soil and vegetative health issues may still exist. In several areas these historic driveways have been rerouted to coincide with existing Forest System Roads and closed timber sale roads. This has allowed many of the impacts associated with past use of the driveways to be minimized or eliminated. As a result, the vegetative condition and overall health of these historic driveways has improved dramatically.

As a rule nearly all level 3-5 roads have a direct and positive effect upon the livestock industry on the Rio Grande National Forest. These roads have provided grazing permittees easier access to their allotments. This access has more than likely lowered operating costs by reducing travel time to the allotments and improved overall allotment management due to this improved access. The level 2 roads provide the permittees travel routes to move livestock from one pasture to another or to access range improvements for maintenance purposes.

The network of roads on the Rio Grande National Forest has improved the overall administrative capability within the range management program. Administratively, the road network now allows rangeland management specialist easier access to most of the allotments on the Forest. The current road system allows for quicker access by vehicles and horses to the wilderness and back country portions of the forest. This translates to improved allotment monitoring for permit compliance.

The current maintenance level 2-5 road system provides adequate access for management of the range resources on the RGNF at the forest level. Access will continue to be assessed at the project level.

Special Products (SP)

SP 1: How does the road system affect access for collecting special forest products?

The road system provides the primary means by which commercial harvesters and individuals access and transport special forest products such as Christmas trees, posts, poles, firewood, transplants, mushrooms, ferns, etc. The majority of harvest and collection is accomplished manually and therefore takes place in close proximity of the road system.

The existing road system provides sufficient access for collecting special forest products.

Special Use Permits (SU)

SU 1 –How does the road system affect managing special-use permit sites (concessionaires, communication sites, utility corridors, and so on)?

The existing road system is adequate to serve the needs of existing or anticipated recreational and non-recreational special uses. There are isolated cases of illegal/unauthorized use of routes on the Forest The Forest Service does not have legal rights of way access on about 10% of the roads crossing private land.

Overall, the current road system provides good access for recreation special use permits (outfitter/guides and recreation residences). Access for non-recreation special uses (private property) is adequate for most uses with the exception of some isolated cases. There are some private land access issues but these are being addressed on a case-by-case basis. Access to private lands does not necessarily need to be on level 3-5 roads.

Many permitees rely on the existing road access or utility corridors to accommodate construction, operation and maintenance. Most leasable mineral requests require reconstruction of old roads or new construction. These requests are analyzed through the NEPA process and are addressed in the associated decisions.

Access and Forest Service responsibility under ANILCA and R.S> 2477 are issues on the Forest.

Issues 4 and 5.

Water Production (WP)

WP 1: How does the road system affect access, constructing, maintaining, monitoring, and operating water diversions, impoundments, and distribution canals or pipes.

The existing road system is sufficient to access existing water diversions, impoundments, and distribution canals and pipes. The larger impoundments and diversions tend to be accessed by the arterial and collector roads. However, the Forest does have numerous agricultural ditches and reservoirs that are closed to public access and are accessed by the permittees on a "by request" basis only. This access is for inspection and maintenance only and is required by their permit. Public motorized access on these roads is generally restricted, and extensive use by the permittee is usually addressed with maintenance requirements in their permit.

Maintenance level 3-5 roads with easements to access water diversions and impoundments are identified in the road matrix (Appendix C).

WP 2: How does road development and use affect water quality in municipal watersheds?

The Forest Plan notes that the towns of Creede, Del Norte, Antonito, and Crestone take or have taken water from forest streams. However, no specific watersheds are designated as municipal watersheds. Road development as well as other disturbances in watersheds can add additional sediment to streams if not properly planned and mitigated.

Related question: AQ 7.

WP 3: How does the road system affect access to hydroelectric power generation?

The RGNF does not have any hydroelectric power generation facilities.

General Public Transportation (GT)

GT 1: How does the road system connect to public roads and provide primary access to communities?

National Forest System roads connect numerous public roads managed and operated by either the state of Colorado or county governments. However, few Forest roads serve as the primary through-routes that connect communities. Of greater importance is how the county roads and state highways give communities, tourists, and industries access to the RGNF. These roads connect to arterial, collector, and some local roads at the Forest boundary where traffic is dispersed into the Forest for a variety of uses. Some county and state highways traverse into or through the RGNF. Table 15 lists public roads identified as important to linking the RGNF to public roads and local communities.

Table 15. Public roads under county or state jurisdiction that access the National Forest.

Public Road Number/Name	Termini
Alamosa County, Colorado	
6 Mile Lane	CO State Highway 17 – CO State Highway 150 NFSR 852 NFSR Road 975 NFSR Road 235
Rio Grande County, Colorado	
CR 41G	CO State Highway 112 – Saguache County 41G – NFSR 41G
CR A	CO State Highway 112 – CR 41G
CR 13	US Highway 160 – NFSR 13, 879, 850, 848, 327, 320.2A, 319
CR 14	US Highway 160 – NFSR 14, 898, 873, 345, 338, 337, 333, 331.1A, 331, 330.3B, 330.2D, 330, 329, 328
CR 18	US Highway 160 – CR 15
CR 360	US Highway 160 – NFSR 332, 355, 359, 360, 360.3C, 360.4A, 360.4B, 360.4C, 360.4D, 360.4G, 844, 845, 933, 933A
CR 31	CO State Highway 112 – Saguache County 41G – NFSR 41G

Public Road Number/Name	Termini
CR 15	CO State Highway 149 – CO State Highway 112 NFSR 610, NFSR 614, NFSR 630, NFSR 645, NFSR 650, NFSR 660
Saguache County, Colorado	
CR AA	CO State Highway 17 – Forest Boundary
CR GG	CO State Highway 17 – Forest Boundary
CR 41G	Rio Grande County 31 - NFSR 41G
Colorado State Highways 15	Monte Vista, CO – La Jara, CO
17	NM State Line – Antonito, CO
17	Alamosa, CO – US 285 junction
112	Del Norte, CO – Center, CO
114	North Pass/Continental Divide – US 285 (at Saguache)
149	US 160 (at South Fork) – Spring Creek Pass/Continental Divide
150	US 160 – Great Sand Dunes NM entrance station
New Mexico State Highways	
17	US 84/64 (at Chama, NM) – NM/CO State Line
Federal Highways	
US 160	Monte Vista, CO – Wolf Creek Pass/Continental Divide
US 285	CO 112 (near Center) – Poncha Pass

The RGNF road system does not provide any primary access routes to or between communities. However, local communities use several Forest roads for recreation and commercial access to the RGNF. As population increases, recreation and commercial use of the road system is also expected to increase. Table 16 lists major population centers and public and Forest System roads used for primary access to the RGNF.

Table 16. Primary county, state, and forest roads providing access to and through the RGNF

Community, Town, or City	Public Roads	National Forest System Roads
Alamosa, CO	US Hwy 160, 285 CO State Hwy 17, 150 6 Mile Lane (Alamosa County)	NFSR 235 NFSR 852 NFSR 935
Monte Vista, CO	US Hwy 160, 285 CO State Hwy 15 Rio Grande County 28, 277	NFSR 28 NFSR 250 NFSR 270 NFSR 5180
Del Norte, CO	US Hwy 160 CO State Hwy 112 Rio Grande County 41G Rio Grande County 13 Rio Grande County 14	NFSR 41G NFSR 13 NFSR 14 NFSR 270 NFSR 650 NFSR 660
South Fork, CO	US Hwy 160 CO State Hwy 149 Rio Grande County 15 Rio Grande County 18	NFSR 610, NFSR 614, NFSR 630, NFSR 645, NFSR 650, NFSR 660
Creede, CO	CO State Hwy 149	NFSR 502, NFSR 503, NFSR 504, NFSR 507, NFSR 550
Saguache, CO	US Highway 285 CO State Hwy 14, 125, 127 Saguache County AA, GG	NFSR 41G, NFSR 720, NFSR 842, NFSR 850, NFSR 880
Antonito, CO	US Hwy 285 CO State Hwy 17	NFSR 101, NFSR 102, NFSR 103, NFSR 250
La Jara, CO	US Hwy 285 CO State Hwy 15	NFSR 240, NFSR 255
Chama, NM	NM State 17 CO State 17 Archuleta County, CO 121	NFSR 121

These roads and others are important to smaller communities around the Forest. Many people in these communities rely on access to the Forest for their livelihood as well as for recreation. The RGNF is important for tourism, ranching, timber and mining. Some of those communities are listed in the Table 17. Some subdivisions (Alpine, Baca Grande, and Trinchera Ranch) near the Forest have larger populations than some local small towns.

Table 17. Small residential communities near the Rio Grande National Forest.

County	Residencial Community
Conejos County, CO:	Horca, Capulin, Mogote, Fox Creek, Canon, Platoro, Centro
Costilla County, CO:	Blanca
Rio Grande County, CO:	Agua Ramon, Masonic Park,
Alamosa County, CO:	Mosca
Saguache County, CO:	Crestone, Moffat, Villa Grove, Bonanza, La Garita
Mineral County, CO:	Wagon Wheel Gap

GT 2: How does the road system connect large blocks of land in other ownership to public roads?

The RGNF NFS roads do not provide primary access to most large blocks of land in other ownership. Public lands surrounding the RGNF include Bureau of Land Management and Colorado State Wildlife Area lands and other Colorado state lands. The Pike-San Isabel, San Juan, Gunnison and Carson (in New Mexico) National Forests, Monte Vista National Wildlife Refuge and Great Sand Dunes National Park and Preserve are adjacent to the Rio Grande National Forest and share access roads. The following Forest roads shown in Table 18 access these lands.

Table 18. Forest roads providing access to lands under other ownership.

Ownership other than Rio Grande NF	Forest Roads
Bureau of Land Management	NFSR 240, 255, 250, 252, 28, 268, 13, 14, 610, 660, 665, 646, 41G, 850, 706, 720, 730, 760, 773, NN14, 783, 770, 780, 810, 850, 882, 855, 856, 880, 853, 879, 858, 871, 46AA, 857, 861, 888, 890, 873, 874, 875, 876, 990, 947, 980, 948, 992, 944, 933, 998, 970, 964, 957, 975
La Jara Reservoir State Wildlife Area	NFSR 240, 249, 248
Coller State Wildlife Area	NFSR 432
Hot Creek State Wildlife Area	NFSR 254, 255
Saguache Park State Wildlife Area	NFSR 744, 787
Other Colorado State lands	NFSR 101, 102, 103, 240, 248, 249, 259, 250, 28, 350, 646, 41G,

Ownership other than Rio Grande NF	Forest Roads
	856, 947, 998,
Pike-San Isabel National Forest	NFSR 970, 235
San Juan National Forest	NFSR 380.2A, 520
Gunnison National Forest	NFSR 787, 518, 547, 597, 740, NN14, 784, 855
Carson National Forest	NFSR 103, 117, 125
Great Sand Dunes National Park and Preserve	NFSR 235

The amount and dispersion of private and other ownership lands varies across the Forest. Maintenance level 3-5 roads access most private inholdings. However, some inholdings are accessed by lower standard local roads and some such as those in roadless areas have no road access at all. Access needs for inholdings are addressed on an individual basis as requests are received. Forest Service policy is that access will be provided to a level that is reasonable and suitable for the uses occurring on the land. When landowners desire access, they are asked to apply for a special use or road use permit. The application is then analyzed through the NEPA process to determine possible environmental effects and the level of reasonable access required.

Some private land inholdings use NFS roads for access. When these tracts are subdivided, the resulting multiple ownership can increase demands on the road system. Converting roads to other jurisdictions (e.g., county or road district) should be considered when use has increased beyond the needs of general Forest access. This eliminates the need for the Forest Service to enter into road use or special permits with each individual landowner. When the county grants permission for a subdivision that will be accessed by a NFS road, the county or state should be encouraged to assume jurisdiction on that portion of the road.

Access is normally limited to summer or non-snow periods, but on occasion; permits are issued for snowplowing during the winter. There is an increase in year-round occupancy of some private inholdings on the Forest. The impacts on the road system with increased winter use are discussed in SI 1 and WU 1.

In some areas, the Forest Service lacks adequate legal access to the public road system. Priorities for acquiring access are identified during planning for commercial or land management projects.

Historic access across some private land is being closed to the public as ownership and land uses change. While this is not a change in legal status, it gives the appearance of shutting off large tracts of public land. The Forest Service recognizes the legacy of hunting and fishing on public lands and the recreational and economic benefits derived from those activities. The Forest Service signed a Memorandum of Understanding (MOU) for Sportsman's Access in September, 2003 which commits the agency to improve access for hunting and fishing opportunities on federal lands, as well as to increase the availability of access information to better serve hunters and anglers. In 2003 and 2004, the House Appropriations Committee directed the Forest Service to report on actions being undertaken to improve public access and to work with the Bureau of Land Management to develop a strategic plan that identifies how the agencies will: inventory ownership of roads, trails and access points; prioritize a list of perpetual access easements; and establish a process and timeline for developing current recreational access plans. The Forest Service Washington Office is currently taking action to respond to the Congressional direction and to implement the Sportsman's Access MOU.

Where access is needed for forest management activities, additional rights-of-way may need to be pursued. Currently, the RGNF has identified 187,600 acres of land on the forest for which there is no current legal public access by road. This was determined though a GIS overlay analysis intersecting the 6th level HUC watershed polygon theme with the RGNF ownership polygon theme. This resultant theme was then

intersected with the RGNF roads theme and the acreage determined for those watersheds on the forest that were separated from the forest road network by private land or other reasons. A study should be undertaken to determine which areas need to have access easements established. All or portions of the following watersheds on the forest have no current legal public access by road: Alder Creek, Axtel Canyon, Baxter Creek, Bolton Creek, Box Canyon, Brook Creek, Butterfly Creek, Caldwell Creek, California Gulch, Carr Gulch, Cedar Creek, Chimney Gulch, Chokecherry Canyon, Clover Creek, Cook Creek, Cotton Creek, Cottonwood Creek, Deadman Creek, Denton Canyon, Dorsey Creek, Eaglebrook Gulch, Elk Creek, Elliot Creek, Euclid Gulch, Evans Gulch, Farmers Creek, Ferguson Creek, Fisher Creek, Garner Creek, Goose Creek, Haney Canyon, Henderson Gulch, Holbrook Creek, Hot Springs Canyon, Jack Gulch, Kelly Creek, Limekiln Gulch, Lion Gulch, Lone Tree Creek, Major Creek, Marshall Gulch, McKinney Gulch, Middle Fork Cotton Creek, Middle Zapata Creek, Mill Creek, Mill Gulch, Miller Creek, Morris Gulch, Nieland Creek, Noland Gulch, North Arrastre Creek, North Decker Creek, North Fork South Zapata Creek, North Rock Creek, North Zapata Creek, Orient Canyon, Peterson Creek, Phantom Creek, Pierce Creek, Pioneer Creek, Poison Gulch, Pole Creek, Quartz Creek, Raspberry Gulch, Rio Grande, Rito Alto Creek, Roaring Fork, Round Hill Gulch, San Isabel Creek, San Luis Creek, Sawmill Gulch, Seepage Creek, Short Creek, Soda Creek, South Arrastre Creek, South Decker Creek, South Fork Cedar Creek, South Fork Wild Cherry Creek, South Rock Creek, South Zapata Creek, Spring Creek, Spring Gulch, Swidinski Creek, Tellurium Gulch, Texas Creek, Tobin Creek, Turquoise Gulch, Urraca Creek, Wild Cherry Creek, Yankee Creek.

An important aspect of NFS roads is that they are not public roads. Although they generally are open and available for public use, they are authorized only for the administration, protection, and utilization of National Forest System lands. The Forest Service is a public roads agency with the authority to designate certain National Forest System roads as public roads. By definition, a Public Forest Service Road (PFSR) is under Forest Service jurisdiction with a valid right-of-way and a maintenance level 3-5. These roads are designated "open to public travel" in accordance with the following (23USCs101(a)):

- The roads must serve a compelling public need.
- The roads would remain open and meet Federal Highway Safety Act requirements. Exceptions would be for scheduled seasonal closures or emergency closure needs.

To date, and per agreement with the Federal Highway Administration, most maintenance level 3-5 roads have been subject to the Highway Safety Act requirements but without the public road designation.

The Forest Service has identified certain routes as potential PFSRs. In addition, necessary construction work to improve these roads to the appropriate standard has been identified. Potential PFSRs are identified in the road matrix (see the Appendix C – Road Matrix). Further analysis through travel management and NEPA may be required for these roads.

Opportunities where the Forest road system accesses other ownership lands include the following:

- When road use patterns change, review the road for appropriate jurisdiction and maintenance responsibility.
- Pursue new rights-of-way where access to the National Forest is not adequate for management needs.
- Encourage counties to assume jurisdiction on portions of roads that access subdivisions.

Issues addressed: 3, 4, 5

Related questions: GT3, SI1, WU1, SU1

GT 3: How does the road system affect managing roads with shared ownership or with limited jurisdiction? (RS2477, cost share, prescriptive rights, FLPMA easements, FRTA easements, DOT easements)

The definition of jurisdiction has been subject to different interpretations over the years. "Jurisdiction is the legal right to control or regulate use of a transportation facility derived from fee title, an easement, an agreement, or other similar method. While jurisdiction requires authority, it does not necessarily reflect ownership." (FSM 7705). When addressing road management issues, a thorough research of jurisdiction and legal rights-of-way is recommended for all roads, especially roads associated with a project. The INFRA database jurisdiction information should be verified for accuracy. The Travel Routes Data Dictionary provides examples of the correct coding for roads with a variety of circumstances. Updating the Forest right-of-way atlas is also recommended.

Rights of access by law, reciprocal rights, or easements are recorded in Forest files and county courthouse documents. The Forest recognizes these rights and works with the owners to preserve access while protecting the natural resources and facilities on adjacent National Forest System lands. There is also an understanding by the Forest Service that individuals or entities may have established valid rights, unknown to the Forest Service at this time, to occupy and use National Forest System lands and roads. The courts have established that such valid outstanding rights may be subject to some federal regulation (*Sierra Club v. Hodel*, 848 F 2d. 1068, 10th Circuit, 1988). This analysis recognizes that such valid outstanding rights may exist, and the Forest Service will honor such rights when it is subsequently determined that the specific facts surrounding any claim to such rights meet the criteria for occupancy and use.

