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ROAD ANALYSIS REPORT

Forest-wide analysis for collector, and arterial roads, and highways (maintenance levels 3, 4, and 5).

Approved by Martin D. Chavez
Carson Forest Supervisor
April 25, 2003

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File Code: 7710
Date: April 28, 2003

Dear Friends of the Carson,

The Carson National Forest has completed a Forest-scale analysis of its main public access road system. The analysis included roads that are used or planned for use by passenger cars.

The roads analysis was prompted by the National Forest System Road Management rule published in the Federal Register in January 2001, January 12, 2001 (66 FR 3219). The rule helps ensure additions to the National Forest System network of roads are 1)deemed essential for resource management and use; 2) minimize adverse impacts from construction, reconstruction, and maintenance of roads; 3) initiate the decommissioning of unneeded roads and restoration of ecological processes.

The rule requires each National Forest to identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. [36 CFR 212.5] This interdisciplinary science-based forest-scale road analysis will be used to inform planners and decision-makers of road system opportunities, needs, and priorities that support land and resource management objectives. [FSM 7712.1]

The Forest roads-analysis team focused on the early stages of the process to describe the existing situation and identify concerns, as well as possible issues, with the main access roads within the overall transportation system. Roads that have an objective Maintenance Level of 3, 4, or 5 (roads that are maintained for passenger car use) were reviewed by the roads analysis team. A full range of benefits and risks associated with these roads were identified. The team used this information to produce a report and accompanying maps that document social and environmental opportunities, problems, risks, and priorities for future road management. [FSM 7712.11]

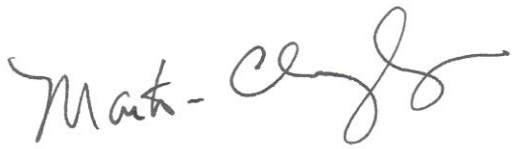
The forest scale roads analysis process does not make decisions at the project level and is not a National Environmental Policy Act (NEPA) decision. The forest scale roads analysis report identifies opportuities for watershed and project level proposals. The project level proposals will go through the normal NEPA process, including public involvement. [FSM 7712.11] The public is encouraged to help with the identification of road-related benefits and risks in order to develop an analytical framework for project level analysis. This framework will ultimately lead to guidelines for addressing future road management issues and setting priorities.

The draft copy of the road analysis was released for public coment on March 11, 2003. A copy of the report and related maps was placed on the Carson National Forest web site, www.fs.fed.us/r3/carson/. Availability of the draft roads analysis report was reported in The Taos News on March 20, 2003. No comments have been received in any written form nor by telephone.

The Roads Analysis Report for the Carson National Forest and related maps may be found on the Carson National Forest web site, www.fs.fed.us/r3/carson/.

Mr. Steve Okamoto, Forest Engineer, Carson National Forest, 208 Cruz Alta Road, Taos, New Mexico 87571 is your contact if you have any further questions regarding this road analysis package.

Sincerely,



MARTIN D. CHAVEZ, Jr.
FOREST SUPERVISOR

Carson National Forest
Roads Analysis

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Introduction

This Forest wide Roads Analysis report focuses on the Carson National Forest roads with an Objective Maintenance Level of 3, 4, or 5. These designations indicate a road segment is suitable for a passenger vehicle at various comfort levels. Roads with a 1 or 2 Objective Maintenance Level designation shall be analyzed on the watershed level. An interdisciplinary team (IDT) was assembled to complete the analysis using the procedures outlined in document, FS- 643 Road Analysis: *Informing Decisions About Managing the National Forest Transportation System*.

A roads analysis is designed to identify the components of an optimum road system, one that reflects land management objectives. The primary objective of this report is to provide line officers with information necessary to implement road systems that are efficiently managed, have minimal ecological effects, and are in balance with available funding. This analysis does not allocate funds nor does it finalize issues pertaining to the Carson National Forest road system.

Executive Summary

This analysis provides information that will help the Carson National Forest to more efficiently and effectively manage the transportation system within existing and anticipated funding levels. Management priorities addressed in this analysis include maintaining high value roads, reducing road maintenance costs, and reducing adverse ecological road related effects.

The roads in this analysis are important for primary access to the multiple uses of the Carson National Forest. High priority uses include; recreation, commodity production, and access. GIS analysis was used to identify priority Recreation and Facility access roads through out the CNF. In addition, a GIS stream channel proximity analysis identifies roads that are likely to contribute sediment to streams. The extent of road connectivity with stream channels is significant because it determines whether geomorphic or hydrologic processes will affect the aquatic environment.

104 road segments were evaluated for this study. The combined mileage of these roads is 902 miles. This analysis does not recommend reduction of maintenance level of road under FS jurisdiction currently classified as objective maintenance level 3. Of the 902 miles analyzed, 97% of the road miles are assigned an overall high-risk index. 68% of the road miles are assigned an over-all high value index. The assessment of these roads will guide efforts at mitigation and cooperation with State and County Agencies.

The risk and value assessment conducted for this analysis was an interdisciplinary approach utilizing scientific resources to consider the socio-economic environmental impacts of road maintenance. This assessment also provides a foundation that will be used for ongoing transportation analysis and future planning efforts. In addition, the CNF Forest Roads Analysis will guide future research efforts and data collection on affected resources.