Non-federal ownership of lands or interests in lands may include rights granted as part of a reserved or outstanding right or as provided in statute or treaty. Roaded access is the most common type of access pursued in conjunction with two of the more prominent statutes:

- The Alaska National Interest Lands Conservation Act (ANILCA)[3]
- Recognized highway rights-of-way granted over NFS lands under Revised Statute 2477 (RS 2477)[4].

ANILCA

ANILCA ensures access to non-federal land inholdings: "*The authorized officer shall authorize such access deemed adequate to secure the landowner the reasonable use and enjoyment of their land.*" This access may not be the most direct, economical, or convenient route for the landowner and may not be road access in all cases. Alternative routes and modes of access may be considered. If a landowner has an adequate alternative route or mode of access, including access across other land ownerships, the Forest Service is not obligated to authorized roaded access. Reasonable access is currently determined on a case-by-case basis. The Forest Service recognizes valid ANILCA access as a statutory right. Additional discussion on access to private inholdings is included in question GT2.

Requests for access to private inholdings during the winter months have been increasing in recent years. Historically, winter road use has been restricted by snow. This new winter use of the road system creates concerns including adequate road design, strength of the surfacing material to support traffic in other than dry or frozen conditions, safety with mixed-use traffic, wildlife concerns with increased winter traffic, and recreation concerns with the change in winter use patterns. This issue is also discussed in questions RR 2 and WU 1.

[3] Public Law 487. Alaska National Interest Lands Conservation Act of 1980. Act of December 2, 1980. 16 U.S.C. 3210.
[4] Public Law 94-579. Revised Statute 2477 (RS 2477). Rights of Way and Other Easements on Public Land. October 21, 1976. 43 U.S.C. 933

RS 2477

RS 2477 grants rights-of-way for public highways constructed across public domain lands in the late 1800s to early 1900s. A RS 2477 highway must have been constructed across public domain lands before the date of the national reservation; for example, before the land became a National Forest or Grassland. The RGNF was designated a National Forest in 1908. The Federal Lands Policy Management Act (FLPMA) repealed RS 2477 in 1976. However, rights-of-way that predate the establishment of the National Forest are still in effect, unless they have been subsequently relinquished. There is currently a moratorium on processing RS 2477 claims. Any reviews are undertaken on a case-by-case basis.

Numerous roads crossing the Forest fall under the jurisdiction of other agencies. When desirable, cooperative agreements should be established to share road improvement and maintenance responsibilities when all partners can benefit.

Forest Highways are designated under the Federal Lands Highways program of the Transportation Equity Act for the 21st Century (TEA21). These routes are state, county, or Forest Service owned roads qualifying for Highway Trust funding for improvement or enhancement. They provide access to and within the RGNF and are shown in Table 19.

Table 19. Forest Highways on the Rio Grande National Forest.

Forest Highway Route No. -Name	Description	County	Length (miles)
5 - Cumbres Pass	This route starts at the Colorado-New Mexico state line and travels northeasterly and easterly on CO State Highway 17, to east forest boundary 12 miles west of Antonito, CO. This route is also a part of a designated as the Colorado State Scenic and Historic Byway known as the Los Caminos Antiguos.	Conejos, Archuleta	26.7
7 – South Fork – Lake City	This route starts at the junction of CO 149 with US-160 at South Fork, travels on CO Highway 149 to 2 miles south of Lake City. This FH is shared with the Gunnison NF. This route is also designated as the Colorado State Scenic and Historic Byway known as the Silver Thread Byway.	Rio Grande, Gunnison	64.7 (total)
67 – Summitville Road	This route travels from FH 69 west of Summitville, northeasterly on a county road (Rio Grande CR 14/FS 14-330) to US-160 in Del Norte. This route is also known locally as Grayback/Pinos Creek Roads.	Rio Grande	30.6
68 – Alamosa River Road	This route travels from FH 69 northwest of Platoro, easterly on a county road (FS 250) to CO State Highway 15, 12 miles south of Monte Vista.	Rio Grande	33.7
69 – Conejos – South Fork	This route travels from CO State Highway 17, northwesterly along the Conejos River on a county road (Conejos CR 250/FS 250) over Stunner Pass, then along Park Creek (FS 380) to US 160 southwest of the Town of South Fork, CO.	Conejos, Rio Grande	52.0

Table information sources: US DOT Federal Highway Administration, Colorado Forest Highway Route Description table – 06/07/93. Colorado DOT State Highway Map 1999

Portions of these Forest highways may still be under the jurisdiction of the RGNF. When funding is secured and improvements are made to bring these sections to Federal Highway Administration standards, they will be turned over to either the state or county. The Forest needs to cooperate with these agencies by supporting them in their efforts to obtain funding through the Federal Lands Highway Program.

The Forest has cooperative maintenance agreements with the following counties: Rio Grande, Conejos, Saguache, and Mineral. These agreements define the joint road maintenance plans for identified roads. The degree of shared maintenance can vary depending on the most efficient operations for parties involved (see FSM 1509.11-23 and R2 Supplement 1509.11-96-1 for a more complete explanation of the agreements).

The Forest works cooperatively with the Colorado Department of Transportation (CDOT) on highways that pass through the Forest. There are resource concerns with the application of magnesium chloride and the type of snow plowing in the winter months, especially on US 160 over Wolf Creek Pass. The RGNF continues to work with CDOT on these concerns. One of CDOT's primary concerns will always be public safety.

Currently, there are no cost-share agreements with private or public landowners on the Forest. The diversity of ownership and lack of any sizeable inholdings does not indicate a need to pursue agreements of this type at this time.

Opportunities to address jurisdiction and maintenance concerns include:

- A thorough review of jurisdiction and legal rights-of-way is recommended for all roads, and especially roads with current projects proposed.
- Bring lands and engineering specialists into the project early to help determine if access is going to be an issue.
- Update the Forest right-of-way atlas, and keep it current.
- Keep existing road maintenance agreements (Schedule A) updated.
- Pursue agreements with other counties and land management agencies.

Issues addressed: 1, 5, 11

Related questions: GT2, UR/RR2, WU1, AU2

GT 4: How does the road system address the safety of road users?

In 1975, the Forest Service developed a Memorandum of Understanding (MOU) with the Federal Highway Administration that required the Forest Service to apply the requirements of the National Highway Safety Program to all roads open to public travel. In 1982, this agreement was modified to define "open to public travel" as "those roads passable by four-wheeled standard passenger cars and open to general public use without restrictive gates, prohibitive signs …" Most roads maintained at level 3, 4, and 5 meet this definition. Design, maintenance, and traffic control on these roads emphasizes user safety and economic efficiency.

The largest proportion of road maintenance and improvement funds allocated to the Forest is spent on these higher standard roads that are subject to the Highway Safety Act. Safety work (e.g., surface maintenance, roadside clearing, installation and maintenance of warning and regulatory signs) are performed on an annual basis. During the winter, these roads are not usually plowed open. Some are subject to seasonal restrictions to prevent road damage during the early spring when the roads are drying out. Traffic control signing follows standards set forth in the Manual on Uniform Traffic Control Devices (MUTCD). Exceptions are permitted where state or county practices on similar public roads deviate from these guidelines. Signing should

conform with local practice in those situations where use of MUTCD guidelines would be confusing to the motorist.

When accidents occur on Forest roads, often the Forest Service is not immediately informed unless an employee is involved. Accidents involving only public motorists are reported to the local sheriff or state patrol, if reported at all. When the Forest does become aware of an accident, an investigation is initiated to attempt to identify the cause. If a feature of the road is found to be unsafe, addressing the condition becomes a high priority.

Road condition surveys conducted in 1999 to 2002 revealed a backlog of over $1.8 MM in deferred health and safety work items on level 3-5 roads in the analysis area. A large portion of this backlog is a result of deteriorated road surfacing on aggregate-surfaced roads. In the past, road-resurfacing projects were planned as part of commercial timber sale activities. The decline of this program has reduced the Forest's ability to fund this work.

Many arterial and collector roads do not meet standards for alignment or roadbed width. Built originally for commercial use, design considerations did not emphasize the high volumes of public recreational traffic experienced today. Many roads lack sight distance, turnouts, and adequate lane width needed for the higher volume and speed of traffic now occurring. Another high-cost item is removal of roadside brush. Level 3, 4, and 5 roads need to be placed on a recurring schedule to maintain sight distance and a safe clear zone. While this work has been part of the annual maintenance program, it is often dropped in years when budget allocations are reduced. Finally, warning and regulatory signing contributes significantly to the backlog. As funding levels permit, these signs are being installed. Sign maintenance after installation is part of the annual maintenance program of work.

Maintenance level 1 and 2 roads that intersect the higher standard roads need to be clearly distinguished from those managed for passenger car use. This can be accomplished in a variety of ways. The surface type and condition of the lower standard road should convey the impression that a high-clearance vehicle is needed. The route marker used to identify the road should be placed back from the intersection so it does not readily attract attention to the road. It should also be shaped so the number is vertically aligned and not of the distinctive or rectangular shaped signs used on level 3, 4, and 5 roads. The closure device on roads that are maintained at level 1 should be visible from the intersection or have a clear warning sign for traffic approaching the closure. During watershed and project-scale analysis, Forest officials should give high priority to recommending decommissioning those roads that pose the greatest risk to public safety.

There is a potential for hazardous safety conditions when there is mixed-use traffic on public roads. Road Management Objectives (RMOs) are developed for each road in accordance with FSM 7712.5. Road management objectives establish design criteria (FSM 7720) and operation and maintenance criteria (FSM 7730.3) for each road. RMOs require approval and signature by the District Ranger and Forest Engineer, and become part of the road atlas (FSM 7711.1). Safety concerns and travel management restrictions should be addressed in the RMOs, especially where mixed traffic is a concern. Appropriate signing and education can help alleviate the safety concerns. RMOs should be updated to reflect changes in management or resource needs. Documenting the primary use of the road and any safety issues can also help prioritize funding to address critical health and safety concerns.

Travel management regulations are posted on the ground and described on the Forest Visitor's map. These regulations have been established by the Forest to enable safe motorized travel while protecting natural resources and minimizing conflicts between users. Off-road recreational vehicles such as trail motorcycles and ATVs are discouraged on higher standard arterial and collector roads but not prohibited. Colorado state law governs registration of off-road vehicles. This law also applies to out-of-state visitors. These licensed vehicles can then be operated on public roads, including designated Forest Service roads and trails. An effort for consistent signing statewide will show which uses are allowed on each road and trail. Over the next few years, these signs will be installed on all Forest roads and trails. Some counties have separate restrictions for

off-road vehicle travel on county roads. Users should be educated when allowed uses change as different jurisdictions are crossed.

Law enforcement responsibility for road related regulations are sometimes unclear. Signing and law enforcement responsibility on roads can be further defined by agency in joint use maintenance agreements (Schedule A). Efforts to keep signing and closure orders up to date and educating the public about permitted road uses can help consistency in law enforcement efforts.

Opportunities for safety-related road issues:

- Prioritize funding to address critical health and safety needs.
- Ensure road design is adequate to meet the expected traffic on the road to meet the management needs as described in the RMOs. Keep RMOs up to date.
- As set forth in MUTCD, establish and maintain proper signing on roads subject to the Highway Safety Act (most maintenance level 3, 4, and 5 roads).
- Inform users of type of travel permitted on Forest roads through appropriate signing and education, especially when the road crosses through different agencies' jurisdictions.
- Develop an accident reporting system to track locations, types, and frequencies of motor vehicle accidents on Forest roads.

Issues addressed: 2, 10, 12

Related question: AU2

Administrative Use (AU)

AU 1: How does the road system affect access needed for research, inventory, and monitoring?

The road system provides access for a variety of research, inventory, and monitoring activities. Some of these activities are internal to the Forest Service, and some access is provided for other entities conducting the activities. Examples of some of these uses include National Atmospheric Deposition Program sites for air quality monitoring, Remote Automated Weather Stations for fire weather recording, SNOTEL sites, USGS stream gages, and NRCS sites for snow depth measurements. The current road system appears adequate to serve these needs.

Two types of designations on the Forest emphasize research, inventory, and monitoring: Research Natural Areas (RNAs) and Special Interest Areas (SIAs). There are six designated RNAs and seven SIAs on the Forest as shown on Table 20 and Table 21.

Table 20. Research Natural Areas and access on the RGNF.

Research Natural Areas	Access Road Number
Mill Creek	958, 958.3A, and 958.3B
North Zapata	In Wilderness
Deadman Creek	In Wilderness
Spring Branch	326 and 327
Hot Creek	240, 253 and 254.
Finger Mesa	514, 515 and 516

Standards and guidelines in the Forest Plan preclude new road and trail construction in RNAs, except where construction of new trails is necessary to correct resource damage from existing trails. Existing roads are allowed for scientific, educational, or administrative purposes. "Volunteer" two-track roads within the RNAs will be closed. Winter motorized use is possible to these areas, where they are easily accessed from off snowmobile trails or road corridors. Three RNAs are inside designated roadless or Wilderness Areas and are not susceptible to changes in existing road management (see Forest Plan FEIS Appendix F and question SI 3). The road system providing access to the designated RNAs is adequate. Deadman RNA is located in a remote portion of the Sangre De Cristo Wilderness and does not currently have a public road within 7-10 miles of it. Current access is through the private Baca Grande in the Crestone, CO vicinity. This situation may change in the future when a large portion of the Baca Grande will be acquired by public agencies/entities and turned over to Federal agencies for management. North Zapata RNA is located in a remote portion of the Sangre De Cristo Wilderness and does not currently have a public road within 1 mile of it. Current access is through the private Zapata subdivision off of State Highway 150.

Table 21. Special Interest Areas and access on the RGNF.

Special Interest Areas	Access Road Number
Blowout Pass	FSR 329
Chama Basin Landslide Geologic Area	FSR 122
Fremont Historic Area	FSR 650, FSR 640
Wagon Wheel Gap Experiment Station	FSR 600
Elephant Rocks Botanical Area	FSR 666
Ripley Vetch	NA
Bachelor Loop Historic Area	FSR 503

The routes which access these areas are: FSR 101, 101.1G, 101.2A, 101.2F, 101.2G, 103, 103.2A, 103.2B, 103.2C, 103.3, 125, 125.2A, 125.2B, 129, 129.1A, 502, 502.1A, 502.2, 503, 503.1A, 504, 504.1, 504.1A, 504.1B, 504.1C, 504.1D, 504.2, 504.3, 504A, 504B, 505.1, 517, 549.1, 549.2, 558, 600, 600.3A, 619, 641, 650, 650.4A, 650.4C, 659, 660, 660.3A, 660.3B, 665, 666, 670.2A, 700, 706.3B, 786, 787, 792, 795, 796, 885.

In Special Interest Areas, roads and other activities can occur only when consistent with Special Interest Areas values, such as interpretation or education, or to meet other resource objectives. Many of the Special Interest Areas were designated for their geologic, historic, or scenic values and human access is encouraged. The botanic special areas were designated to protection to plants. They vary in size from ½ acre to 10,900 acres. The road system access is adequate to bring scientists, interested observers, and monitoring personnel into the SIAs. Additional access is discouraged in order to preserve the qualities of the area (see Forest Plan FEIS at page 3-190).

Related questions: SI 3, TW 4, EF 1.

AU 2: How does the road system affect investigative or enforcement activities?

The inventoried road system on the RGNF generally provides sufficient access for investigative and enforcement activities. These roads provide access to developed and dispersed recreation sites where violations commonly occur. These roads also provide access to the 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 increasing public use of the National Forest System lands which can lead to an increase in illegal activities.

The 2002 Rocky Mountain Region Law Enforcement Plan lists 5 major criminal problem areas: 1) travel management 2) unauthorized uses 3) theft of forest products 4) minors in possession of alcohol and illegal drugs and 5) residential occupancy. While the law enforcement plan identifies several causes for each of these major criminal problem areas, they are all facilitated by the existence of the road system.

Off-road motorized travel, primarily ATV uses, is the most common travel management violation particularly during the hunting season, and the inventoried road system provides the access for these vehicles. The demand for OHV opportunities on the Forest is increasing, suggesting a need for more designated motorized trails. People driving around road closures on Level 1 and decommissioned roads is another common travel management violation.

Ineffective road closures can facilitate the illegal motorized use of the closed portion of the transportation system. This problem mostly occurs on maintenance level 1 roads, decommissioned roads, temporary roads, and roads that are closed seasonally. Planning for the appropriate type and location of the road closure will help alleviate this problem. Effective identification of the closed road system, both on the ground and with maps, and closure orders, are essential for law enforcement personnel to ensure compliance with the closures.

Unauthorized commercial use, usually in the form of illegal outfitting and guiding occurs on the RGNF. While this occurs mostly in Wilderness Areas, roads provide access to the backcountry trailheads where non-permitted commercial activities occur.

Theft of forest products is also usually conducted using the road system. These can involve theft of timber, firewood, transplants, and Christmas trees.

There are increasing incidences of minors in possession of alcohol and illegal drugs on the Forest. Much of this activity is in the form of evening partying, which often occurs near the urban area just off established roads. These gatherings often result in resource and property damage.

The RGNF needs to address user-created routes and unclassified roads in project level analysis.

Opportunities:

- Inform users of type of travel permitted on Forest roads through appropriate signing and education, especially when the road crosses through different agencies' jurisdictions.
- Keep Road Management Objectives (RMOs) and travel orders up to date.
- Use road closure devices and methods that are most appropriate to the terrain and intermittent access needs.
- Plan for effective closures during initial design phases of the road.
- Use closure methods that provide for hydrologic stability and eliminate vehicle travel. Methods can include ripping and seeding, constructing berms and water diversion structures, removing culverts, pulling slash and stumps across the road bed, scattering boulders, putting the road back to the original contours, planting trees and shrubs in the roadbed, gates and signs. The most effective closure methods will be identified on the ground and documented in the RMO.

Issues addressed: 7, 8, 10, 12.

Related questions: GT 4, TW 3

Protection (PT)

PT 1: How does the road system affect fuels management?

Fire is considered to be a significant disturbance agent in most all forested areas of the Rocky Mountains, but particularly so in the high elevation forests. Fire plays more of a maintenance role in lower elevation forests, but in high elevation forests it has shaped the vegetation mosaic for thousands of years through stand-replacing disturbances on a variety of scales.