Products of the Analysis

- A report for line officers and the public that documents the information and analysis used to identify opportunities and set priorities for the future Carson National Forest road system.
- A map displaying the main road system for the entire Forest and the risks and opportunities for each road or road segment.
- Other maps and tables necessary to display specific access and watershed priorities as well as recommended changes in the road system.

Scope of the Analysis

Geographic Scale	Forest wide
Roads	Roads on existing inventory in the following categories: Public and private roads with Objective Maintenance Level of 3, 4, and 5 on the Carson National Forest.
Analysis Period	
Specialist information	Forest level analysis will be done using existing information and the judgment of technical specialists on the ID team. Inadequate or incomplete data will not be considered for this analysis.
Public Participation	Draft Report will be available for review on the CNF internet web for comment.
Internal Review	

Existing Condition

Obj. Mtc. Level	Total	FS	County	State	Private
3	501	496	0	0	5
4	141	121	12.7	8	0
5	260	15	0	245.3	0
Total	902	632	12.7	253.3	5

Figure 1. Miles of road in the Carson National Forest Analysis

Road Management Agenda

The current Carson National Forest Plan (CNFP) and amendments provide direction for roads management. The recommendations made in this analysis will improve the current CNFP and provide information for future Forest Level management planning.

Road Reconstruction: The CNFP estimates that 5 miles of Forest Service Roads will be reconstructed at a cost of $200,000/year.

Road Maintenance: Currently, the CNFP estimates that it will use $80,000/ year for road maintenance.

Road Density: Current road density on the CNF is .36 miles per square mile (902miles/ 2480 square miles). These results are based on road segments with an Obj. Maintenance Level 3, 4, and 5. Level 1 and 2 road density shall be determined on the watershed or project level.

Cooperative Maintenance Agreements: There is no data available for cooperative maintenance agreements on the Carson National Forest.

Road Operation/ maintenance funding and costs

Road condition surveys conducted in 2002 provided an estimate of deferred maintenance costs required to maintain the CNF road system in accordance with industry safety standards.

Maintenance Level	Miles Sampled Oct. 2002	Deferred Maintenance Critical Needs
3	367	$ 7,463,592
4	131	$ 3,230,288
5	11	$ 449,229
Total	509	$ 11,143,109

Figure 2. 2002 Deferred Maintenance Summary

Maintenance Level	Miles Sampled Oct. 2002	Capitol Improvements Total
3	367	$ 116,780
4	131	$ 137,511
5	11	$ 0
Total	509	$ 254,291

Figure 3. 2002 Capitol Improvement Summary

Maintenance Level	Miles Sampled Oct. 2002	Annual Maintenance Total
3	367	$ 3,055,617
4	131	$ 977,187
5	11	$ 62,798
Total	509	$ 4,095,602

Figure 4. 2002 Annual Maintenance Summary

Carson National Forest Roads Analysis Process

Hazard and risk assessment:

An interdisciplinary team (IDT) used a Risk and Value assessment to describe the condition of each road with Objective Maintenance Levels of 3,4, and 5. The assessment protocol was developed by the Lincoln National Forest and can be accessed via the Internet at: *http://www.fs.fed.us/r3/lincoln/Nepa/roads_analysis/road_index.htm*. In addition, the CNF Roads Analysis method follows the recommendations outlined in the document FS-643, *Roads Analysis: Informing Decisions About Managing the National Forest Transportation System.*

Values: Roads are valued for Forest management because they provide access to:

FACILITIES
RESOURCES
RECREATION
SAFETY (escape from populated areas, access for wildfire response)

Risks: The presence or conditions of roads present risks associated with:

HUMAN CAUSED FIRE
WATERSHED CONDITION
WILDLIFE
CULTURAL RESOURCES

Roads were placed in categories of high or low value combined with high or low risk. The overall risk assessment will be "high" if any of the four risk criteria under them are assessed as high. The overall value will be "high" if any of the four criteria under them are assessed as high.
Recommendations were made for each of four categories based on this assessment.

Value Assessment Criteria

Facilities: Access to FS administrative facilities and special use facilities. Access to private land and associated facilities is not a criteria used to assess the value of a FS operated road. The FS cooperates with State or County agencies in accessing private land, but access to private land is not a primary value determining operation of Forest Service jurisdiction roads.

HIGH - A high value road has Forest Service related facilities that require access by passenger car. Examples are Ranger District main offices, offices or locations that offer public information services, locations with crew quarters, facilities, and special-use facilities that require access by the general public.
LOW - A road accessing no facilities, facilities not open to the public, and facilities where high clearance vehicle access is adequate. Examples are roads to lookouts, some special-use sites or FS communication sites.

Resources: Access to vegetative treatment areas, wood product management and harvest, and access to range resources.

HIGH - Roads that are the primary access to several planned or potential vegetative management projects, or large amounts of high-value commercial wood resources. These roads will be used multiple times for vegetative management within a 20-year analysis period. A road's improved condition will reduce haul time/cost and improve safety. Roads that are the primary access to permitted grazing allotments where a maintenance level 3 road is needed to safely accommodate cattle trucks or larger trailers on a regular and recurring basis.
LOW - Roads that do not provide access to high value wood resources, or where consistent or recurring access by low clearance hauling vehicles is not needed. Roads that do not provide access to permitted grazing allotments and where high clearance vehicle access is adequate for resource use and management.

Recreation: Access to dispersed recreation areas, trailheads, campgrounds, picnic grounds, touring routes.

HIGH - Access to recreation uses that require access by passenger car. Examples are developed sites in the urban, rural or roaded natural Recreational Opportunity Spectrum (ROS) class, main touring routes, main routes to many (10 or more identified) dispersed recreation sites.
LOW - High clearance vehicle access is adequate for use and management of the recreation resource. Examples are trailheads in roaded natural or semi-primitive motorized ROS class, and access to 9 or fewer dispersed camp areas.

Safety: Access for fire suppression, evacuation routes and emergency medical response.

HIGH - Roads that provide alternate emergency access to populated areas. Roads that provide access to areas prone to wildfire, roads that provide access to resources or human values during a period in which response time is critical.
LOW- Roads to areas that are not populated or where access by high clearance vehicle will be adequate for fire suppression.

Risk Assessment Criteria

Human Caused Fire:

HIGH - Roads that access areas that have a recorded pattern of human caused fire ignitions, or that access areas where use, landownership, vegetation and fuel conditions indicate a high potential for human caused fire ignition.
LOW - Roads that are not evaluated as high risk.

Watershed Condition (effect to water quality and inherent erosion hazard):

HIGH - The road management situation will hinder attainment of state water quality standards or the road is within 100 feet of an impaired stream. Road exists in highly erosive soils or is on a cross slope exceeding 40%.
LOW - State water quality standards can be achieved through assigned road management standards. Road is located mostly in inherently stable soils and on a cross slope less than 40%.

Wildlife Risk Assessment Criteria

Impacts from road use, maintenance, development and reconstruction will have varying degrees of risks (i.e. effects) depending on the spatial distribution, maintenance level, and distance of roads from critical wildlife habitats. For this Forest Road Analysis (FRA), the criteria for evaluating risk to wildlife are presented below. The criteria addresses risk from Forest Level 3, 4 and 5 roads on wildlife and serves to rank the risk as either High or Low. Wildlife used for this analysis will be species that are, in order of priority, Endangered, Threatened, Proposed, and Sensitive. The reason for selecting these species over others such as game species are due to the fact that they influence forest management activities more than other species. In addition, critical winter range for big game will also be evaluated, since road densities tend to affect winter range habitat more than other factors (i.e. weather) in the southwest.

Cultural Resources Risk Assessment Criteria: Risk assessments for roads analysis are guided by the following questions:
* Has the road been surveyed for cultural resources?
* Does the road impact any cultural resources?
* Is the road located in a high, moderate, or low site probability area?

HIGH - The road has been surveyed for cultural resources and it impacts identified sites, or the road has not been surveyed but is located in an area with high or moderate site density.
LOW - The road has been surveyed for cultural resources and it does not impact any sites, or the road has not been surveyed but is located in a low site density area.

General Recommendations for Value/Risk Categories:
High Value/High Risk

These roads are the "main transportation system" for the Forest. Recommend continued Forest Service or cooperative agency maintenance for passenger car access.
High risk and value indicate these are the highest priority for investment of time and funds to mitigate or eliminate risk and accommodate uses.
Recommend mitigation of risk. Mitigation depends upon the specific risks and may include, but are not limited to: additional maintenance effort, reconstruction, relocation, seasonal maintenance restriction, seasonal road closure.

Low Value/High Risk
Passenger car access for enjoyment or use of National Forest resources is not needed on these roads.
Short term (~1 month to 1 year) improvement of these roads may be needed for improved access to project areas during project activities.
Recommend mitigation of risk. High risk indicates these roads are second priority (behind the high value/high risk roads) for investment of time and funds to mitigate or eliminate risk. Mitigation depends upon the specific risks and may include additional maintenance efforts, reconstruction, relocation, seasonal maintenance restrictions, and road closure.
Recommend reducing maintenance costs by reducing maintenance level of FS jurisdiction roads to high clearance (ML 2), or administratively closed (ML 1).
Coordinate with county government or private landowners to determine maintenance responsibility on roads needing passenger car access to private lands. On roads where the primary use is access to communities, request public roads agencies (county, towns, state government) to assume road operational jurisdiction. On roads where exclusive need is access to private land, issue a special use permit for the road. On roads or road segments not open to the public, and not required for access to private land, close or decommission the road. Additional information may be needed to determine level and type of use.

High Value/Low Risk

These roads are the "main transportation system" for the Forest. Recommend continued Forest Service or coop agency maintenance for passenger car access.
Low risk indicates low priority for investment of time and funds to mitigate risk.

Low Value/Low Risk

Passenger car access for enjoyment or use of National Forest resources is not needed.
Short term (~1 month to 1 year) improvement of these roads may be needed for improved access to project areas during project activities.
Recommend reducing maintenance costs by reducing maintenance level of FS jurisdiction roads to high clearance (ML 2), or administratively closed (ML 1).

Coordinate with county government or private landowners to determine maintenance responsibility on roads needing passenger car access to private lands. On roads where the primary use is access to communities, request public roads agencies (county, towns, state government) to assume road operational jurisdiction. On roads where exclusive need is access to private land, issue a special use permit for the road. On roads or road segments not open to the public, and not required for access to private land, close or decommission the road. Additional information may be needed to determine level and type of use.