Utilization of Land Type Associations (LTA's), as opposed to Cover Types, is more appropriate for Forest-scale analyses. The four major forested LTA's of the RGNF are LTA 1-Engelmann spruce/subalpine fir (49%), LTA 5-Ponderosa pine and Douglas fir (6%), LTA 3-White fir and Douglas fir (5%), and LTA 6-Pinyon pine (5%). Overall, the RGNF is generally in a low frequency/high intensity fire regime (Fire Regimes 4 and 5), with a moderate frequency/mixed severity regime (Fire Regime 3) the next most common. The fuel loads within the predominant LTA/fire regime tend to build naturally, predisposing the stands to potentially large, high intensity fires, though the return interval or frequency is very high (100 to 400 years). However, it should be noted that per *the Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy* document and the National Fire Plan, among other policy and direction documents, the focus of the fuels program should be in fire regimes 1, 2, and 3, and in wildland-urban interface (WUI) areas, regardless of fire regime. The RGNF is a very "rural" Forest with limited WUI treatment opportunities, though they are increasing. Also, the RGNF has a relatively small percentage of ecosystems that could be characterized as falling into fire regimes 1, 2, or 3 (approximately 16%). Within this 16% of fire regimes 1, 2, and 3, the fire hazards are greatest in older, "undisturbed" stands where an accumulation of ground fuels and development of ladder fuels has occurred, characterized as Condition Class 2 or 3. Utilizing structural stage data to represent this, approximately 80% of the forested LTA's 3, 5, and 6 (fire regimes 1 and 3) are in, or approaching, a high fire hazard condition outside of the historic range of variability (Forest Plan FEIS, Chapter 3, page 3-232).

Higher road density and unrestricted motorized travel can increase the risk of ignitions while at the same time aiding fire control efforts. Motorized roads provide access, increasing the level of human activity and the risk of human-caused ignitions. The access provided by these roads can also improve fire crew response time and increase the effectiveness of control efforts. Conversely, limited access in many areas may reduce the risk of human-caused ignitions, but may hamper control efforts by increasing report and response times and allowing fires to grow in size and intensity before the fire crew arrives. Roads may also act as a firebreak for low to moderate intensity fires but would likely have little effect in halting a high intensity fire.

As mentioned earlier, recent fire events and the advent of the National Fire Plan have resulted in an increased emphasis to reduce hazardous fuels, especially in the wildland/urban interface. The major focus of the RGNF fuels management program is hazardous fuels reduction in the urban interface/intermix and near communities at risk. The ability to implement mechanical fuels treatment or prescribed burns is enhanced by the presence of an adequate road system. The access provided to personnel and equipment by an adequate road system increases efficiencies and effectiveness. This is not as critical for prescribed burning, but roads do help in reducing the cost of treatment by decreasing travel costs to and from the treatment location, providing more efficient access for engines and other control equipment, and utilization as a control line. Maintenance level 1 and 2 roads can provide adequate access for these activities.

Accessibility of an area is an important factor in evaluating mechanical treatment feasibility. Without adequate access, many mechanical treatments are not an option; this further limits fuels management alternatives.

In general, the road system, and specifically the maintenance level 3-5 roads, provides adequate access to those Forest areas where it is desirable to implement fuel treatments. The Forest's fuels program has grown

significantly in the last few years and has recently initiated several large fuels projects, with more project planning areas identified in order to develop an outyear ("pipeline") project plan. As previously mentioned, the focus of much of this fuel reduction planning is in the wildland/urban interface/intermix (WUI). Generally, these WUI areas have adequate access for fuel management projects. Exceptions to this general statement include certain residential/forest intermix areas, such as the Conejos Canyon area.

Issue addressed: 3.

PT 2: How does the road system affect the capacity of the Forest Service and cooperators to suppress wildfires?

R2 Guidance identifies this question as being more appropriately responded to at the sub-forest scale.

PT 3: How does the road system affect risk to firefighters and to public safety?

R2 Guidance identifies this question as being more appropriately responded to at the sub-forest scale.

PT 4: How does the road system contribute to airborne dust emission resulting in reduced visibility and human health concerns?

Air quality impacts from the Forest road system are associated with vehicle emissions and dust from traffic on unpaved roads. These effects typically are localized and temporary, and their extent depends on the amount of traffic. Dust from unpaved roads increases with dryness as well as vehicle weight. Forest roads are usually unpaved and are used for recreational purposes (such as passenger cars and four-wheel drive use), as well as resource management purposes related to timber harvest, mining, oil and gas development, and fire/fuels management.

National air quality standards must be met on the Forest to comply with the Clean Air Act. The State of Colorado has determined that there are no non-attainment areas on the Rio Grande National Forest.

Motorized recreation occurs year-round. Summer use includes off-highway, two-wheel and four-wheel drive vehicles. When these vehicles travel on unpaved surfaces, they can stir up dust However, as use of Forest roads increases with visitation, road dust impacts to sensitive areas may need to be addressed.

Vehicular travel on unpaved roads can be expected to be heavy during resource management activities such as timber harvest, mining, oil and gas development, and during the infrequent, large-scale fire suppression or fuels treatment projects. These uses typically require dust abatement measures to reduce the air quality impacts of sustained and heavy traffic use. It is a standard procedure during large-scale suppression operations (Type 1 and 2 incidents) to utilize dust abatement methods on the unpaved roads, generally with water. The application of dust palliatives to a road surface not only alleviates traffic-related dust problems, but it also benefits the road and the surrounding area by increasing road-surface integrity. The increased surface integrity reduces fine-sediment erosion and decreases wash-boarding of the road surface. Dust abatement product application reduces resource degradation, increases safety to drivers, and creates cost-saving road maintenance benefits. Other mitigation measures may also be necessary, such as reducing haul speeds, watering, and limiting the number of trips per day and the time of day for operations. On un-surfaced roads, temporary increases in dust emissions occur during and after routine surface maintenance when conditions are dry. Watering during blading or scheduling maintenance when natural moisture content is higher would help reduce dust emissions.

Specifying the type of dust abatement product or method and frequency of use is not a programmatic issue. This is a relatively expensive activity and is dependent on budget levels and priorities. Dust abatement should be considered as a mitigation measure for higher traffic volumes resulting from commercial activities and special use permits, particularly on arterial and major collector roads when traffic is expected near developed recreation sites. It should also be considered on higher volume roads that are in riparian areas where dust could have unacceptable impacts to sensitive plants and animals.

Recreation (UR and RR)

UR 1 & RR 1: What are the supply and demand relationships for motorized and or non-motorized recreation opportunities?

Forest roads provide travel opportunities for resource management and recreational activities. Recreation activities include driving, walking, or bicycling onto and through the RGNF, yet there is a dichotomy in the way Forest users view roads. Comments received during the Forest Plan revision process demonstrated the difference of opinion about motorized and non-motorized opportunities on the Forest. Visitors often have strong opinions about motorized and non-motorized access. Building roads and closing roads continue to be controversial.

Some people feel unroaded areas need to remain undeveloped and relatively undisturbed by humans for wildlife and other resources protection purposes.

Motorized users express their need for additional routes and opportunities. They often feel they are losing road and trail opportunities on the RGNF. The Forest Plan identified motorized and non-motorized travel routes with a net reduction in motorized road miles. Motorized users also prefer long distance routes or loops.

Roads are closed or restricted to motorized use to prevent unacceptable resource damage, avoid wildlife conflicts or habitat degradation. Seasonal road closure will tend to affect traditional access patterns for recreation opportunities, hunting, and firewood gathering.

Recreation Opportunity Spectrum (ROS)

The Recreation Opportunity Spectrum (ROS) is a tool to describe the recreation setting and how it is managed. The spectrum describes and defines recreation settings that provide different types of recreation experiences. The presence of roads and the distance from roads are two criteria for determining an area's ROS class. The spectrum of ROS classes available on the RGNF is shown in Map 9 and Table 22. Generally an area with Wilderness or Semi-primitive Non-motorized ROS does not contain roads while a Semi-primitive and Roaded Modified ROS does contain roads.

Table 22. ROS class mix on the Rio Grande National Forest.

ROS Class	Acres	Percent of Total Area
Wilderness (Pristine, Primitive & Semi-primitive)	429,055.34	23%
Semi-Primitive Non-motorized	304,125.18	17%
Semi-Primitive Motorized	209,993.14	11%
Roaded Modified	914,322.81	49%

The Roaded Modified (RM) class describes an area with level 3 and 4 roads (arterials) that provide access to other, less developed areas. Sightseeing and driving for pleasure are dependent on maintenance of arterial and collector roads (level 3 and 4 roads). Roaded Modified areas have modifications to the natural environment. Improvements include roads, trails, campgrounds, and scattered facilities. There is limited opportunity to escape from other visitors. The Roaded Modified (RM) class also includes timber harvest areas, skid trails and landings. These roads are typically temporary (although some level 3 roads are developed), and there is some opportunity to avoid other users within these areas. Visitors can expect to encounter logging and other management activities.

The Semi-Primitive Motorized (SPM) ROS setting offers access on level 1 and 2 roads or on designated trails open to motorcycles or ATV's. These areas provide limited opportunity to experience solitude, have little or no improvements except for road and trail maintenance, and appropriate controls to reduce impacts to resources.

The Semi-Primitive Non-motorized (SPNM) ROS setting offers solitude in large (>5,000 acres) undeveloped areas that typically are more than a mile from open roads. Numerous SPNM areas were inventoried as roadless in the Forest Plan. A majority of these areas are allocated to a Backcountry Management-Area prescription that remains undeveloped and relatively undisturbed by humans. These areas are accessed by foot or horse, provide solitude with limited human encounters, and are areas for self-reliance and risk taking with no site development or site modifications within the natural environment.

The extensive area in Wilderness on the RGNF provides opportunities for solitude with no roads or motorized use.

Recreation Use

The RGNF participated in the National Visitor Use Monitoring project (NVUM) in 2000/2001. Forest visitors were surveyed at different sites, including Forest roads. Data collected helped determine visitor use and primary activities on the RGNF. Nearly all activities required access by a Forest road. Developed facilities, trailheads and access to dispersed areas are generally located on a maintenance level 3, 4, or 5 roads. Table 23 below illustrates the primary activities and percent participation by visitors on the RGNF.

Table 23. Visitor Participation in recreation activities on the RGNF.

Activity	Percent Participation	Percent Who Said It Was Their Primary Activity
Viewing natural features such as scenery, flowers, etc on national forest system lands	78	68
Viewing wildlife, birds, fish, etc on national fores system lands	75	56
Hiking or walking	59	52
Driving for pleasure on roads	57	17
Off-highway vehicle travel (4-wheelers, dirt bikes, etc)	52	17
General/other-relaxing, hanging out, escaping noise and heat, etc.	30	6
Picnicking and family day gatherings in developed sites (family or group)	27	12
Hunting – all types	18	18
Snowmobile travel	17	9
Fishing – all types	14	11
Cross-country skiing, snowshoeing	11	1
Downhill skiing or snowboarding	10	10
Camping in developed sites (family or group)	5	1
Primitive camping	3	1

NVUM visitor use was also categorized by facility or area type use as shown in Table 23. The top four activities on the Forest were driving on Forest roads and scenic byways, using developed campgrounds and hiking or horseback riding. These activities show the importance of Forest roads to use the various Forest facilities.

Table 23. Facilities used by survey respondents in FY 2001.

Facility / Area Type	**Percent Who Said They Participated (National Forest visits)**
Other forest roads	56
Scenic byways	45
Developed campgrounds	33
Hiking, biking, or horseback trails	30
Designated Wilderness	29
Interpretive site	20
Visitor center, museum	19
Designated Off Road Vehicle area	18
Picnic area	16
Motorized developed trails	15
Boat launch	12
Developed fishing site/dock	8
Forest Service office or other info sie	7
Recreation residences	5
Swimming area	2
Organized camp	1

Recreation Trends

It is important to understand trends in recreation use, in order to meet future needs or desires of Forest users. Sixty-eight percent of those surveyed said viewing scenery was their primary activity when visiting the Forest; while another fifty-six percent indicated viewing wildlife was important. Days spent sightseeing are expected to increase 75% by 2050 (an average 1.5% per year), with the number of trips taken increasing by 90% within this same period (Bowker et al. 1999).

Visiting undeveloped (Backcountry) areas or wilderness was another popular and important activity. These areas provide a variety of opportunities and challenges, panoramic views and long distance travel. Hiking, biking and horseback riding are probably the most compatible trail activities. Hiking and horseback riding are expected to increase over the next 50 years: 60% for horseback riding and 59% for hiking. This is an increase of more than 1% per year.

By 2050, time spent in using a 4 wheel drive vehicle or ATV is expected to increase by 54%, while actual participation will increase by 37% (Bowker, English et al. 1999). Age and income levels appear to have an adverse relationship to the type of recreation activity preferred; hiking or horseback riding is higher in the

younger population with a lower income level. Older users prefer a leisurely OHV trail system (generally an old two-track) where they can see some backcountry without having to walk or ride a horse.

There is an influx of retirees using the forest's campgrounds, site seeing and generally using the forest. While some in the older age group prefer easier access to their favorite recreation spots, others want to motorized trials to get to remote areas. In either case, a well-designed road system is imperative for their access.

Issues addressed: 3, 4, 10

Related questions: SU1, GT 3, GT 4

UR 2 and RR 2: Part 1) Is developing new roads into unroaded areas, decommissioning of existing roads, or changing the maintenance of existing roads causing substantial changes in the quantity, quality, or type of unroaded (or roaded) recreation opportunities? Part 2) How do user-created routes affect the management of the road system?

No new roads have been built on the RGNF including unroaded areas since the revised Forest Plan was implemented in 1996. This and the current road management have not caused substantial change in the current recreation opportunities. Maintenance of existing roads has changed, however, due to a lack of funds and personnel. Increasing or decreasing annual road maintenance levels will affect the frequency and pattern of use. Roads that provide the opportunity for scenic and wildlife viewing should be maintained on an annual or bi-annual basis. Road maintenance funding shortfalls means not all annual road maintenance is occurring on existing Forest roads and over time, they may become hazardous for sedan travel. Routine road maintenance will enhance use of Forest roads and the public's ability to pursue other recreation activities and opportunities.

A mapping analysis using GIS roads, inventoried roadless and backcountry area layer was developed to assess if existing road segments were within inventoried roadless/backcountry areas. This analysis used the most current updated and precise information. This mapping analysis revealed that 517 miles (4,686 acres) of inventoried Forest roads in addition to 52 miles (3,792 acres) of unclassified roads (roads with no route number) are within the mapped boundaries of backcountry management areas. Most of this appears to be the result of boundary mapping errors (in conjunction with the old road database) used in the Forest Plan revision. A closer assessment of each road segment mapped in backcountry areas will need to be undertaken to verify the accuracy of the data and map boundaries of the backcountry areas may need to be corrected This may occur in the future at the forest or project scale. See Map 12 Mapped Road Segments Within Backcountry areas.

Any road status change or decommissioning will require analysis and a decision at the project level.

User-created roads impact the RGNF, causing resource damage and erosion and requiring administrative time. These roads are primarily an enforcement issue but may also require resource remediation. The RGNF has worked with the San Luis Valley Ecosystem Council to begin to monitor these user-created roads. The management of this situation will occur on a site specific basis at the project level.

Issue addressed: 5, 7, 8, 9, 11

Related questions: TM2, TM3, GT3

UR 3 and RR 3: What are the adverse effects of noise and other disturbances caused by developing, using, and maintaining roads on the quantity, quality, and type of unroaded (and roaded) recreation opportunities?

Noise and other disturbances caused by developing, using, and maintaining roads can indirectly affect quantity, quality, and type of dispersed recreation opportunities. Road use on the RGNF is seasonal. Where road use activities are heavy during certain seasons, visitors will have a less primitive experience and could be displaced to other parts of the forest. Heavy road use is usually short term. Motorized users can affect the solitude of visitors within earshot of roads or motorized trails, especially with vehicles such as motorcycles, dirt bikes, and ATV's without effective noise abatement. This use can be site specifically managed in relation to sight and noise distances.

In winter, road corridors become snowmobile and ski trails. Some road corridors become groomed routes for snowmobile users and cross-country skiers. In some areas of the forest, these two activities are not compatible and require management. In other areas, access is not exclusive to motorized or non-motorized users, and so until users can disperse away from trailheads or staging areas, noise will be a factor. Snowmobile noise is the major complaint from cross-country skiers and snowshoe users.

Road construction and reconstruction activities can be disruptive to recreation users but this is temporary, as these are usually short term activities.

Issue addressed: 11

Related questions: TW2, TW3

UR 4 and RR 4: Who participates in unroaded recreation and road-related recreation in the areas affected by constructing, maintaining, and decommissioning roads?

Forest visitors use arterial/collector roads (level 3-5 maintenance levels) to get to their primary activity on the Forest. Level 2 roads provide dispersed recreation users access into many remote areas on the RGNF.

The NVUM survey indicated that about 11.2% of forest visitors were from other countries. Local residents made the most frequent visits to the forest (81%) with the remaining visits (29%) by visitors from out of state and communities along the front range of Colorado. The survey identified 224 different visitor zip codes.

The NVUM survey also found that most visitors were predominately male (89%) while 11% were female. The survey also outlined that 80.2% of those visiting the Forest were ethnically white, 19.4% were Hispanic and 0.4% were American Indians.

In addition to gender, the survey findings indicate that most visitors were between the ages of 31 and 60. The national study categorized age groups differently than the U.S. Census. Table 25 compares the age classes of NVUM and Census groups. Nearly 58% of Forest visitors were in the age group 31-60, compared with 51% of the general population. Nearly 9% of the general population is over the age of 65; however 10.3% of visitors to the forest are over the age of 65.

Table 25. Age distribution of NVUM survey respondents compared to the U.S. Census general population. Age breakouts are not directly comparable.

Age Group (years)	Percent in NVUM Group	Age Group (years)	Percent in 2000 U.S. Census
Under 16	17.3	Under 5	6.9
16-20	5.2	5 - 9	7.2
		10 - 14	7.2
		15 - 19	7.1
0-16	22.5	0-19	28.4
21-30	9.6	20 to 24 years	7.1
31-40	14.6	25 to 34 years	15.4
21-40	23.2	20-34	22.5
41-50	19.6	35 to 44 years	17.1
		45 to 54 years	14.3
41-50	19.6	35-54	31.4
51-60	23.4	55 to 59 years	4.5
61-70	8.2	60 to 64 years	3.4
Over 70	2.1	65 to 74 years	5.3
		75 to 84 years	3.3
		85 years and over	1.0
51-70+	42.7	55-85+	16.5

Detailed Census information for areas within and surrounding the RGNF is available in the NRIS Human Dimensions Module available on the Forest.

UR 5 and RR 5: What are these participants' attachment to the area, how strong are their feelings, and what alternative opportunities and locations are available?

Visitors to the RGNF have a high attachment and concern for roads and trails, as indicated by the number of mapped "Concern Level 1" and "Concern Level 2" roads on the Forest. Concern Level 1 is defined as viewers having a high concern for the scenery surrounding them on heavily used, major corridors or reads that directly access recreation sites or trails. Concern Level 2 is defined as viewers having a moderate concern for the scenery surrounding them on inventoried roads with a moderate amount of traffic use. Many of the roads and trails on the RGNF are mapped as Concern Level 1 or 2 and experience high volumes of visitors annually. This can indicate that constituents, both local and non-local, have strong emotional attachments to these areas, or to areas that are accessed by the roads and trails.

Many people in the San Luis Valley, some of whom are descendents of original Spanish Settlers, choose to live in somewhat traditional ways and rely on the nearby public lands for wood for heating and cooking, and

hunting and gathering to supplement their diets. These people, along with the other residents of the Valley, still use the roads and trails of the RGNF for access to hunting, plant gathering, trapping, firewood gathering, and special forest product gathering.

Users from the national, regional and local levels all have strong opinions about Forest road management. Road use (including motorized and non-motorized use), road construction, and road closure continue to be contentious issues.

Both motorized and non-motorized recreation opportunities are provided on the neighboring Bureau of Land Management and Great Sand Dunes National Park and Preserve, Pike and San Isabel National Forest, Gunnison, Carson National Forest, and the San Juan National Forests.

Issue addressed: 11

Related questions: UR/RR2

UR 6 and RR 6: How does the road system affect the Scenic Integrity? How is developing new roads, decommissioning of existing roads, or changing the maintenance of existing roads into unroaded areas affecting the Scenic Integrity?

The road system is one of the primary basis for which the Scenic Resources are measured. All roads and trails are given a Concern Level (Level 1, 2, or 3) based upon users concern for scenic value. Concern Level 1 indicates viewers have a high concern for the surrounding scenery. Concern Level 2 would indicate that viewers have a moderate to high concern for the surrounding scenery, and Concern Level 3 indicates that viewers have the least concern for the surrounding scenery. Usually Concern Level 3 roads are roads that are only used for administrative purposes and are not used by forest visitors. Concern Levels help determine what degree of change is acceptable to the surrounding landscape.

The greater number of roads can negatively affect the Scenic resource by changing the Characteristic Landscape. Viewing other roads from Sensitivity Level 1 roads can also negatively affect the Scenic Resource if large cut banks or fill areas are seen. Conversely, some roads can positively affect the landscape. A "Sensitivity Level 1" road that directly accesses a site valued by the public (i.e. special interest area, scenic overlooks, recreation destinations), can elevate the Scenic Integrity Objectives for the surrounding area and make this area more valued when providing access.

Decommissioning roads usually have a positive affect to the characteristic landscape, as it reduces eliminates any scars or non-characteristic affects to the landscape, especially if the road is highly visible. Decommissioning poorly designed roads or roads in a highly visible area from another road can positively affect the surrounding landscape and ultimately the Scenic Integrity.

The Scenic Integrity may be negatively affected if roads are not maintained causing slides, erosion, noxious weed problems, or other resource damage.

RR 7: How does road management affect wilderness attributes, including natural integrity, natural appearance, opportunities for solitude, and opportunities for primitive recreation?

Roads and road use may negatively affect non-motorized recreationists. Although they use roads to access trailheads into unroaded areas or wilderness areas, many users perceive roads to have a negative effect on the environment. They see these unroaded areas as critical to their individual, community, or ecosystem health. The presence of roads and road use can diminish opportunities for solitude.

Numerous roads across the Forest provide convenient access to both backcountry and Wilderness trailheads to access these areas. The Forest is experiencing an estimated 10-15% increase in OHV and snowmobile use

each year. This increased use of motorized vehicles has resulted in an increase in user created roads in backcountry and Wilderness and increased snowmobile use in Wilderness. These motorized intrusions impact the areas natural appearance, opportunities for solitude and a primitive recreation experience.

Although roads provide access to the Wilderness areas, roads near or adjacent to Wilderness areas would not be considered a positive Scenic or experiential attribute as this can negatively affect opportunities for solitude. Scenic Integrity Objectives on the landscape range from "Very High" or no landscape deviations, "High" or no visible landscape deviations, "Moderate" or some landscape deviations, "Low" or landscape deviations, and "Very Low" or noticeable landscape deviations. The Scenic Integrity Objective for Wilderness is "Very High" or managed so that there are no deviations to the characteristic landscape. Both local and non-local constituents expect wilderness areas to contain a more natural appearing landscape as well as maintain the natural integrity of the characteristic landscape. Any non-characteristic feature (any deviation to the current characteristic landscape) within wilderness would have a negative impact to the Scenic Integrity, natural appearance, and natural integrity.

The presence of roads and the associated road use can also affect unroaded areas under consideration for additions to the National Wilderness Preservation System.

Issue addressed: 11.

Social Issues (SI), Cultural/Heritage Issues (CH), Civil Rights (CR), and Environmental Justice

SI 1: Who are the direct users of the road system and of the surrounding area? What activities are they directly participating in on the Forest? Where are these activities taking place on the Forest?

The Rio Grande National Forest participated in the National Visitor Use Monitoring (NVUM) project from January 1 through December 31, 2000. Reported visitor days totaled 1.3 million National Forest visits. Visitors were composed of about 89% males and 11% females. Based on interview information about 80% of visitors to the Forest where white and 20% were Hispanic. About 17% of the visitors were under age 16, about 2%of the visitors were over 70 years old, and the 51-60 year old age group comprised 23% of the visitors. About 11% of forest visitors were from another country. There was an average of 2.6 people per vehicle reported.

During their visit to Rio Grande National Forest the top five recreation activities participated in were: viewing scenery, viewing wildlife/nature, driving for pleasure, OHV travel, hiking/walking, and bicycling The top primary activities of visitors were viewing scenery, viewing wildlife, hiking/walking, hunting, driving for pleasure and OHV travel. Driving for pleasure on roads was done by 57% of visitors and 17% reported it as their primary activity. Hiking or waking was done by 59% of visitors and 52% reported it to be their primary activity. See Table 26.

Table 26. Activity Participation and Primary Activity for the Rio Grande National Forest.

Activity	Percent participation	Percent who said it was their primary activity
Camping in developed sites (family or group)	5	1
Primitive camping	3	1
Backpacking, camping in unroaded areas	4	2
Resorts, cabins and other accommodations on Forest Service managed lands (private or Forest Service run)	4	0
Picnicking and family day gatherings in developed sites (family or group)	27	12
Viewing wildlife, birds, fish, etc on National Forest System lands	75	56
Viewing natural features such as scenery, flowers, etc on national forest system lands	78	68
Fishing- all types	14	11
Hunting- all types	18	18
Off-highway vehicle travel (4-wheelers, dirt bikes, etc)	52	17
Driving for pleasure on roads	57	17
Snowmobile travel	17	9
Hiking or walking	59	52

Activity	Percent participation	Percent who said it was their primary activity
Horseback riding	32	0
Bicycling, including mountain bikes	35	0
Non-motorized water travel (canoe, raft, etc.)	3	0
Downhill skiing or snowboarding	10	10
Cross-country skiing, snow shoeing	11	1
Other non-motorized activities (swimming, games and sports)	16	0
Gathering mushrooms, berries, firewood, or other natural products	4	0

Some roads hold more importance for Forest users than others. The roads considered to be the most important on the RGNF include:

Conejos Peak Ranger District: Cumbres Pass (Colorado Highway 17), Conejos River Road (FSR 250), Alamosa River Road (FSR 250).

Divide Ranger District: Wolf Creek Pass (U.S. Highway 160), Park Creek Road (FSR 380), Pass Creek Road (FSR 390), Beaver Creek Road (FSR 360), Colorado Highway 149, Pool Table Road (FSR 600), Middle Creek Road (FSR 528), Rio Grande Reservoir Road (FSR 520).

Saguache Ranger District: Colorado Highway 114, Carnero Creek Road (Road 41G), Squaw Creek Road (FSR 739), and the Bonanza Road (Road LL36). These roads are highly visible and are main access points.

Issues addressed: 4, 5, 7, 8.

Related question: AU2

SI 2: Why do people value their specific access to national forest and grasslands? What opportunities does access provide?

Access is predominantly viewed as a social issue and people can value existing access opportunities, whether they exercise them or not. Others can value areas with limited or no opportunities for access, seeing access as negative. "Why do these people value their access?" Some people perceive roads to be the only means of access to forest resources, on which they may be economically and culturally dependent. Roads are oftentimes seen as a part of the landscape and culture of the area.

Some of the values people hold for an area or a forest resource are spiritual, religious, or have ties to traditional customs. Road obliteration, closure, reconstruction, or construction, or a change in management of an existing road in proximity to unique or special areas can change not only the access, but also the experience in terms of natural integrity, opportunities for solitude, vistas, noise, and dust levels and crowding in adjacent forestlands.

Understanding why people value and desire more or less access to an area will help decision-makers understand how road management changes may impact people's current and future uses of the Forest. As an example, if a road is managed as a Level 3 road and the decision is made to upgrade it, more and different users might begin to use the area. This will change the character for users who consider the area to be special; it will change their experience and may displace current users to other areas for their recreation. Likewise, if a

road is currently managed as a Level 4 road and the decision is made to downgrade maintenance, the road will not be as comfortable to drive, and the area can become inaccessible for some current users. Because a variety of different people use the existing road system, people need to be considered before road management changes are made.

Many types of recreation are road-dependent, so users want roads maintained (see the discussion in UR/RR1). Hunting is both facilitated and hindered by roads. Illegal use of roads is a concern for many hunters who may track big game for several miles on foot only to meet someone using a motorized vehicle (OHV or 4WD) on a road that is not open to motorized vehicle use. Motorized use of roads is not necessarily helpful when tracking game; however, roads are useful for packing an animal out of a remote area (see discussion in Chapter 3, Issue # 9).

Issue addressed: 9

Related question: AU2

SI 3: What are the broader social and economic benefits and costs of the current Forest road system and its management?

Many communities and individuals have social and economic dependencies on RGNF roads and the access they provide to Forest resources. Changes to a road system or to road management may affect (positively or negatively) such things as local commuting patterns, lifestyles, forest resource-related businesses, the collection of special forest products; school bus routes, firefighting access needs in the wildland-urban interface, and access to municipal water supplies, power lines, natural gas lines, and other local infrastructure. Some communities are more vocal than others on this topic and are highly dependent on the RGNF for the health of the local economy. Road management is considered necessary for Forest management as commodity users rely on the existing road system.

The benefits provided to communities around the RGNF extend beyond those who directly access or use Forest resources. People owning or working in businesses in "gateway" communities often benefit from tourism associated with people visiting the nearby National Forest. Providing quality roadless opportunities is also an important aspect to consider for "gateway" type communities. Local businesses also benefit through the potential economic activity generated by resource activities like timber harvest, grazing, road development and maintenance, water projects, and other special uses. Tourism is an important part of maintaining a more diverse economy for communities around the Forest. Communities may benefit from tourism and the associated infrastructure development that also enhances the local quality of life. However, these developments may negatively impact surrounding resources. These "externalities" may include the overall impact to resources such as soil, water, habitat, and scenery or damage to values people hold for an area such as an unroaded character, limited accessibility, or solitude.

Ethnic groups, subcultures, Indian tribes, national interest groups, and local residents can hold cultural, spiritual, sacred, traditional, symbolic, or religious values associated with access to specific places, opportunities, or resources on the Forest. The groups most commonly heard from on projects are those who are directly affected by a project or special interest groups representing a particular segment of the population. People who comment might be from other parts of the country, but they hold intrinsic values for forestlands and management of the RGNF.

The Forest Plan identified special areas on the Forest: Wild and Scenic Rivers, Research Natural Areas, and Special Interest Areas. Suitable access to these areas is in place on the Forest. Level 3, 4, and 5 roads lead to other important areas accessed by Level 2 roads, and generally dispersed recreation sites. Well-developed and regularly used dispersed campsites can also be considered special areas. Dispersed camp and recreations sites that are close to rivers and lakes are a source of concern. Since water serves as an amenity to most

campers, removing these campsites may be a last resort; cleanup, revegetation, and rest can help mitigate resource problems.

The National Survey on Recreation and the Environment

The Forest Service completed its Strategic Plan (2000 Revision) in October 2000. The goals and objectives included in the Strategic Plan were developed with input from the public, some of which was obtained through a telephone survey. The long-term goals and objectives of the Strategic Plan must therefore reflect not only the agency's mission, but also the public's views and beliefs for our country's forests and grasslands. A telephone survey randomly selected members of the American public who were asked about the following:

Their values with respect to public lands.

Their objectives for the management, use and conservation of forests and grasslands.

Their attitudes about the job the USDA Forest Service has been doing in fulfilling their objectives.

Their beliefs about the role the USDA Forest Service should play in fulfilling those objectives.

The following discussion is based on 7,069 responses to the NSRE phone survey:

The American public is divided in its opinion about issues relating to access, as evidenced by the difference between support for motorized access and support for non-motorized access.

Motorized recreation is not a high priority objective, while preserving the ability to have a "wilderness experience" is important.

The expansion of off-highway motorized access and the development of new paved roads are somewhat unimportant objectives and trails for motorized access are slightly unimportant to the public. Contrast this with the provision of non-motorized access, which is viewed as a somewhat important objective to the public.

The provision of increased access for motorized recreation is seen as a slightly unimportant objective for public land management and is also viewed as a slightly unimportant role for the USDA Forest Service (NSRE 2000). Non-metropolitan easterners and metropolitan westerners see motorized access as a more important objective than do non-metropolitan westerners and metropolitan easterners. Agency performance in the area of motorized recreation is viewed as somewhat favorable, except in the case of off-highway motorized access, where the agency role and performance are rated as slightly unfavorable.

The agency is viewed as doing a somewhat favorable job providing non-motorized access. Support for non-motorized recreation opportunities is stronger in metropolitan areas than non-metropolitan areas. Separating these often conflicting types of pursuits by designating trails for specific uses is seen as a somewhat important objective, with higher support outside of metropolitan areas.

Issue addressed: 6.

SI 4: How does the road system and road management contribute to or affect people's sense of place?

Sense of place describes the character of a physical location and the meaning, value, and feelings people attach to it because of their experiences there. It integrates interpretations of a geographic place, including the biophysical setting, psychological influences (memory, choice, perception, imagination, emotion), and social and cultural influences. People's sense of place is directly tied to the characteristics of an area that invoke a special feeling of attachment to the area.

Changes in road management can affect access to these special places or change their biophysical setting, affecting people's sense of place and what they value or desire in an area. Roads may facilitate some people's enjoyment of the area by providing for driving comfort, the amount and type of use, and any number of

aesthetic attributes visible alongside the road. In contrast, roads may deter from characteristics that are highly valued for some people's enjoyment and appreciation of an area.

People who visit a particular place have expectations about what they may see or experience. This helps build a mental picture of a particular area. Certain images such as romanticism, emotionalism, and knowledge are attached to features of a place. The scenic, cultural, social, and biophysical characteristics of a landscape, along with the psychological influences (memory, choice, perception, imagination, and emotion) help form the "sense of place" in which people live and interact. People's sense of place is directly tied to the characteristics of an area and experiences associated with this area that invoke a special feeling of attachment. Several images may be attached to a place. Even a geographic area, such as the San Luis Valley, can have an identifiable image.

The San Luis Valley lies adjacent to the RGNF. It is a high mountain desert with unique geologic and cultural features. This area is much like northern New Mexico, as it was settled primarily by the Spanish as they moved north, however, it is a unique and distinct portion of Southern Colorado and stands alone. Surrounded on all sides, except to the south, by high mountain peaks, this area is still somewhat isolated both culturally and economically. This area contains unique architecture, Native American influence, and Hispanic settlements, including large Spanish Land Grants that are deeply routed in religious practices. Many people in the San Luis Valley, some of whom are descendents of original Spanish Settlers, choose to live in somewhat traditional ways and rely on the nearby public lands for wood for heating and cooking, and hunting and gathering to supplement their diets.

Changes in road management can affect access to these special places or change their biophysical setting, affecting people's sense of place and what they value or desire in an area. Roads may facilitate some people's enjoyment of the area by providing for driving comfort, the amount and type of use, and any number of aesthetic attributes visible alongside the road. In contrast, roads may deter from characteristics that are highly valued for some people's enjoyment and appreciation of an area.

Particular areas that currently have "sense of place" attachments to them would be, Trujillo Meadows, Chama Basin, Neff Mountain, Conejos Canyon, Alamosa Canyon, Old LaManga/Elk Creek, Spruce Hole, Navajo Canyon, Alamosa Campground, Johns Creek, Saguache Park, La Garita, Sangre de Cristo Mountains, Wheeler Geologic Area, Rio Grande Reservoir, and the Continental Divide Trail.

This list is just a partial list and many smaller areas can be considered to have special attributes and sense of place attachment across the RGNF.

Issue addressed: 5.

SI 5: What are the current conflicts between users, uses, and values (if any) associated with the road system and road management? Are these conflicts likely to change in the future with changes in local population, community growth, recreational use, resource development, etc?

Conflicts often occur between different types of users (motorized and non-motorized, hunting/fishing and non-consumptive, and resource preservation and resource extraction) and within uses (e.g., motorized and non-motorized hunting). Understanding these conflicts provides needed context for road management, enabling decision-makers to predict the social effects of their decisions with regard to existing conflicts. It will also help decision-makers formulate road management decisions that may help resolve or mitigate these conflicts.