Results

Risk and Value Analysis Results

Total Miles-902

High Risk/ High Value **68% of total mileage** 616 miles	Low Risk/ High Value **.39% of total mileage** 3.6 miles
High Risk/ Low Value **29% of total mileage** 260 miles	Low Risk/ Low Value **2% of total mileage** 22.6 miles

Figure 5. Risk and Value Analysis Results

Risks

The Risk and Value assessment used spatial data in order to determine areas where human and lightening caused ignitions were the most frequent, and where fuel loading was heavy. 72 roads on the CNF are classified as posing high wildfire risk to the forest **(See Appendix F).** The effect of the road system on wildlife habitat is also classified as high. 77% of inventoried roads were classified as a high risk to wildlife. Overall watershed risk was evaluated according to the degree in which a roadbed contributes to erosion, sedimentation, and mass wasting. 26% of roads were assigned as a high risk to watershed condition on the CNF. All Objective Maintenance Level 3,4,5, CNF roads are high risk to cultural and heritage resource values.

Values

All roads on the CNF were rated as having a high value to resource management. 3 roads were assigned a high value to facilities access. 46 out of 104 roads were classified as high value recreation access roads. The safety value of the CNF roads system was evaluated based on wildfire access, evacuation routes and emergency medical response. 47 roads were classified as high value safety routes.

Stream Channel Proximity Analysis

Roads can affect water flow through a watershed by intercepting, concentrating and diverting flows from their natural flow path. One way to assess the impact of roads on water flow is a hydrological connectivity analysis. This type of analysis is a broad representation of connectivity that will illuminate priorities and risks of the road system in relation to watershed stability. A stream channel proximity GIS assessment was generated for the CNF Road Analysis. The analysis examines Maintenance Level 3-5 roads that intersect perennial water bodies within Carson National Forest boundaries. Refer to Appendix E. Of the 902 miles surveyed, there are 274 points where a road is connected to a waterbody. Of these 274 points of connectivity, 273 are hardened crossings. The non-hardened crossing is at the junction FS 439 and FS 442 on the Middle Rio Grande. Future hydrologic studies will be conducted on a watershed scale. The studies will focus on stratifying watershed, road, and geomorphic features, which impact hydrologic connectivity.

Watershed Analysis

The Carson National Forest is currently implementing area planning and treatment by fifth code watershed. Watershed Analysis for the Jicarilla Ranger District (3) has been completed. Objective Maintenance Level 1_2 Roads analysis will be integrated with the planning efforts on the watershed level. The 5th Code watersheds either partially or completely within the boundaries of the Carson National Forest are listed below:

Watershed	District
Canjilon Creek	1
Lower Chama Tributaries	1
Rio Tusas/ Vallecitos	2
Rio Grande del Rancho	4
Rio Pueblo	4
Coyote Creek	4
Upper Mora River	4
Santa Cruz/ Rio Grande	4
Rio Ojo Caliente	6
Rio Brazos	6
Aguaje de la Petaca	6
Los Pinos/ San Antonio	6
Rio Nutrias/ Rio Cebolla	6
Red River	7
Rio Hondo	7
Ponil	7
Rio Costilla	7

Figure 6. 5th Code Watersheds

Discussion

Current road management issues on the Carson National Forest are identified in this forest Roads Analysis report. Objective Maintenance Level 1-2 roads will be assessed on the watershed or project level. Based on the results of this analysis, specific management priorities on the Carson National Forest were identified; these priorities include wildlife, cultural and heritage resources, and watershed integrity. Future studies will be conducted on the watershed or project level.

There are no existing Objective Maintenance Level 3-5 roads recommended for closure or maintenance level reduction. Overall, the Objective Maintenance Level 3-5 roads on the Carson National Forest are operating within industry and safety standards. Road maintenance cost reduction should be considered when Objective Maintenance Level 1-2 roads are analyzed.

Appendix

Appendix A: Ecological, Social, and Economic Considerations

- Ecological
- Aquatic Riparian and Watershed
- Terrestrial Wildlife
- Economics
- Timber
- Minerals Management
- Range Management
- Water Production
- Special Forest Products
- Special Use Permits
- General Public Transportation
- Protection
- Unroaded Recreation
- Roaded Recreation
- Passive Use
- Social Issues
- Civil Rights and Environmental Justice

Appendix B: Risk/ Value Assessment Table, D1-D6

Appendix C: Roads Analysis Map D1-D6

Appendix D: Recreation and Facilities Map

Appendix E: Stream Channel Proximity Map

Appendix F: Fire History Map

Appendix G: Roads Analysis ID Team

Appendix A

Carson National Forest
Roads Analysis

Road level 3-5 only does not include level 1 and 2

ASSESSMENT OF EFFECTS

Ecological (EF)

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

There are no plans to build roads within inventoried roadless areas. In addition, no other unroaded areas are planned to have permanent roads built. The ecological attributes of these areas and proposed Research and Natural Areas will continue to be protected by the Forest Plan and project-level design features.

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

Roads and associated human activity create a potential vector for the introduction of exotic and invasive plant species. The greatest threat is the introduction of noxious weeds and invasive plants that can be transported on the wheels, undercarriages, bodies of vehicles, and on heavy equipment during road maintenance. There is potential that use of the roads and construction could introduce exotic insects, diseases, and parasites to the area. The highest risk areas would be on areas disturbed for road maintenance (ditch lines, cuts and fills on existing roads).

The road system will also permit monitoring, inventory, and treatment of introduced species on a more efficient basis.

The potential effect of exotic plant introduction is type conversion from the native ecosystem plants to exotic plants. Increased fire occurrence and spread, reduced diversity, increased erosion are all general effects caused by introduction of exotic plant species. [Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas, The Nature Conservancy, Creating and Integrated Weed Management Plan, A Handbook for Owners and Managers of Lands with Natural Values, Colorado Department of Agriculture] The long-term effect without treatment caused by invasive plants is to introduce foreign ecosystems unfavorable to native plants and wildlife populations. Reducing diversity to nearly a monoculture.