Conflicts may increase in severity and geographic distribution as use levels increase. Conflicts may also increase as more subdivisions are developed adjacent to and within the boundaries of the Forest. Populations in communities around the Forest continue to grow and change in character. Demands for levels of road maintenance on the main arterial and collector roads may also increase.

Issues addressed: 1, 5, 10

Related question: GT4

CH 1: How does the road system affect access to paleontological, archaeological, and historical sites and the values people hold for these sites?

Access to paleontological, archaeological, and historical sites provides opportunities for studying, learning about, and enjoying our natural history and cultural heritage. People want different experiences at resource sites. Some people want roads to go right to the sites for ease of access and quick visits. Others prefer to have road access near paleontological and cultural resources but not visible from the sites so the feeling of the site is more as it may have been in the past. Others seek sites that are far from roads and trails so they can experience the feeling of discovery and the perception of being one of the few to visit the site. American Indians often prefer that roads not be visible or audible from sites they consider sacred. Lack of roads to a site is unlikely to stop a scientist from studying a resource of interest.

Rio Grande National Forest cultural resources provide a variety of experiences. At present, the public has not expressed interest or concern in closing or opening additional roads to specific cultural sites on the Forest. Access to paleontological, archaeological, and historical sites also increases risks of unintended physical damage, artifact and fossil collection, and site vandalism. Closing roads usually improves protection of paleontological and cultural resources by decreasing the number of people in the area, thereby reducing artifact and fossil collection and other forms of site damage. Opening new roads, conversely, exposes these resources to increased visitation and possible site damage, especially sites within ¼ mile of the road corridor.

If maintenance actions, including plowing snow, stay within previous disturbance, vertically and horizontally, road maintenance has no potential to cause effects, as defined in 36 CFR 800.3(a)(1) for Section 106 of the NHPA. If the action needs to expand beyond previous disturbance, a cultural resource assessment is needed for that area. Indirect effects, such as illegal artifact collecting, may be mitigated by providing better education and information.

CH 2: How does the road system and road management affect the exercise of American Indian treaty rights?

Congress ratified an act (June 15, 1880) to purchase all lands within Colorado from the confederated bands of the Ute Indians. This included the Southern Ute, the Ute Mountain Ute, and the Northern Ute Tribes. In part, the act required that the Ute Bands be moved to the reservation along the La Plata River or to the Uintah Reservation in Utah. This congressional act terminated all Ute treaty rights to lands administered by the RGNF. Although Tribal treaty rights have been terminated on lands administered by the RGNF, the Forest has a trust responsibility to tribal governments, brought about by federal laws and regulations. Access to medicinal plants, minerals, and sacred or spiritual places are the most important trust rights. The road infrastructure allows Tribal members access to exercise these rights. In contrast, roads within areas identified as culturally important may be viewed as detrimental by affected American Indian tribes.

CH 3: How does road use and road management affect roads that constitute historic sites?

Important historic roads are managed most efficiently and effectively if they are identified, recorded, and evaluated early and at a larger scale; for example, at the Forest scale rather than the project scale. Presently, historic roads are assessed at the project level for compliance with Section 106 of the National Historic Preservation Act. Historic roads known, but not yet recorded, include: the Silver Lakes Toll Road from the

Alamosa River to Platoro (12 miles), the Alamosa River Military Road (24 miles), the Old Spanish Trail in the vicinity of Cochetopa Pass (11 miles), and the Stony Pass Wagon Road (32 miles). Portions of these historic roads are located on present Forest roads and visible traces of the roads are located off of the system.

Maintenance of historic roads has no potential to cause effects, if maintenance actions stay within previous disturbance, vertically and horizontally, and the important characteristics of the road (design, setting, location, materials) are not changed. Maintenance can potentially benefit historic roads by reducing erosion. Road upgrades and closures can change the design, setting, location, and/or materials that convey the quality of the site during its period of significance. For example, a narrow, winding road providing the only entry to a historic homestead site would no longer convey the same experience if it was straightened, widened, and paved. Closing a road by ripping and seeding would also change the character of a historic road.

CR 1: Is the road system used or valued differently by minority, low-income, or disabled populations than by the general population? Would potential changes to the road system or its management have disproportionate negative impacts on minority, low-income, or disabled populations?

All people are affected by changes in road management and the access afforded by roads. The road system is used by all groups of people traveling to and through the Forest. Changes in road management, including closing or decommissioning of any of the roads would have the same effect on all groups, including minorities and different cultures. The Rio Grande National Forest does not discriminate against any group or persons based on color, creed, abilities, nationality, or background. All persons are treated equally in policy and management of the National Forest. Travel management is no exception. The rules, standards, and laws that govern how the travel system is developed and used apply equally to all that use it.

The following direction addresses access by persons with disabilities:

Section 504 of the Rehabilitation Act of 1973

"No otherwise qualified person with a disability" in the United States shall, solely by reason of his disability, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance or under any program or activity conducted by any Federal Executive agency or by the United States Postal Service".

7CFR 15e. 103(iii)(2)

"Further the person with the disability must be able "to achieve the purpose of the program or activity without modifications to the program or activity that fundamentally alters the nature of that program or activity".

It should be noted that the term "reasonable accommodation" in regard to disabilities is only used in reference to employment. There is no such requirement for program access, which would include access to the national forests.

OHV Access by Persons with Disabilities:

There is no legal requirement to permit a person with a disability to utilize an OHV in any area that restricts or prohibits OHV use under the Forest Plan or the Forest Travel Plan/Transportation Plan.

Related question: UR/RR1.

Winter Use (WU)

WU 1 Rio Grande NF Supplemental Analysis Question: What are the potential effects of using the road system during winter, including authorizing snow removal?

Historically winter vehicle use of the road system has been restricted by snow. However, winter use of the road system to access private inholdings is increasing. The courts have ruled that the Forest Service must provide private inholders with reasonable access, which may or may not mean year-round access. The Alaska National Interest Lands Conservation Act (ANILCA) provisions include "access for the reasonable use and enjoyment of their private land." For additional discussion of ANILCA, see GT3.

A special-use permit is the standard procedure for granting access across NFS lands, including snow removal, to private inholdings. These permits are subject to terms, provisions, and conditions that will safeguard forest resources and may include limiting access to only the permittee.

There are engineering, safety, social, and environmental (watershed and wildlife) concerns associated with snow removal and/or use of the road system during the winter. Most National Forest System roads are designed and constructed for use during the normal operating season, meaning the time of year when the road subgrade is in an unsaturated condition. The normal operating season varies by climate conditions, aspect, and elevation. On the RGNF, the normal operating season is from spring snowmelt in May-July (depending on elevation and snow depth) to the first major snows, which can start as early as October. The concerns addressed here are for use of the road system following the first major autumn snows which would typically close the road system, through spring snowmelt and a return to unsaturated conditions or the normal "summer" use period.

Engineering Concerns

Even light vehicle traffic can cause considerable damage when the road surface and subgrade are saturated. To prevent this damage, aggregate surfacing, additional drainage features, widening of the clearing limits, or other measures needed to strengthen the road may be necessary. Restricting vehicle use during thawed conditions helps protect the road surface and subgrade. When this is not feasible, measures to strengthen the road may be necessary.

It may be necessary to evaluate the existing road design for its ability to support winter use. Some design criteria to consider include turnout spacing, intersection radius and grade, sight distance on approaches, approach grades (especially at highway and county road intersections), road template (insloping or outsloping roads), and road grade. The design and critical vehicles may be different for winter and summer use.

Plowed roads can attract additional traffic. For plowed roads, it is important to design adequate turnaround space at the end of the plowing and before any closure devices.

Opportunities and guidelines to address engineering concerns include the following:

- When issuing easements, contracts or permits to plow roads during the winter or authorize use outside the normal operating season, consult appropriate engineering staff to determine the need for reconstruction, maintenance and snowplowing requirements.
- Attach standard specification 803 or equivalent to all authorizations for snow removal on roads. The specification may be accessed at http://www.fs.fed.us/database/acad/dev/roads/803.doc. Timber sale contracts address snow removal through the regional C-provision RO-C(T)5.36# - Snow Removal(9/01).
- Upgrade the road surface as needed to accommodate use during saturated and thawing conditions.

- If there is inadequate parking and turnaround space at the end of a plowed road section, consider restricting winter use to only the permittee.

Safety Concerns

Many roads serve as snowmobile and cross-country ski trails during the winter. Authorizing snow removal can create unsafe conditions for the public. Appropriate signing to designate acceptable use should alert users to mixed traffic use.

Since the existing road system was designed for 'summer' use, there may be safety concerns at intersections during winter conditions including sight distance and approach grades.

Opportunities to address safety concerns include the following:

- Consider requiring marking and signing roads, adding turnouts, and constructing alternative trails for winter use when the road width and geometry does not provide safe passage for mixed traffic.
- Reconstruct or relocate intersections to attain approach grades appropriate for winter conditions. Intersection approach grades that are adequate in dry conditions may be too steep to negotiate on snow-covered roads.
- Construct snow berms (removal, etc.) to avoid impacting sight distance, particularly at intersections.

Social concerns

Several factors are changing winter use patterns. Winter experiences can be changed for non-motorized recreationists seeking quiet landscapes. Year-round access changes recreation in areas not previously accessible by motor vehicles. In some areas, cabin owners have begun using their cabins year-round. This off-season use increases overall use levels and changes use types. New activities are also now possible due to improvements in technology.

All winter uses should be considered and coordinated where possible. Special use road permits are normally an exclusive use designation. Where the road has previously designated specific uses (such as for snow machines or cross-country skiing), other activities which may not be compatible such as four-wheeling may need to be prohibited in a seasonal closure order.

Changes in the types of winter uses and patterns of use can cause conflict. Expectations can change and it can become controversial to restrict uses once they become established. If roads are kept open in winter, there is a greater likelihood that they will continue to be used during poor conditions resulting in road damage.

Opportunities to address social concerns include the following:

- Identify and inventory the winter trail system. Develop closure orders as necessary to prohibit incompatible uses on the winter trail system.
- Stay abreast of new uses and restrict them if they become inappropriate due to effects on resources or social concerns.
- Include use of the road system in winter travel management plans.

Environmental concerns

The primary environmental effects of snow removal and winter use of the road system are to wildlife, and the soil and water resources.

Soil and water: The unrestricted use of roads during wet weather and winter can result in rutting and churning of the road surface. Runoff from such damaged road surfaces carries a high sediment load. The damage and maintenance cycle for roads that are frequently used in winter can create a disturbed road surface

that is a continuing source of sediment (USDA Forest Service 1988). Snowplowing can affect spring runoff processes by developing berms. Berms are defined as a dike of snow, resulting from snow removal operations, which extends above the surface of the traveled way. Berms on the edge of the road prism trap and concentrate water on the road surface rather than allowing water to flow across the road prism. This further reduces dispersed flow of water down the hillside, and increases the concentrated surface flow which reaches the channel faster than subsurface flow.

On roads where snowplowing occurs, plowing of snow directly into the stream channel at road-stream crossings could result in the development of ice-dams. These ice-dams reduce channel capacity and the ability to convey water. This can result in culvert failure, and/or can cause channel migration as water is forced out of the channel in seeking a route around the ice-dam. The channel migration can result in the development of a braided channel since the areas outside of the channel may not be resistant to the erosive forces of water.

Opportunities and guidelines to reduce the effects of winter use on the soil and water resources include the following:

- Do not plow snow and debris directly into stream courses.
- Remove or breach snow berms created through snowplowing to avoid accumulating or channeling melt water on the road and to prevent water concentration on erosive slopes or soils. This should include an adequate number of breaches or breaks in the snow berm to allow frequent drainage of water from the road surface. Spacing of the breaches is highly dependent on slope, soil type, and road design.
- Suspend or limit road use of the road to colder portions of the day when the road surface is frozen. Suspend road use when ruts exceed three inches in depth for a length of 100 to 200 feet, depending on grade. If this is a problem, upgrade the road surface to a standard so that rutting does not occur.
- Mark all culverts and low water crossings prior to snowfall. Ensure that the culverts and crossings are open and functioning throughout the winter and at the beginning of spring snowmelt.
- Plow the road surface when temperatures are consistently below freezing to promote freezing of the road. This will remove the insulation provided by the snow allowing the subgrade to freeze to a greater depth and reduce road surface damage that might occur from use during unfrozen conditions.
- On roads where snowplowing occurs, remove all snow fills and restore the natural stream crossing on any natural stream or low-water crossing prior to spring snowmelt to prevent the development of ice-dams.

Wildlife concerns: Snow plowing can impact wildlife in several ways. Compacted snow routes may facilitate the movement of competing carnivores (i.e. coyotes, bobcats, foxes) into lynx habitat (Buskirk et al. 2000). In the absence of roads and trails, snow depths and snow conditions normally limit the mobility of lynx competitors. Plowing roads nullifies the competitive advantage of lynx by allowing habitat generalists access to areas normally blocked by deep snow. Lynx possess adaptations to travel through deep snow in order to out-compete habitat generalists like the coyote and bobcat. Thus, plowing roads on the RGNF potentially puts the lynx, at a disadvantage by artificially reducing the quality of its habitat and increasing its competitors' available habitat. The extent of the effects on the lynx is not known.

As mentioned previously in the Social Concerns section, plowed roads invite increased winter use to areas previously not accessed. In some areas, plowing roads would increase access to new terrain for snow mobile and ski activity. By creating new staging areas, snowmobile users and skiers can access areas that were previously less accessible. This creates new areas of concentrated use and increases the area impacted by snow compaction.

The tracks of compacted snow created by these activities can potentially be detrimental to those species dependent on the insulating capacity of snow. For instance, amphibians and many small mammals hibernate below the frozen topsoil during the winter. The depth of frozen topsoil is correlated with the depth of snow. All things being equal, when snow is compacted, the soil underneath will freeze deeper than if the snow were not compacted. This can directly impact hibernating wildlife. In addition, some small mammals, such as the meadow vole, remain active all winter long by using the insulated environment in the space between snow and soil (Jarvienen and Schmid 1971, Halfpenny and Ozanne 1989, Pruitt 1960). Snow compaction can either eliminate this space or reduce the temperature within this space, thereby increasing the energy expenditure required by the meadow vole to thermoregulate itself. Finally, snow compaction can change the timing of snowmelt. Early snowmelt can result in the flooding of subnivian tunnels, forcing meadow voles out into the extreme temperatures of the ambient air and exposing them to predators.

Plowed roads facilitate increased human activity (see Social Concerns) in wildlife habitat during a critical season for wildlife. Winter tends to stress animals more than any other season because food is scarce and energy expenditures for staying warm and traveling through snow are high. Human activities facilitated by plowed roads can disturb many wildlife species. Disturbance can result in stress and displacement of animals (Cassirer et al. 1992, Ferguson and Keith 1982, Freddy et al. 1986). Constant disturbance can result in changes in behavior, abandonment of territory (Anderson et al. 1990, Knight and Cole 1991) and even death of animals (Leptich and Zager 1991).

Issues addressed: 5, 10

Opportunities and guidelines to reduce the effects of winter use on wildlife include:

- Consider restricting winter use to only the permittee.
- Consider restricting snow-compaction activities like snowmobile riding from staging areas made newly accessible by snow plowing. This likely is most important for wet meadows and riparian areas where species vulnerable to snow compaction (e.g., amphibians, meadow voles) are most likely to occur.

Chapter 5 Describing opportunities and setting priorities

Problems and Risks Posed by the Current Road System

Introduction

This chapter identifies opportunities to address problems and risks posed by the current road system. It integrates the issues identified in Chapter 3 with the assessment of benefits, problems, and risks identified in Chapter 4. Opportunities and guidelines for addressing each issue are identified to help prioritize and guide sub-forest scale analyses.

The problems and risks posed by the current classified road system on the RGNF were evaluated using a GIS assessment, a road matrix, and a road management graph. As with any database-based analysis, there were some inherent limitations in the data used. The information used represents the most current data available as of January 2003. -

GIS Assessment: The effect of roads on the wildlife, watershed, and aquatic resources was analyzed using Geographic Information System (GIS) technology in conjunction with the Forest transportation inventory and other resource-related spatial information. This analysis was not limited to the effects of level 3, 4, and 5 roads; all roads currently inventoried on the Forest were included. Areas with high road densities were identified and assessed for potential risk to the aquatic and wildlife resources.

The Road Matrix lists every classified road on the Forest and assigns a rating of low, moderate, or high for both values and risks. This is a broad assessment, so the accuracy of road risk and values contains a degree of subjectivity and potential for inaccuracies. However, this road matrix provides road-specific information that will help define the potential minimum road system, identify roads that pose high risk to other resources, and prioritize sub-forest scale projects. As more information becomes available, the road matrix information should be validated and updated.

The Road Risk-Value Graph was developed to display the information in the road matrix. It categorizes the values and risks of the current road system and helps identify opportunities for managing the road system and prioritizing expenditures of Forest road maintenance and improvement funds. This graph is only a management guide; it is not firm direction as it combines many of the road matrix risk and value variables.

Resource Risks versus Road Use Values

The risks and values from the road matrix, and the road management graph are defined below.

Road-related Risks

Watershed and Aquatic Risks by 6th-level watershed: The watershed and aquatic resources were evaluated for risks from road-related impacts. In a given watershed basin, aquatic health depends on watershed health. The GIS assessment compiled the following information by 6th-level watershed:

Geologic hazards	Miles of road on sensitive soils
Soil types	Proximity of roads to streams
Road densities	Number of road-stream crossings on USGS blue-line streams
Critical aquatic habitat	Location of TES aquatic species relative to maintenance level 3-5 roads

Each 6th-level watershed was assigned a low, moderate, or high risk rating. This was intended to guide sub-forest scale analysis. This information was then used to determine watershed and aquatic risk (see accompanying watershed and aquatic tables in Appendix A) for each 6th-level watershed.

A separate analysis evaluated the potential effects of inventoried roads on the watershed and aquatic resources, and the individual roads were assigned a risk rating in the road matrix.

Watershed matrix risk ratings: The watershed matrix risk rating addressed the physical risks of each road to the soil and water resources. The road matrix risk rating considered the miles of road adjacent to the stream system, miles of road of sensitive soils, and number of road-stream crossings. Due to the varying length of roads, the relative percent of road affected by each factor was considered rather than absolute miles.

Aquatic matrix risks: This rating focused on aquatic TES species. The aquatic species considered included Rio Grande cutthroat trout, boreal toad, northern leopard frog, Rio Grande chub, and Rio Grande sucker. Criteria used to evaluate roads influence on aquatic TES species included road density, number of stream crossings, location within the water influence zone (WIZ), sensitive soils, and presence of TES species or TES habitat. Roads were given a high risk rating (3) if they create potential migration barriers at road-stream crossings for fish or amphibians, the road is located within the WIZ (or within 200 feet of the stream), or a relatively high percentage of the road is located on sensitive soils and have high surface erosion potential or increased potential for mass movement. Roads were given a moderate risk rating (2) if they where located within a drainage containing TES species and has connection to TES species habitat via ephemeral drainages or some segment of the road is within the WIZ, or is located on sensitive soils where surface erosion and mass movements could occur. Low risk ratings (1) were given to roads located outside of the WIZ but TES species present in the watershed, relatively low road density in the watershed, no stream crossings, and no sensitive soils present. A rating of 0 was given if no TES aquatic species were located within the drainage.

The level of risk determination also depended on what percent of a given road had potential effects on aquatic or riparian dependent species. Also see the watershed risks and wildlife risks for riparian species.

Wildlife Risks: Many scientific studies have documented impacts of roads on wildlife including direct mortality, habitat loss and/or reduced available habitat due to road avoidance, habitat fragmentation, edge effects, increased competition and predation from edge-associated species, population isolation, nesting and

rearing disturbances, and reduced habitat effectiveness – all of which can adversely affect viability and sustainability of wildlife populations. These factors were used to evaluate wildlife risks (see Appendix D).

Financial Risks: Annual maintenance and deferred maintenance costs were included in the risk categories for the road management graph. These costs were included to reflect the Forest's financial commitment to maintain the road system and to identify the link between maintenance and resource protection. If basic annual road maintenance (e.g., drainage maintenance) is not performed, roads have an increased potential for loss of investment and environmental damage. The same is true for deferred maintenance, such as replacing major culverts in perennial streams at the end of their design life. A catastrophic drainage failure will have a direct negative impact on the associated watershed and aquatic health.

Road-related Values

Resource Management Value: This value was based on the variety of land and resource management access provided by the road. Value was determined by looking at resource management use and recreation use. In some cases, the road is needed for access but not necessarily as a maintenance level 3-5 road. For example, a road may access a timber management area, but a level 1-2 road, which would be used intermittently, would provide sufficient access. To differentiate roads which provide critical access but don't necessarily have to be maintained as a level 3-5 road, the matrix rating is shown with lower-case letters; for example, a road providing critical access to an area for management purposes but where a level 1-2 would meet the access requirements would be given a resource value rating 'h.' This signifies that the access provided by the road is of high value, but it would still meet management needs if it were maintained as a level 1-2 road. Reducing the maintenance level from 3-5 to 1-2 would reduce the annual and possibly deferred maintenance costs, while retaining the access value of the road for resource management.

The Forest Plan Management-areas were used as the primary basis to determine road resource management value. Roads within development Management-areas were considered high value and necessary to achieve the goals and objectives within those areas. Roads within non-development Management-areas were considered low value, as these roads did not contribute significantly to the goals and objectives of the areas. The following criteria were also considered on a road-by-road basis to determine the value for different resource management and administrative needs:

Timber/insect and disease value

- Access to suitable timber base.
- Access to treat beetle infected areas.
- Access to treat stands at moderate or high risk of beetle infestation.

Fire/fuels value

- Access to high-density urban interface areas for fire suppression.
- Access for fuel reduction projects.

Administrative and permitted use values

- Access to private land.
- Existing or potential legal right-of-way to NFS lands.
- Access to key administrative facilities.
- Access to water production or storage facilities.

These criteria were used either alone**,** in cases where one use was very important for management of that resource**,** or in combination where the road served two or more access needs.

Recreation Use Values: The value of recreation use of the road system was rated separately since access for recreation affects the general public, whereas resource management is directly related to managing forest

resources. High values were assigned to roads that provided direct access to developed recreation sites or were key recreation access roads to the Forest. Moderate to high values were assigned to dispersed recreation areas along roads with heavy summer and fall use. Low values were often assigned to roads that provided only seasonal dispersed recreation use.

Road System Modification Options

After performing a road-by-road rating of risk and value based on the established criteria, the following road management categories and graph were developed to display the information and present opportunities for road management. The matrix, along with the watershed and wildlife assessments, provides a basis for sub-forest scale roads analyses. The graph helps identify roads that make up the potential minimum road system, roads that may need additional investment to protect the resources, and roads that could have their maintenance level reduced or be decommissioned.

Road Management Categories and Graph

The following four categories of roads were identified based on value and risk. Within each category, there are several possible management options for the roads.

Category 1: High Value and Low Risk – Ideal Situation

Options:

- Focus road maintenance funds on these roads to keep them in this category.
- High priority for the Public Forest Service Road designation.
- These roads form part of the potential minimum road system for the Forest.

Category 2 – High Value and High Risk – Priorities for Capital Improvements

Options:

- High priority for sub-forest scale roads analysis to identify high risk reduction needs.
- High priority for capital improvement funding, such as PFSR designation, road improvement, road relocation, funding, capital improvement program, etc.
- Shift road maintenance funds to these roads to keep their resource risks from increasing.
- These roads are also part of the potential minimum road system for the Forest.

Category 3 – Low Value and High Risk – Priorities for Risk Analysis

Options:

- High priority for sub-forest scale roads analysis to identify high-risk reduction needs and confirm use value.
- Potential for reducing maintenance level.
- High potential for decommissioning.

Category 4 – Low Value and Low Risk – Priorities for reducing Maintenance Level

Options:

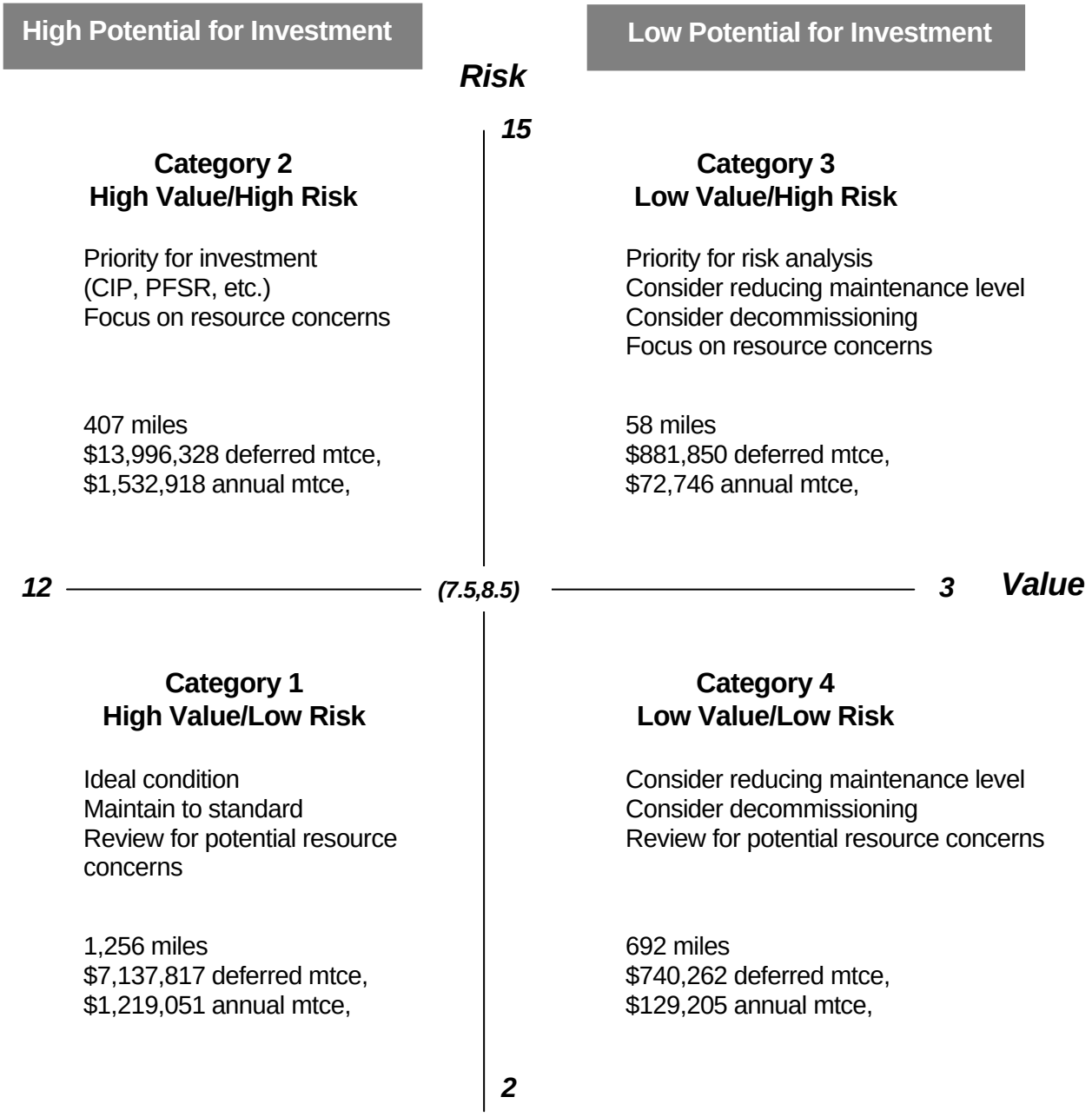
- Lowest priority for expending annual road maintenance funding.
- Moderate potential for decommissioning or reducing maintenance level.
- Where there is a recreational demand, convert these roads to trails.

The Road Risk-Value Graph (see following page) places each road into one of the management categories. Several factors need to be understood to correctly interpret this graph and identify why roads were placed in different categories.

Roads with a value of more than 6 (left side of the vertical axis) constitute the potential minimum road system for management and use on the RGNF. Those roads with a value of 6 or less are potentially not needed, at least not at their current maintenance level. The situation is similar for the horizontal axis. Those roads with a risk rating of 10 or more may be causing unacceptable resource impacts, while those with a rating of less than 10 are not as much of a resource impact concern.

It needs to be emphasized that just because a road falls below the horizontal axis does not mean it is not causing resource impacts. The risk values are a sum of the risks: wildlife, watershed, annual maintenance and deferred maintenance costs. Low costs and higher resource risks could still result in an overall rating of less than 10, low risk, on the graph. The road matrix needs to be used with the graph to identify the actual risks that have been assessed through this analysis.

Road Risk-Value Graph



Note: Not to scale.
Value = Recreation + Range + Timber + Fire/Fuels management value (max = 12).
Concerns = Watershed + Terrestrial, Riparian species, + Aquatic Species + Deferred maintenance + Annual maintenance (max=15).
Horizontal axis: Value of 6 or less = low potential for investment (low value).
Value > 6 = high potential for investment (high value).
Vertical axis: < 10 = low concern. 10 or greater = high concern

Road Maintenance Costs

A roads analysis helps identify ways to more efficiently spend the limited road maintenance dollars allocated to the Forest. One approach is to reduce or eliminate expenditures on roads that are not needed or not needed at their current maintenance level. The process described above identifies one way to make that determination.

Some conclusions can be made by comparing annual road maintenance funds needed for each road to the road maintenance graph on the previous page. If all of the roads to the right of the vertical axis were to be decommissioned, the needed annual road maintenance funding on the Forest would be reduced from $2,954,000 to $2,752,000. The actual road maintenance funding for the RGNF has been ranging around $600,000 to $700,000 per year. More road maintenance funding is needed to support the road system infrastructure.

Decommissioning Guidelines

Discussion

Road decommissioning results in the removal of a road from the road system. The goal is to return the roadway to a more natural state where the roadway is hydrologically self-maintaining and to permanently remove it from the transportation system. To accomplish this, a number of techniques can be used, such as posting the road closed and installing waterbars or earth berms, posting and installing barriers and barricades, ripping and seeding, scattering slash or boulders, planting vegetation in the roadway, converting the road to a trail, and full reclamation by restoring the original topography. There is a different cost associated with each of these techniques, and their effectiveness for deterring unauthorized motorized vehicle use varies as well. Planning for the location of the closures is important in ensuring their effectiveness.

Decommissioning level 1 and 2 roads can consist of removing the few culverts, ripping and seeding, posting closed with signs, and installing waterbars to discourage unauthorized motorized vehicle use and ensure proper drainage over time.

Decommissioning level 3, 4, and 5 roads is more expensive than decommissioning most level 1 and 2 roads. When choosing a technique for road decommissioning, the objective is to eliminate the need for future road maintenance.

Level 3, 4, and 5 roads are usually wider than level 1 and 2 roads, have culverts installed at designed intervals to cross drain the road, are ditched, have better sight distances designed on horizontal and vertical curve, have larger cuts and fills, and are designed through the topography rather than with the topography. It is much more expensive to decommission these roads than level 1 and 2 roads. Given the cost, it may be cheaper to maintain level 3, 4, and 5 roads than to decommission them. However, future maintenance costs may not be the only factor to consider; other resource considerations may outweigh the cost. For a particular road (level 3, 4, or 5), high deferred maintenance costs may exceed the costs of decommissioning.

Guidelines

- Balance cost with resource risk and effectiveness of the treatment when selecting methods for decommissioning roads.
- Convert roads to trails as a decommissioning method when analysis of recreation demand indicates a need to expand, connect or improve the existing trail system in the area. Provide adequate trailhead parking as part of this treatment method (See UR1 and RR1 discussion in Chapter 4).
- Decommission by restoring the road to original contours when mitigating visual impacts is required by the forest plan or when necessary to assure the elimination of vehicular traffic.

Capital Improvement Guidelines

Discussion

This analysis shows a need to reconstruct existing roads to correct deferred maintenance work items or improve some roads to meet the increasing use and traffic requirements. Funding limitations require prioritization for reconstruction work. The Road Risk-Value Graph provides a starting point for developing priorities. The following guidelines are to be used in conjunction with the graph when selecting, prioritizing, and implementing road reconstruction and construction projects.

Guidelines

- Conduct road location reviews prior to all new construction and road relocations. Ensure the location meets public and agency needs while mitigating environmental impacts identified in the analysis. Responsible line officers and resource and engineering specialists should participate in the review.
- Establish a traffic counting program to identify high-use roads and traffic patterns.
- Consider reconstruction to two lanes for roads with seasonal average daily traffic volumes exceeding 400 vehicles per day.
- Use motor vehicle accident safety investigations and reports to help identify road safety hazards.
- Use the following categories to prioritize road investments planned to reduce deferred maintenance backlog on roads: 1 – Critical Health and Safety; 2 – Critical Resource Protection; 3 – Critical Forest Mission. Data for these work items can be found in the Infrastructure database.
- Coordinate reconstruction and construction work with other agencies whenever possible. Utilize interagency agreements to develop investment and maintenance partnerships.

Road Management Guidelines

- If a road's maintenance condition has decreased, consider the need for the road and the historic use, as well as alternative roads in the area, before permanently changing the maintenance level. Use the Road Management Objectives (RMOs) to document any changes.
- Reduce the maintenance level on identified low-value level 3, 4, and 5 roads and those roads where the access needs would be adequately met by a maintenance level 1-2 road. Consider this option during sub-forest scale roads analyses, as this can be a cost effective alternative. Reduced maintenance of these roads should not result in any increased watershed risks as the most basic road maintenance will focus on maintaining road drainage. The reduced maintenance should only result in reduced user comfort. Less use due to reduced user comfort will further decrease the potential for road-related watershed risks.
- Provide travelers with sufficient information necessary to decide which road(s) they will travel. When appropriate, utilize entrance treatments, warning signs, route markers, and information bulletin boards to advise travelers of conditions ahead.
- Do not post speed limit and other regulatory signs on roads under Forest Service jurisdiction without a Forest Supervisor's order and a law enforcement plan.

- Consider prohibiting OHV use on Forest system roads when one or more of the following conditions exist:
  - The road is maintained at level 3, 4, or 5 and connects to a state, county, or other public agency road that is similarly regulated.
  - Traffic volumes exceed 100 vehicles per day (SADT) on single-lane roads.
  - Average traffic speed on the road exceeds 25 mph.
- To reduce annual maintenance costs, implement seasonal travel restrictions on roads susceptible to damage during wet or thawing conditions.
- Collect road maintenance and surface rock replacement deposits, as appropriate, on all road use permits and special use permits.

General Guidelines

The following are general road-related guidelines:

- Require authorized, permitted operations utilizing NFS roads to pay their fair share of road maintenance costs.
- Consider road decommissioning when planning projects that involve the construction and use of short-term, single-resource roads: for example, roads planned for mineral projects that undergo exploration, development, and abandonment phases. Incorporating decisions to decommission single-resource roads during the initial stages of project planning helps move the Forest toward the potential minimum road system. Document planned decommissioning when developing road management objectives.
- Develop an annual maintenance plan to prevent deferred maintenance costs from accruing on high value rated roads
- Update the road system databases and keep them current.
- Use an interdisciplinary process to develop, update, and implement road management objectives for all system roads. Ensure that information in the transportation atlas and inventory conforms to approved road management objectives.
- At appropriate intervals, update the data contained in the Road Matrix. Analyze the changes to determine new opportunities that may have developed as new information is collected.
- Require the use of this Rio Grande National Forest Roads Analysis for all sub-forest scale roads analysis through a Forest supplement to the 7700 Manual.
- At least once every 2 years, perform road condition surveys on all level 3, 4, and 5 roads.

Assessment of Building Roads in a Currently Unroaded Area

This assessment focuses on inventoried roadless areas (IRAs). The Forest Plan revision evaluated and considered the IRAs for wilderness designation. None of the IRAs were recommended for wilderness designation. Based on management area prescriptions, about 83% of the total roadless area acreage will retain roadless character, while 17% will not.

About 80% of the suitable timber base in IRAs is within one mile of an existing inventoried road. This suggests that while some maintenance level 3-5 road construction would be necessary to implement vegetative management prescriptions, a high percent of the suitable timber in IRAs could be accessed with reconstruction of existing roads, minimal construction of new roads, or use of temporary roads. However, even with minimal road construction, there are likely to be conflicts over any road construction in IRAs.