The paved highways generally follow old trail systems established before the advent of the national forest. Invasive weed inventories indicate invasion centers along many of the paved roads within and adjacent to national forest lands. The arterial and collector roads also tend to follow old trail or road systems. Many parts of the Carson National Forest were settled in the late 1600's and throughout the 1900's. Land grants, Spanish and Mexican gave impetus to settlement along watercourses. Hence many roads were established along these same trails and watercourses. The roads along watercourses can contribute to the spread of invasive plants by permitting dispersal of seed and plant parts.

EF 3. To what degree do the presence, type, and location of roads contribute to the control of insects, disease, and parasites?

Due to their cyclic and widely scattered nature, insect outbreaks are not generally treated using ground-based systems except in campgrounds. Past efforts at insect epidemic control were based on aerial applications that are not dependent on the road system.

Disease concentrations are not generally treated due to their widely scattered nature. The existing road system contributes to the control of parasitic plants (dwarf mistletoe) within the national forest land by providing ready access. Parasitic plants are treated with ground-based systems such as hand thinning. The road system permits ready access to known insect, disease, and parasite sites on the national forest.

The presence of roads allows access to the forest for many types of possible treatments, including mechanical, prescribed burning, cultural methods, and chemical.

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

The most significant affect of road systems on the surrounding ecosystem takes place during the actual construction of the road. The ongoing effect of a roadbed on the surrounding ecosystem depends on the road type and frequency of use.

Fire, insect and disease infestations, and parasitic plant (dwarf mistletoe) infections and drought represent the primary ecological disturbance regimes that naturally occur within the Carson National Forest in the pinyon-juniper, ponderosa pine, and coniferous forest types. These regimes are interrelated since drought often leads to increased incidences of fire and outbreaks of insects and disease. Fire is thought to be the most significant disturbance regime and many past large stand replacing fires are found on the Forest. Wind throw does occur within the Forest but has not been widespread in recent history.

Even though it is acknowledged that road access in the Forest increases risk for human caused fire, this risk can be minimized through administrative means such as smoking and campfire restrictions and complete closures during high and extreme fire danger periods. A well maintained forest road system benefits fire suppression because it provides access and allows for a rapid Initial Attack response.

The threat of major insect infestations is moderate to high. Dwarf mistletoe infections are low to high depending on location within the Forest. Fire suppression represents an introduced ecological disturbance greatly enhanced by roads. Access provides an increased opportunity to monitor or control disturbances within the Forest.

The idea that an unroaded ecosystem will remain in a static, constant condition simply because we do not build roads in the area is not correct. Unroaded areas are subject to fires of greater extent and severity due to the absence of fuel breaks and limited accessibility. Ecosystems that are significantly altered by major disturbance regimes (such as fire) are unduly stressed and weakened and prone to infestations. It is essential to integrate natural and unnatural disturbance regimes in resource planning and management strategies. The consequences of trying to suppress a natural disturbance agent (such as lighting-caused fires) must be considered and possibly counteracted by inducing human caused disturbance events. Roads do not directly affect ecological disturbance regimes, but they are necessary for management access when human-induced disturbance events are part of active resource management.

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

Ecological effects of noise are primarily associated with wildlife. It also affects recreation users, primarily those hunter camps in proximity to any of the roads with a large amount of heavy truck traffic. Wildlife species, particularly elk and deer, alter their use patterns in proximity to the heavily used roads ("Effects of Timber Management Practices on Elk", January 1987).

Noise from developing, using and maintaining roads may affect people and wildlife within hearing distance. There is no specific data on the effects of noise from Carson National Forest (CNF) roads on people.

This is not an issue at the forest scale. It will be addressed if it is an issue at the project level scale.

Aquatic, Riparian Zone, and Water Quality

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

Roads have three main effects on water: 1) they **intercept** rainfall directly on the road surface and road cut banks, and subsurface water moving down the hill slopes or springs; 2) they **concentrate** flow, either on the surface or in an adjacent ditch or channel; and 3) they **divert** or **reroute** water from normal flow paths had the roads not been built. Increased road density, increases the overall impact on watershed health. For example, by

intercepting surface and subsurface flow, and concentrating and diverting it into culverts, ditches, gullies, and channels, road systems effectively increase the density of streams in the landscape, thereby changing the amount of time it takes for water to enter a stream channel, altering the **timing of peak flows** and hydrograph shape. Usually the change in the hydrograph's shape is a quicker runoff response time (i.e. "flashier" flow response), which produces a taller and sharper shape in the hydrograph's peak flow design.

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

Different parts of the road system and their adjoining cutbanks and fillslopes behave quite differently hydrologically. **All roads do not perform equally during storms**, and the same road segment may behave quite differently during storms of different magnitudes. As storms become larger or soil becomes wetter, more of the road system contributes water and sediment directly into streams. Road gradient has a profound effect on the magnitude of hydrologic change on roads and to surrounding areas. Discharge from hillslopes, cutbank height, and density of stream crossings, soil properties, and response to storms all differ by slope position or watershed aspect. The most important consideration of how roads impact the watershed is the number of roads and miles built as well as the type of road whether it's paved, graveled, or dirt. The number of miles of roads per area in a watershed is known as road density. The greater the road density value, the greater the potential impact to a watershed and its hydrologic system caused by those roads. Proper design and maintenance of roads can reduce the amount of sedimentation. The amount and timing of traffic use on a road can affect the Forest Service's ability to properly maintain the road. As more private lands are developed, there will be an increase of use on the maintenance level 3-5 roads.