A recent Administrative Order suspended implementation of the Roadless Area Conservation Rule, and an interim directive was developed reserving to the Chief of the Forest Service, with some exceptions, authority to approve timber harvest and road construction and reconstruction in roadless areas. As discussed previously, any road construction in inventoried roadless areas will depend on the outcome of the Roadless Conservation Rule. Depending on the outcome, there may be a future need to amend the Forest Plan to change Management-area Prescriptions and revise management direction.

Much of the IRAs and other unroaded areas are not conducive to road building due to physical constraints (steep slopes, unstable soils, wetlands) or critical wildlife habitat. If roads where to be constructed in any unroaded areas, it would occur only after a site-specific analysis, careful design and the necessary mitigation to reduce potential effects to forest resources.

Opportunities for Addressing Problems and Risks

Travel management: For roads with a low value rating, either decommission or consider ways to raise this value: for example, by providing recreation opportunities along the road. Recreation use on the Forest is increasing and there are road-related opportunities to better disperse this use and lessen recreation impacts occurring elsewhere. An example of increasing recreation use on a low-value road would be to develop a trailhead and trail system at the end of the road. There are many opportunities on the Forest to convert the level 1 and 2 roads to motorized and non-motorized trails.

Watershed: The watershed assessment identifies potential effects of roads that can impact watershed condition and aquatic habitat. Watersheds and associated aquatic resources at greatest road-related resource risk could be prioritized for separate analyses to better identify specific areas of concern that may need repair. AQ 6 in Chapter 4 identifies watersheds with the highest risk of being affected by the road system.

Wildlife: The wildlife assessment (TW1-3) identified watersheds where roads have a high risk of affecting wildlife, as well as individual maintenance level 3-5 roads that may be affecting wildlife. These roads and watersheds should be prioritized for sub-forest scale analyses to identify specific areas of concern and opportunities to address these concerns.

Fuel reduction: Fuels reduction funding anticipated for the next several years is another opportunity to address growing urban interface wildfire risks. The IDT placed high resource management values on many of the level 3, 4, and 5 roads that provide primary access to areas around and within the Forest with high densities of cabins, homes, and other structures. These roads may be important access routes for fuel reduction projects, (especially any commercial projects that could involve log hauling) and provide important access for wildfire suppression access and evacuation egress. The ID teams for these fuel reduction planning projects can use the road matrix to begin identifying existing access/egress situation to help define the road-related project proposals.

Deferred maintenance backlog: Annual maintenance funding is inadequate to maintain the road system on the Forest. Over time, these roads will continue to incur additional deferred maintenance costs and degrade unless significant road reconstruction funding becomes available. The agency is addressing this issue nationally by proposing a new funding category for the 2004 federal highway transportation funding authorization called Public Forest Service Roads (PFSR). A challenge for this Forest is determining how to prioritize roads for the PFSR funding. The Road Matrix Table can be used to prioritize roads for PFSR proposals/funds.

The roads analysis identified an opportunity to improve road-related dialogue with the respective counties. To more efficiently use taxpayer funds, the Forest should continue to pursue formal road maintenance agreements with the counties interested in sharing maintenance.

Issues

Chapter 3 identified forest scale issues that were carried forward. The following section outlines each issue and identifies opportunities to address each issue. Appendix H will display the public comments to this report.

1. Some roads may not be under the appropriate jurisdiction, and the right of way atlas may not reflect current jurisdiction.

The definition of jurisdiction has been subject to different interpretations over the years, which has led to some inconsistent entries in the INFRA database. "Jurisdiction is the legal right to control or regulate use of a transportation facility derived from fee title, an easement, an agreement, or other similar method. While jurisdiction requires authority, it does not necessarily reflect ownership" (FSM 7705).

FSM 7703.3 discusses jurisdiction over transportation facilities and includes direction for determining which agency should have jurisdiction of a road. Once appropriate jurisdiction is established, opportunities for shared maintenance on joint use roads should be explored to make the most efficient use of public funds.

Opportunities to address jurisdiction and maintenance concerns include the following:

- Conduct a thorough review of jurisdiction and legal rights-of-way for all roads, especially roads with current projects proposed. Clarify current jurisdiction and update road atlas to reflect current jurisdictions, ROWs and INFRA and once jurisdiction is clarified, identify roads where jurisdiction seems inappropriate.
- Include jurisdiction verification in sub-forest RAPs. Bring lands and engineering specialists into the project early to help determine if jurisdiction or access is going to be an issue.
- Update the Forest right-of-way atlas (FSM 5490).
- Keep existing road maintenance agreements (Schedule A) updated.
- Pursue agreements with other counties and land management agencies.
- When road use patterns change, review road for appropriate jurisdiction and maintenance responsibility.
- Pursue new rights-of-way where access to the Forest is not adequate for management needs.
- Encourage counties to assume jurisdiction on portions of roads that access subdivisions.
- Consider RS2477 developments.

Relevant questions: GT3, SI5, CH1-3.

2. Road maintenance funding is not adequate to maintain roads and signs to standard.

The annual cost to maintain the entire road system to standard is considerably higher than the amount allocated by Congress. The experienced budget level from the Forest Plan projected $1,442,000 per year. Desired condition budget level was projected as $1,969,000 per year. Historic budget for the road program in the last five years have roughly ranged from $600,000 to $700,000 per year. Due in large part to this funding shortfall, there is a need to identify and prioritize the road system necessary for access to and management of the Forest.

The largest proportion of road maintenance and improvement funds allocated to the Forest is spent on the higher standard roads. Safety work such as surface maintenance, roadside clearing, and installation and maintenance of warning and regulatory signs are performed on an annual basis.

Reducing the maintenance level of the road (and comfort level to the user) is one method of reducing the costs.

Opportunities to address funding issues include the following:

- Prioritize funding to address critical resource needs.
- Prioritize funding to address critical health and safety needs.
- Ensure road maintenance level is appropriate to meet the expected traffic on the road for the management needs as described in the RMOs.
- Decrease the required annual road maintenance costs by correcting deferred maintenance work items.
- Re-evaluate road maintenance levels to balance costs and benefits. Consider reducing maintenance levels, where possible, to reduce costs.

Relevant questions: GT4, EC1-3.

3. Road access may not be adequate for future management needs.

There are specific areas of the Forest where road access may not be adequate to address future management needs. Responses to questions TM2-3, EF3-4 and PT1 conclude that, in general, the objective maintenance level 3 - 5 system is sufficient to: 1) manage the suitable timber base, 2) access timber stands in need of silvicultural treatment, 3) access areas of the Forest areas in response to disturbance events, and 4) implement fuel reduction treatments in the wildland/urban interface. However, the responses also note that there are exceptions to the general statements and identify specific areas where access is limited.

Areas identified as lacking adequate access include suitable timber base and other lands, both within, and outside of Inventoried Roadless Areas (IRAs). Lack of developed access may be the result of physical constraints (steep slopes, unstable soils, wetlands), critical wildlife habitat, and/or a lack of right-of-way. In addition, road building in IRAs or other unroaded areas has been, and will most likely continue to be, a contentious issue.

A related issue to the lack of adequate access is that the access that is developed is often for a single purpose. As discussed in the response to TM2-3, a large part of the planned road construction and reconstruction projected in the Forest Plan was to provide access to suitable timberland. While the majority of the planned construction and reconstruction would consist of local roads, there would also be some additions to the collector system.

Developing road systems to access IRAs, whether to manage the suitable timber base or other lands, will depend on the re-examination of the Roadless Rule and current and pending litigation. As discussed in the response to TM2-3, the final rule published in the Federal Register on January 12, 2001 prohibits road construction, reconstruction, and timber harvest in IRAs. Depending on the outcome of the reexamination and litigation, Forest Plan amendment may be required to change affected management area prescriptions and geographic area direction.

Opportunities to address this issue include:

- Identify specific areas where road access is inadequate for resource management needs.
- See opportunities for addressing lack of rights-of way listed for issue #4.
- Determine the feasibility of accessing those areas that currently have inadequate access. Feasibility should take into consideration environmental and social effects, as well as costs. Where the feasibility analysis determines access to be too expensive, or having too great of environmental or social effects, consider a forest plan amendment where the management prescription would not require access.

Relevant questions: GT2, EF3-4, TM2-3, PT1.

4. Right-of-way across private land may not be adequate to access the Forest as ownership and land uses change. Historic access across some of these lands is being closed off to the public. While this is not a change in legal status, it gives the appearance of shutting off large tracts of public land.

There is a concern that historic use agreements are becoming outdated. Inholdings and adjacent lands are being sold and subdivided, a trend brought on by plummeting economics in agriculture and accelerating values in lands with nearly exclusive access to public lands. In addition, some landowners are no longer allowing access for hunting because of an increase in abuse of those permissions.

The ability to acquire a right-of-way (ROW) in a timely manner could be affected by many factors. Willingness of the landowner to convey a ROW is one of the most important considerations. Disagreement on values, location, and terms of the proposed easement can slow down and even stop an acquisition. Lack of availability of Realty staff with skills needed to process a ROW is a factor, as well as other competing lands priorities.

Advanced planning on the part of all program areas is critical to ensure that funding and skills are available to process the ROW at the proper time. Access needs to be considered early in the project planning stages to allow adequate time to negotiate with landowners and process (appraisal, survey, title work, etc.) the ROW case. This planning should consider alternative routes should the preferred ROW be unobtainable within the desired timeframe.

There are other concerns over exclusive use of non-motorized areas by adjacent landowners, specifically for OHV riding and illegal outfitting.

The Department of Agriculture has the authority to condemn a ROW to maintain access corridors, although there are some exceptions. The Forest Service may only request condemnation action; it is up to the Secretary of Agriculture to decide when we will use it. Close coordination with the Office of General Council is needed when contemplating a condemnation action. Every effort must be made to acquire a ROW through voluntary means before considering condemnation, and these efforts must be carefully documented. Condemnation is usually considered an action of last resort but is a valid tool; assuming legal authority exists for the subject lands.

Opportunities to address this issue include:

- Identify right-of-way acquisition opportunities during all sub-forest scale RAPs.
- When working on sub-forest scale RAPs, identify opportunities to obtain legal access.
- Update and maintain the ROW atlas with current jurisdiction information. This will help to clarify historic use versus legal access.

- When working on projects regarding ROW acquisition opportunities, consult lands and engineering specialists early in the process.
- Communicate with local planning commissions and counties to keep up-to-date on requests for subdivisions and other land use changes. Develop a shared understanding of access issues (see Issue #5 in this section) and 36 CFR 212.6 and 212.7.

Relevant questions: SU1, UR/RR1, SI1, GT2-3.

5. There are increased demands for year-round access across Forest to private inholdings which may affect the road system and resources.

There is an increasing demand for year-round access across NFS lands to private inholdings. Historically, private inholdings have been accessed in the snow free months or 'summer' and did not require any additional work other than standard road maintenance. However, the shift from summer only use to year-round use poses concerns regarding 1) the effects of year-round use on the integrity of the road, 2) safety, 3) direct and indirect environmental and social effects, and 4) the affect of year-round access on winter use patterns.

In many cases, year-round use means more than access by snowmobile or snowcat; the demand for standard vehicle access is also increasing. Due to the heavy snowfalls during the winter, year-round access for vehicles usually requires snowplowing.

A road plowed for winter use has the potential to change winter use patterns. Plowing the road allows standard vehicle access to areas that were previously unavailable in the winter. This can result in an increase in winter activities (e.g., snowmobiling, cross-country skiing, Christmas tree cutting) in areas which previously were not as accessible. Plowing can also encourage trespass on private lands because property markers are often not as visible in the winter months. Snowplowing plans should have provisions for turn-around and parking areas.

Access to private inholdings across NFS lands requires a special use permit. Certain procedures must be followed to obtain a special use permit. The following provides guidelines to consider including in the permit and opportunities to reduce the effects of winter access on resources.

- Follow procedures outlined in 36 CFR 212.6 and 212.7, and the Forest Plan.
- Develop a monitoring plan that addresses site-specific issues and ensures adequate road maintenance to withstand plowing procedures and winter use.
- Develop a road maintenance plan which outlines responsibilities and projected costs to be covered by the proponent.
- Develop conditions for access.
- Assess private property access during sub-forest scale RAPs/

Opportunities to address engineering concerns include:

- When issuing easements, contracts or permits to plow roads during the winter or authorize use outside the normal operating season, consult appropriate engineering staff to determine the need for reconstruction, maintenance, and snowplowing requirements.
- Attach standard specification 803 or equivalent to all authorizations for snow removal on roads. The specification may be accessed at http://www.fs.fed.us/database/acad/dev/roads/803.doc. Timber sale contracts address snow removal through the regional C-provision RO-C(T)5.36# - Snow Removal (9/01).
- Upgrade the road surface, as needed, to accommodate use during saturated and thawing conditions.

- If there is inadequate parking and turnaround space at the end of plowing, then consider restricting winter use to only the permittee.
- To reduce road damage and decrease the cost of plowing, limit use to the permittee.

Opportunities to address safety concerns include:

- Consider requiring marking and signing roads, adding turnouts, and constructing alternative trails for winter use when the road width and geometry does not provide safe passage for mixed traffic.
- Ensure that intersection approach grades are appropriate for winter conditions (intersections may need to be relocated). Intersection approach grades that are adequate in dry conditions may be too steep to negotiate on snow-covered roads.
- Consider requiring management of snow berms (removal, etc.) to improve sight distance. Sight distance may be impaired by snow berms, particularly at intersections.

Opportunities and guidelines to reduce the effects of winter use on the soil and water resources include:

- Do not plow snow and debris directly into stream courses.
- Remove or breach snow berms created through snowplowing to avoid accumulation or channeling of melt water on the road and prevent water concentration on erosive slopes or soils. This should include an adequate number of breaches or breaks in the snow berm to allow frequent drainage of water from the road surface. Spacing of the breaches is highly dependent on slope, soil type, and road design.
- Suspend or limit road use to colder portions of the day when the road surface is frozen to prevent road surfaces from deteriorating under use during thawing temperatures. Suspend road use when ruts exceed three inches in depth for a length of 100 to 200 feet depending on grade. If this is a problem, upgrade the road surface to a standard so that rutting does not occur.
- Mark all culverts and low water crossings prior to snowfall. Ensure that the culverts and crossings are open and functioning throughout the winter and at the beginning of spring snowmelt. Remove all snow fills and restore the natural stream crossing on any natural stream or low-water crossing prior to spring snowmelt to prevent the development of ice-dams.
- Plow the road surface when temperatures are consistently below freezing to promote freezing of the road. This will remove the insulation provided by the snow allowing the subgrade to freeze to a greater depth and reduce road surface damage that might occur from use during unfrozen conditions.

Opportunities and guidelines to reduce the effects of winter use on wildlife include:

- Consider restricting winter use to only the permittee being given the permit to snowplow.
- Consider restricting snow compaction activities like snowmobiling from areas made newly accessible by snowplowing. This likely is most important for wet meadows and riparian areas where species vulnerable to snow compaction (e.g., amphibians, meadow voles) are most likely to occur.

Relevant questions: AQ1-2, AQ4, TW1-4, GT2-3, SU1, UR/RR2, SI1, SI4-5, WU1.

6. There are potential adverse environmental impacts from the current road system. Roads causing adverse impacts should be prioritized for evaluation at the sub-forest scale.

Scientific studies and documentation in the past decade have revealed a number of adverse impacts caused by roads. Many of these impacts are discussed in Chapter 4, particularly in the answers to the aquatic, terrestrial wildlife, and ecosystem function questions. Tables 10 and 11 in Question AQ 6 list

watersheds with high concern ratings due to physical factors (road crossings, road density, sensitive soils, and proximity of roads to streams) and the presence of Rio Grande cutthroat trout. The road matrix (Appendix C) presents the watershed, wildlife (TES), and riparian resource values for each road. This information should be used at the project scale and will be useful in identifying priorities for analysis.

General Opportunities

- Use the tabular information in this report and appendices to prioritize sub-forest scale analyses to identify opportunities to reduce environmental impacts.
- Use this priority table to support special funding requests
- Consider road closure, relocation, reconstruction, maintenance, or enforcement to reduce adverse impacts.

The following is a list of opportunities related to the soil, water, riparian, and aquatic resources.

Opportunities/recommendations to consider if roads are likely to modify surface and subsurface hydrology:

- Design roads to minimize interception, concentration, and diversion potential.
- Design measures to reintroduce intercepted water back into slow subsurface pathways.
- Use outsloping and drainage structures to disconnect road ditches from stream channels rather than delivering water in road ditches directly to stream channels.
- Evaluate and eliminate diversion potential at stream crossings.

Opportunities to reduce surface erosion:

- Increase the number and effectiveness of drainage structures.
- Improve the road surface by either gravelling, or adding a binding material to those roads that have native surfaces with no inherent binder.

Opportunities to address existing roads in areas with high mass wasting potential:

- Relocated roads to areas with more stable soils.
- Relocate drainage structures so that the outlets are on less sensitive areas which may include flatter slopes and better-drained soils.

Opportunities to improve local channels at road-stream crossings:

- Design crossings to pass all potential products including sediment and woody debris, not just water.
- Realign crossings that are not consistent with the channel pattern.
- Change the type of crossing to better fit the situation; for example, consider bridges or hardened crossings on streams with floodplains, and consider bottomless arch culverts in place of round pipe culverts.
- Add cross-drains near road-stream crossings to reduce the connected disturbed area.
- Reduce the number of road-stream crossings to minimize the potential for adverse effects.

Opportunities to reduce the effects of the road system on wetlands:

- Relocate roads out of wetland areas.
- Where relocation is not an option, use measures to restore the hydrology of the wetland. Examples include raised prisms with diffuse drainage such as french drains.
- Set road crossing bottoms at natural levels of wet meadow surfaces.

Opportunities to address road-stream crossings that restrict migration and movement of aquatic organisms:

- Reset the culvert to eliminate the limiting factor.
- Replace the culvert with an alternative crossing such as bridge, hardened low-water ford, or bottomless arch culvert.

Opportunities to address roads that affect riparian plant communities:

- Relocate roads out of riparian areas.
- Restore the hydrology in riparian areas that have been dewatered by the road system.

Opportunities to reduce the effects of roads on wildlife and their habitat:

- Avoid building roads in old growth or old-growth recruitment stands in order to reduce further fragmentation of a cover type that is most useful to wildlife when it exists in large patches.
- Obliterate and rehabilitate existing level 1 or low-value level 2 roads in old growth or old-growth recruitment stands in order to restore larger tracts of old-growth forest.
- Reduce the objective-maintenance level of, or close, roads leading to or through rock outcrops, especially those outcrops that provide substantial habitat for species of interest.
- Strategically close certain low-value roads to reduce the encroachment of recreationists into wildlife habitat, especially in areas where noise and off-trail disturbance presents risks to breeding species.
- Seasonally close certain areas of wildlife concern to reduce the effects of motorized vehicles, including snowmobiles, on wildlife behavior, breeding, and survival.
- Designate snowmobile activity to areas where wildlife concerns are minimal. In particular, exclude snowmobile activity in riparian zones, wet meadows, and lynx habitat.
- Restrict road use to less critical times of year for surrounding species of concern and avoid the breeding season for species of concern.

Increasing use of the road system requires more maintenance. However, as stated in Chapter 2, the road maintenance budget is not adequate to maintain the existing road system. Resource concerns associated with the road system could be exacerbated by increased use and inadequate maintenance. Opportunities to address this concern are similar to those outlined under issue number 2.

Aside from the resource concerns addressed above, there are several resource concerns associated with US Highway 160 over Wolf Creek Pass. Concerns include:

- The effects of magnesium chloride and snowplowing on water quality and roadside or adjacent vegetation.
- The effects of winter recreation use along the Highway.
- The effects of scoria ‘deltas’ on water quality and roadside vegetation.

The primary opportunities to reduce these effects include:

- Work with the Colorado Department of Transportation and the Wolf Creek Ski Area to develop the best winter management option of US 160 which provides for user safety, yet protects resources.
- Develop a winter travel management plan that includes adequate parking facilities to accommodate winter use along the Highway and in the parking areas.

Relevant questions: AQ1-6, AQ8-12, AQ14, TW1-4, SI3.

7. Higher road densities have greater potential to adversely affect resources and encourage illegal use.

When considering the impacts of road density, it is appropriate to consider all levels and types of roads. The negative effects of roads on resources (Issue 6) become magnified with increased road density. Forman et al. (1997) demonstrated that certain wildlife species experience population declines when road densities reach a threshold of about 1 mile/mile^2.

Increased erosion, sedimentation, alterations to hydrology, number of road crossings, population isolation, disturbance to wildlife, fragmentation of wildlife habitat, edge effects, and degradation of big game hunting all increase as road density increases. High densities of level 3-5 roads may pose less of a risk to aquatic systems than level 1-2 roads because of the enhanced maintenance associated with the former. However, high densities of level 3-5 roads often pose a higher risk to terrestrial wildlife (e.g., population isolation, vehicle collisions, barriers to dispersal) than level 1-2 roads because of the higher traffic volume and larger road prism on level 3-5 roads.

Level 3-5 roads present a vector by which motorized vehicles can access level 1-2 roads, as well as unclassified roads. Although level 1 roads are technically considered closed by the Forest, many are still passable for motorists who disregard such closures. Additionally, unclassified roads are user-created roads which do not incorporate best management practices to minimize the effects on resources. For this reason, unclassified roads often have the greatest effect on resources but are often not included in the analysis process since they are not part of the database.

Higher road densities of level 2-5 roads may actually promote the development and use of unclassified roads. In areas of relatively higher road density, users may see more opportunities to make illegal shortcuts between two or more official travel routes. When road density is relatively low and dense vegetation impedes the users' view of potential shortcuts, fewer unclassified roads may be created. In some areas on the RGNF, the sum of unclassified roads through level 5 roads creates areas of especially high road density. The locations of level 3-5 roads also make many miles of level 1-2 roads available to motorists, thereby encouraging the use of these roads. The locations of level 1-2 roads often highly fragment the wildlife habitat. Hunting season is especially problematic in this sense, because some hunters use the higher-level roads to access the lower-level (including closed or unclassified) roads. Hunters are often motivated to seek remote locations where big game might be found.

Questions TW1-4, AQ1, and AQ6 address the consequences of high road density (level 1-5) on wildlife and aquatic resources. Question AU1 addresses the illegal use of roads. Though road densities were considered in the wildlife-risk and the watershed-health assessments and incorporated into the overall watershed and wildlife risk ratings, there was a compounding factor in that unclassified roads were not considered in these analyses because they were not part of the database. Watersheds with an already high density of classified roads are at an even greater risk as the density of unclassified roads increases.

Opportunities

- Prioritize sub-forest scale analyses to focus on watersheds with the greatest risk to wildlife and watershed resources.
- Develop an education program regarding the adverse effects of both off-road travel and motorized use of closed roads on wildlife and aquatic resources. Education may be the best tool to discourage additional development and use of unclassified roads.
- Develop a process for inventorying and managing both classified and unclassified roads.

- Develop a strategy to inventory unclassified roads. The strategy should focus on watersheds already identified as high priority for sub-forest scale analyses in AQ6 and TW1, as well as under Issue #6.
- Analyze level 1-2 roads to identify restriction, closure, and decommissioning opportunities.
- Analyze level 3-5 roads that feed high densities of level 1-2 roads to identify restriction and closure opportunities that would reduce the negative effects of level 1-2 roads. Areas to review at the project level include Upper San Luis Creek, Road 874, Workman Creek, Road 522, and Upper Jack's Creek.

Relevant questions: AQ1-2, AQ4, AQ6, AQ9-10, AQ12, AQ14, TW1-4, UR/RR2, AU2, GT4, SI1.

8. Ineffective closures may have adverse effects on resources, and can encourage illegal use.

Closed roads still provide access to otherwise inaccessible parts of the RGNF, specifically places where other people aren't around. This is an enticement for many users, especially hunters looking for big game that haven't been spooked by other hunters on open roads. The Forest Service's timber program is the usual road-building program, building both classified and temporary roads. As timber sales can take up to 10 years to complete, visitors to the Forest can get used to these roads by the time they are finally closed (after the sale closes). Gates and berms have proven ineffective in keeping many users off the roads. This is generally only an issue on level 1 and 2 roads.

In addition, previous travel management direction was centered on the illegal use of the road, and not the area surrounding the road. Local users are accustomed to using these areas and are not familiar with the travel management decisions that closed all areas to off-road motorized travel. As a result, use is continuing in some areas, and the Forest Service is having a difficult time enforcing the travel management regulations. The better solution would be to plan and design more effective closures, combined with better signing and education.

Opportunities to improve closure effectiveness include:

- When designing roads, consider future access needs and design roads to they can be effectively closed as needed.
- Consider the most appropriate closure method to meet the objectives on a site-specific basis.
- Integrate information on both the Forest Map and Travel Plan Map to better show boundaries of RNA, Wilderness, and Backcountry Areas to be considered in big game retrieval.
- Improve boundary posting for RNA, Wilderness, and Backcountry Areas.
- Develop and implement enforcement plans.
- Use closure methods that provide hydrologic stability and eliminate vehicle travel. Methods can include ripping and seeding, constructing berms and water diversion structures, removing culverts, pulling slash and stumps across the road bed, scattering boulders, putting the road back to the original contours, planting trees and shrubs in the roadbed, gates and signs. The most effective closure methods should be identified on the ground based on site characteristics.
- When locating temporary or classified roads, consider effective closure opportunities. Use road closure devices and methods that are most appropriate to terrain.
- Install temporary closures immediately on newly constructed roads that are not part of the permanent open road system (e.g., temporary or Level 1 roads) so users do not become accustomed to using these roads.
- Consider future needs of the road when determining closures: for example, decommissioning vs. level 1 closures.

- Inform users of type of travel permitted on Forest roads through appropriate signing and education, especially when the road crosses through different agencies' jurisdictions.

Relevant questions: AQ TW1-4, AU2, GT4, UR/RR1-2, SI1

9. Management of the road system may be affecting big-game movement during hunting seasons.

The effect of the road system on big game movement and harvest rates is discussed in TW3.

Opportunities to reduce road effects to big game movements:

- Develop road and travel management strategies to reduce motorized use affecting big game movements during hunting seasons.
- Consider strategies such as temporary closures based upon season or time of day.
- Close roads during the hunting season in strategic areas where such closures would decrease fragmentation of big game habitat and increase big game security areas, with the goal of increasing hunter success on the Forest.
- Educate the hunting public regarding the goal of hunting-season road closures and the reason such seasonal road closures could improve hunter success and hunter satisfaction.

Relevant questions: TW2-3, UR/RR2, SI2

10. Both off-highway vehicles (OHVs) and highway vehicles are used on the same roads and occasionally at the same time. This can be a safety problem.

There is a potential for hazardous driving conditions when there is mixed use traffic on public roads. Safety concerns and travel management restrictions should be addressed in the RMOs, especially where mixed traffic use is a concern. Appropriate signing and education can help alleviate the safety concerns. RMOs should be updated to reflect changes in management or resource needs. Documenting the primary use of the road and any safety concerns can also help prioritize funding for critical health and safety concerns, including signing.

Travel management regulations are posted on the ground and described on the Forest Visitor's map. These regulations have been established by the Forest to enable safe motorized travel while protecting natural resources and minimizing conflicts between users. Off-road recreational vehicles such as trail motorcycles and ATVs are allowed on higher standard arterial and collector roads unless specifically prohibited.

Colorado state law governs registration of off-road vehicles. This law also applies to out-of-state visitors. These licensed vehicles can then be operated on public roads, including designated Forest Service roads and trails. An effort for consistent signing statewide will show which uses are allowed on each road and trail. Over the next few years, these signs will be installed on all Forest roads and trails. Some counties have separate restrictions for off-road vehicle travel on county roads. Users should be educated when allowed uses change as different jurisdictions are crossed.

Law enforcement responsibility for road related regulations are sometimes unclear. Signing and law enforcement responsibility on roads can be further defined by agency in joint use maintenance agreements (Schedule A). Efforts to keep signing and closure orders up to date and educating the public about permitted road uses can help improve consistency in law enforcement efforts.

Opportunities for safety-related road issues:

- Clarify which roads are open to OHVs depending on state, county, and Forest Service regulations.
- Work with State and counties on traffic use.
- Address safety and traffic compatibility concerns on roads open to OHVs. Consider strategies such as signing and roadside clearing to improve sight distance.
- Identify road jurisdiction by using appropriate agency route markers.
- Inform users of type of travel permitted on Forest roads through appropriate signing and education, especially when the road crosses different agencies' jurisdictions.
- Prioritize funding to address critical health and safety needs.
- Ensure road design is adequate to meet the expected traffic on the road to meet the management needs as described in the RMOs. Keep RMOs up to date.
- Establish and maintain proper signing, as set forth in MUTCD, on roads subject to the Highway Safety Act (most maintenance level 3, 4, and 5 roads).
- Consider restricting OHV use on roads where this is a concern.

Relevant questions: GT4, WU1, AU2, UR/RR1, SI5.

11. Roads may be promoting illegal motorized use into wilderness areas.

Certain roads provide access for motorized users to the wilderness boundary. Once at the wilderness boundary, there is a temptation to continue into the wilderness, resulting in illegal use. While this is a difficult issue to address, education and frequent monitoring are the primary opportunities for reducing this illegal use.

The Forest Service works with Tread Lightly! Inc, the International Association of Snowmobile Administrators, the American Council of Snowmobile Associations, the National Off-Highway Vehicle Conservation Council, and other national interest groups and volunteer associations to promote responsible vehicle operation. The RGNF needs continue to maintain its current contacts and make new contacts with local groups to provide users with additional education and assistance.

The RGNF, with the assistance of interested volunteer groups, is monitoring both motorized and non-motorized winter use on groomed roads and trails and other high use areas to establish use data. This information will help determine what and where law enforcement or other management actions are needed to reduce illegal motorized use in Wilderness areas.

Making a concerted effort to install signs at boundaries and trailheads is another education opportunity.

If this is not successful, the Forest can, and has, obtained permission from the Regional Forester to use snowmobiles to pursue snowmobile trespassers.

Opportunities to address illegal use:

- Continue education plan including signing at trailheads and community involvement.
- Develop and implement an enforcement plan.
- Inform users of type of travel permitted on Forest roads through appropriate signing and education.
- Develop an education program to help users understand appropriate motorized and non-motorized uses.
- Assess the effectiveness of closures and re-design as necessary.

- Continue winter use (both motorized and non-motorized) monitoring of high use areas and groomed roads and trails with our partners. This information can be used to determine where law enforcement efforts or other management actions are needed

Relevant questions: AU2, GT3, UR/RR2-3, UR/RR5, UR/RR7.

12. Road management objectives (RMOs) are not current and need to be updated.

Road Management Objectives (RMOs) are developed for each road in accordance with FSM 7712.5. Road management objectives establish design criteria (FSM 7720) and operation and maintenance criteria (FSM 7730.3) for each road. RMOs require approval and signature by the District Ranger and Forest Engineer and become part of the road atlas (FSM 7711.1). Safety concerns and travel management restrictions should be addressed in the RMOs, especially where mixed traffic use is a concern. Documenting the primary use of the road and any safety concerns can also help prioritize funding for critical health and safety concerns.

A review of road maintenance levels and jurisdiction for the RGNF showed a need to have the RMOs updated to reflect current management needs. RMOs should also be reviewed and updated during the planning process for all projects involving roads.

Opportunities to address concerns with Road Management Objectives:

- Continue to review and update RMOs.
- Ensure road design is adequate to meet the expected traffic on the road for the management needs as described in the RMOs.
- Update RMOs, and keep them up to date.
- Require updates to RMOs as part of sub-forest scale analyses.

Relevant questions: GT3-4, AU2.

13. Roads are important to fulfill public recreational needs.

Roads are important to fulfill public recreational needs. Roads provide access to recreational opportunities and allow a greater number of people to access and enjoy the RGNF. Roads are an important component in providing the full spectrum of recreational opportunities on the Forest. They facilitate recreation for people who are unable or do not desire to experience non-motorized recreation. Roads also help to distribute recreation use across the RGNF which helps to prevent overcrowding. Driving the roads is the most popular recreation activity on the Forest.

Opportunities to ensure that the publics recreational needs are being met:

a. Consider the public needs when conducting project analysis. This includes consideration of the spectrum of recreational use available on the Forest, the opportunity for loop roads to provide a recreation experience and to reduce traffic levels, and the requirements for special events which use roads.

Relevant questions: UR 1, RR 1.

14. Roads are an important factor in the compatibility of recreational experiences.

Roads are an important factor in the compatibility of recreational experiences on the Forest. The presence and use of roads is one of the key factors in the recreation opportunity spectrum used to define the recreation experience. Roads bring the presence of development, noise, increased use, and safety elements into the recreation experience. They can bring motorized and non-motorized recreation use into the same area. Motorized recreation use and non-motorized recreation use is often perceived as incompatible. Also, different types of motorized use such as snowmobiles and ATVs, or standard vehicles and ATVs occurring simultaneously on a road may cause safety concerns and affect the recreational experience.

Opportunities to ensure that the roads are considered in recreation management:

b. Consider how roads affect the compatibility of recreational experiences during project analysis. These include uses such as ATV and snowmobiles, hunters and snowmobilers, and different types of uses on snow-groomed roads.

c. Consider how roads and road use are affecting the recreational use and safety of the Forest visitors.

Relevant questions: UR 1, RR 1, RR 3.

15. Road management may not be compatible between different agencies with road jurisdictions such as the Forest Service, BLM, Park Service, the State and counties.

Roads often cross several agency jurisdictions. Road management and use should be compatible between different agencies with adjacent or overlapping road jurisdictions such as the Forest Service, BLM, Park Service, the State, and counties where practical.

Opportunities to ensure that the roads sharing multiple jurisdictions are managed to be compatible between the different agencies are:

- Assess the compatibility of Forest Service road management with the road management by adjacent agencies when doing project analysis.
- Continue to work closely with the agencies at the programmatic and project levels.
- Make Forest road information and management available to other agencies.
- Work closely with other agencies when they are doing road management planning. For example, the RGNF is currently working with the BLM on their San Luis travel management plan. This Roads Analysis will be incorporated into that plan as the two agencies share a contiguous boundary and share many roads.
- Work closely with the Counties at the programmatic and project levels on road issues.

Relevant questions: SI 1, SI 2, SI 5

16. Management of unclassified roads.

Although the primary focus of this Roads Analysis is on the classified or inventoried roads on the RGNF, the management of unclassified roads is an important issue to the Forest and the public. Unclassified or user created roads are a resource protection, recreation use, and law enforcement concern.

Opportunities to address unclassified roads:

- Develop a strategy to inventory, manage, and monitor unclassified roads and use. Continue to work with other agencies and citizen groups such as the San Luis Valley Ecosystem Council to inventory and assess unclassified roads.
- Assess unclassified roads at the appropriate project scale. Develop a management strategy for these roads to physically close and rehabilitate these roads and prevent continuing illegal use or incorporate them into the inventoried road system.

Relevant questions: AQ 1-6, AQ 8-12, AQ 14, GT 3, TW 1-4, SI 13.

17. Off HighwayVehicles (OHV)

OHV use on trails is an issue brought up by the public. Although the primary focus of this Roads Analysis is on the classified or inventoried roads on the RGNF, OHV use on trails is an important issue to the Forest and the public. OHV use on the RNGF is a popular and growing recreational activity. Providing adequate opportunities for OHV use on the RGNF is important. Safety and compatibility of OHV use with other recreational activities is a management concern.

Opportunities to address OHV use on trails include:

- Continue to monitor and assess OHV use on trails and adjust the travel plan as needed on a case by case basis.
- Work closely with OHV users and other recreationists during trail management planning.
- Provide law enforcement as appropriate to ensure that OHV use is legal.

Relevant questions: Relevant questions: AQ 1-6, AQ 8-12, AQ 14, GT 3, TW 1-4, SI 13.

NEPA analysis needs

This roads analysis provides information and opportunities for sub-forest scale roads analyses. It is not a NEPA analysis and does not result in a NEPA decision. It may be used to inform a future NEPA decision. Any decisions which construct or change management of the road system resulting from sub-forest scale roads analyses will require the appropriate level of NEPA analysis.