The landscape position of the road contributes to the generation of surface erosion. Roads located in narrow canyons and valleys and/or adjacent to stream courses are likely suspects for causing surface erosion causing impacts to stream waters. The hydrologic connectivity of roads is dependent on location of the road (landscape position), the location of drainage features, and the buffers that lie between a road location and the drainage bottom.

Table 1. Road locations that may contribute sediment to stream courses and surface erosion. There may be some road segments not readily identified that may contribute sediment. There are portions identified that do not contribute sediments to stream courses listed in the following table.

Road Number	District	Location	Reason	Owner
NFSR 1950	Questa	Valle Vidal access road from Costilla to Shure ponds	Proximity to Costilla Creek, Narrow canyon,	Forest Service

Road Number	District	Location	Reason	Owner
NFSR 134	Questa	From Lagunita Saddle To SH 563 near town of Questa, NM	Proximity to Cabresto Creek, acid soils destroying culverts	Forest Service
SH 38	Questa	East boundary of district near Bobcat pass to town of Questa	Proximity to Red River, crosses hydrothermic soil runout,	New Mexico
SH 578	Questa	Town of Red River to end of road south of Red River	Proximity to Red River,	New Mexico
SH 150	Questa	Community of Valdez to Taos Ski Valley	Proximity to Rio Hondo, narrow canyon	New Mexico
US 64	Camino Real	East district boundary to Taos, NM	Proximity to Rio Don Fernando, narrow canyon, blocked culverts	New Mexico
NFSR 437	Camino Real	Garcia Park to community of Talpa	Proximity to Rio Chiquito, narrow canyon, established prior to Forest ownership	Forest Service
NFSR 438	Camino Real	Bernadin Lake access to Pot Creek	Proximity to Rio de la Olla, narrow canyon. Part of road closed due to flood damage, established prior to Forest ownership	Forest Service
NFSR 439	Camino Real	Intersection of NFSR 440 to SH 518	Proximity to Rio Grande del Rancho, narrow canyon. established prior to Forest ownership	Forest Service

Road Number	District	Location	Reason	Owner
NFSR 76	Camino Real	Little Korea area to SH 518	Proximity to Rito de la Presa Narrow canyon	Forest Service
SH 518	Camino Real	NFSR 161 intersection to SH 75 intersection	Proximity to Rio Pueblo, Narrow canyon	New Mexico
SH 518	Camino Real	NFSR 439 intersection to Talpa community	Proximity to Rio Grande del Rancho, Narrow canyon	New Mexico
NFSR 207	Camino Real	Santa Barbara campground to cumminity of El Valle	Proximity to Rio de las Trampas, narrown canyon	Forest Service
US 64	Tres Piedras	Rio Tusas to NFSR 133	Proximity to Rio Tusas	New Mexico
NFSR 222	Tres Piedras	Intersection of NFSR 1864 to SH 519	Proximity to Canada de la Agua, narrow canyon, formerly state highway	Forest Service, Rio Arriba county
NFSR 274	El Rito	SH 111 to T 27N, R7 E, Sec 9	Proximity to Rio Vallecitos, narrow canyon	Forest Service
NFSR 559	El Rito	El Rito community to NFSR 106 intersection	Proximity to El Rito Creek former state highway	New Mexico/ maintained by Forest Service
NFSR 44	El Rito	El Rito community to Vallecitos community	Narrow canyon, proximity to several drainages Former state highway	Forest Service
NFSR 559	Canjilon	NFSR 130 to Canjilon community	Proximity to Canjilon Creek, narrow canyon	New Mexico/ maintained by Forest Service
NFSR 129	Canjilon	NFSR 559 to Trout Lakes	Proximity to Canjilon Creek, Moist area	Forest Service
US 84	Canjilon	Ghost Ranch to top of ridge	Proximity to Canjilon Creek,	New Mexico
US 64	Jicarilla	East boundary	Proximity to	New Mexico

Road Number	District	Location	Reason	Owner
		to West boundary of district	Vacqueros drainage	

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

Mass wasting is generally not a problem in the Carson National Forest. The Red River drainage and Cabresto canyon to the north of Red River both contain hydrothermic soils. These hydrothermic soils developed from water reaching hot rocks deep in the ground and the water being blasted upwards. The underlying rock is fractured. These soils are susceptible to mass wasting when water is concentrated over a long period. Road design has placed an emphasis on maintaining natural drainage patterns. There is no known incidence of mass wasting of these hydrothermic soils due to roads (level 3-5) on the Carson National Forest.

Another area of concern is located in the vicinity of US Hill on the Camino Real Ranger District. State Highway 518 has slumped near the top of the ridge. The slump has been a scene of ongoing repair by the New Mexico Department of Transportation. In addition there is an area to the south of this location along SH 518 where a cut bank is showing evidence of slumping. This location is within the National Forest within the right of way of SH 518. The New Mexico Department of Transportation is aware of this slump area and has taken action to stabilize the area.

Concentration and diversion of flow into headwater areas can cause incision of previously unchanneled portions of the landscape and initiate slides in colluvial hollows. Diversion of stream flow at road-stream crossings, road proximity next to stream channels, and the culvert placements and frequencies are key factors contributing to road failure and other landscape erosional consequences during large flood events. Another potential factor would be the unusually high antecedent moisture content in the soils as a result of above normal wet years or heavy snow pack allowing increased risk for slumping or small landslides along, usually, cutbanks and less often on fillslopes.

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

Road stream crossings can be a major source of sediment to streams. Sediment loading is a result of channel fill around culverts, subsequent road-crossing failures, and subtle or major changes in stream morphology caused by aggradations. Increasing road density will impact the number of road-stream crossings thereby increasing the impact on stream water quality. Stream crossings such as (non-hardened crossings) ford crossings contribute more sediment because of direct connectivity from road to stream, whereas culvert crossings and bridges (hardened crossings) reduce the amount of sediment in streams. This study found one **non-hardened** stream crossing on the CNF Objective

Maintenance level 3,4, and 5 roads. This crossing is located at the intersection of FS 442 and FS 439.

In conclusion, increasing traffic volume and road density will increase the risk of sedimentation to streams. This will ultimately increase the over all impact on water quality, fish, and/or macro invertebrates

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

Clear and open pathways for pollutants to enter surface waters are either at road crossings such as fords and roadside culverts that discharge near or directly into surface waters. The potential for pollutants to enter surface waters is also based upon the design of the road system such as outsloped vs. in-sloped road designs, the incorporation of broad road dips, and the number of culvert installations along road-side ditches. Other factors are the roads' proximity to streams and the amount of vegetation such as grasses that can serve as "pollutant traps" between the road and stream water. If the road is designed poorly or there is a lack of vegetation materials to serve as a "buffer strip" between the road and stream water, movement of pollutants into surface waters is likely to occur. Proximity of the road to a stream is the strongest controlling variable in determining problems on water quality in streams. However, paved road systems are likely to be the pollution source areas due to the higher public vehicular use, greater attention on road maintenance requirements, and accidental spills, while unpaved road system are likely to be the source for sedimentation problems to nearby streams.

Routes designated as State Highways or Federal Highways are kept open during winter months except the portion of US 64 between Tres Piedras and Tierra Amarilla. De-icing materials such as cinders, calcium chloride, and road salt are used. Many of the paved roads in the Carson National Forest dry quickly due to the low humidity and intense sunlight reducing the need for de-icing materials.

AQ 6. How and where is the road system "hydrologically connected" to the stream system? How do the connections affect water quality and quantity (such as, the delivery of sediments and chemicals, thermal increases, elevated peak flows)?

See AQ(1), (2), (3), and (4) above for additional information. For thermal increases, roads that are closely parallel to stream systems have the potential to increase sunlight exposures to streams due to the lack of sheer number of trees between roads and stream channels that act as shade corridors and immediate source of litter fall into stream channels. These areas are essentially riparian zones where riparian plant communities thrive close to a water source. Trees on stream banks have the potential to lose soil due to the undermining or undercutting action by floods where weakened stream banks or

fillslope areas slump into streams thereby introducing woody materials. These actions can reduce shade coverage and expose surface waters to more sunlight and potentially increase water temperature. Recreational uses such as fishing, water diversions for agriculture and range uses, drinking water, stock ponds, and impoundments are the beneficial uses. Perennial stream systems support aquatic and wildlife species, and riparian plant species. Intermittent streams may support these as well during wetter seasons.

Some level 3-5 roads are located in or near drainage bottoms. These roads were constructed in the past and placed on sites that would lend readily to establishing a path or roadway. Drainage bottoms, open areas, and broad ridge tops were favorite locations.

Water quality is affected during high runoff events by roads. Sediments are normally captured by existing ground vegetation and woody ground cover where the cover exists. During intense thunderstorms or peak runoff some of the sediment generated is delivered to downstream locations.

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?

The continued population increase in the western states some of whom are relocating in communities in and around the Carson National Forest will likely generate an increase in recreational and transportation needs as result. These increases will likely cause additional impact to both paved and non-paved road systems throughout the National Forest. Impact to roads from pollutants and the mobilization of sediments to streams will likely occur thereby increasing the potential for additional strain to aquatic systems and degradation of water quality. This may be due in part to erosion, changes in sediment loads to streams, changes in water chemistry, acidity or pH, temperature, turbidity, and conductance as a result of the higher road maintenance requirements and increased road uses by public and private sectors.

Lands administered by the CNF include watersheds that provide domestic and agricultural water for the Chama River valley, Rio Grande valley, Red River valley, San Juan River valley, Tusas River valley, and for all of the communities located within or near the Forest (i.e. Questa, Costilla, Taos, Taos Ski Valley, Red River, Penasco, Espanola, Tres Piedras, El Rito, Canjilon, and many smaller communities and Pueblos). Use of water from these watersheds for domestic purposes is expected to increase over time. Road-derived pollutants might include hydrocarbons, salts, mineral sediments, or anything spilled from a hauling vehicle. These pollutants, if present in enough quantity, could affect the drinking water and the health of the people using that water, or could affect wildlife and plants, especially and most directly aquatic species.

Appendix A

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

Wetland roads are quite different from upland sites with regard to erosion potential and processes. Low gradients, high water tables, ample soil developments, water-loving plants, and poorly defined natural drainage and sheet flow areas during heavy rainfall events often define wetland areas. Trafficking of wetland roads generally occurs in the driest time of year while upland roads are usually designed for year-round access. The mobilization of fine sediment produces little impact immediately in the wetland areas but may be potentially impacted from upland sources and where floodwater could impact wetlands. However, wetlands on the CNF are far and few in between, and are rarely found near roads. Wetlands are likely to be found near spring areas where flat trails or road cuts are located in amply shaded locations, near naturally dammed areas such as travertine deposits or known active beaver areas that have beaver dams, or along near valley flats where perennial streams can be found.

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

- Relocate roads out of wetland or seasonally wet 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.

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 affect geomorphic and channel dynamics from four different mechanisms: **1)** accelerating erosion from the road surface and prism itself by both mass and surface erosion processes that adds or changes the equilibrium dynamics in a channel through sediment loading and erosional processes; **2)** directly affecting channel structure and geometry by constraints to the floodplain or stream that have a natural tendency for lateral (or vertical) migration; **3)** altering of surface flow paths and increasing stream density, leading to increased landscape dissection or channelization onto previously unchannelized portions of the landscape; and **4)** causing complex interactions among water, sediment, and woody materials (see question #5 also about woody materials and roads) where an increase in sediment movements, road side failures, slumpings, stream bank failures, landslides, and changes in streamflow dynamics will occur. These mechanisms involve different physical processes, have varying effects on erosion rates, and are not uniformly distributed either within or among landscapes or watersheds. As variable as climatic results will occur, so will the responses of a watershed or landscape containing a road system.

The existing road system does not isolate floodplains nor offer restriction to channel migration. The existing road system does not restrict movement of large woody material through out the system. Bridges permit the movement of this material. Culverts and bridges throughout the existing road (level 3-5) system allow the movement of fine organic matter, and sediment.

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

Road systems affect the migration and movement of aquatic organisms by blocking access to spawning grounds or suitable habitats through inappropriately installed culverts, poorly designed low water crossings, or changes in water velocities in a stream. Movement of fish within a stream or river system is equally important to resident fish, such as those on the Carson national Forest, as it may be to migrating Steelhead or Salmon in the Pacific Northwest. An inappropriately installed culvert is likely to pose a movement barrier to resident fish attempting to move to headwaters to spawn. This same culvert may also affect juvenile fish attempting to move to rearing habitat or cooler waters by increasing water velocities through the culvert and prohibiting movement within a stream. Culverts and low water crossings can also affect habitat links between different streams and stream systems within a watershed or multiple watersheds. If culverts or low water crossings close off habitat links, then genetic exchange between fish populations are reduced or eliminated, resulting in isolated populations and inbreeding. The probability of losing these isolated populations to disease and extirpation increases with time.

On the Carson National Forest, it is currently not known where restriction of migration and movement of aquatic organisms occurs. No surveys of culverts or low water crossings have been conducted to determine where conflicts with aquatic organisms exist. This information still needs to be obtained.

It is currently not known to what extent barriers to migration and movement affect aquatic organisms on the Carson National Forest. The aquatic organisms on the Carson National Forest that could potentially be affected by barriers include: Rio Grande Cutthroat Trout, Brook Trout, and Rainbow Trout. The possibilities of re-introducing Rio Grande Cutthroat Trout to the other portions of the Carson National Forest in the future still exist.

Channel crossings by roads and culverts designed to allow uninterrupted stream flow may also affect the morphology of small tributary streams, as well as limit or eliminate fish passage due to incorrect culvert placement and slope angle. Indirect effects of roads on channel morphology include the contributions of sediment and altered streamflow that can alter channel width, depth, local gradients, and habitat features (pools, riffles) for aquatic organisms.

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

See AQ(5)

The construction and maintenance of road systems disrupts the surrounding ecosystem by reducing shade, increasing stream temperatures, and reducing the potential for large woody debris to enter a stream system. These factors ultimately affect aquatic and riparian habitats.

Road ecosystems do exist, and as a result, may provide ecological niche areas for plant communities in some locations. A road system can exacerbate conditions by altering an already dynamic environment. For example, road systems have the potential to increase noxious weed and non-native plant population in riparian areas via people and vehicles. Road systems may also cause a change in the nature of lateral migration in a channel affecting riparian plant communities.

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

The existing road system on the Carson National Forest currently provides adequate access to fishing waters by sportsmen. During normal rain years, sportsmen access forest service system roads for fishing at Cabresto Canyon, Red River Canyon, Taos Canyon, Rio Pueblo, Rio San Antonio, Rio Los Pinos, Lagunitas, Canjilon Lakes, Rio Vallecitos, and other streams within wilderness and none wilderness areas of the Forest.

It is unknown how much poaching of fish occurs on the Carson National Forest. Since the fish bearing streams are located on the Carson National Forest and the availability of other larger fishing bearing waters is limited with the exception of Eagle Nest Lake, the amount of poaching on lands managed by the Forest Service is likely at moderate level. Poaching of deer and elk is more prevalent on the Lincoln than poaching of fish. However, fish bearing streams where road networks loop or interconnect with other roads have a higher potential for poaching than roads that dead-end at a lake or stream. Poachers tend to favor roads that loop or interconnect with other roads in order to enter an area one way and then exit the same area in a totally different direction. Poachers tend not to favor roads where the exit route is the same route that they came in on (communications with New Mexico Game and Fish officers).

Known locations of poaching (fishing) activities are in the Fifteen Springs area on the El Rito Ranger District and the Camino Real Ranger District. The Fifteen Springs area is accessed via NFSR 274. The poaching activity at this location involves Rio Grande Cutthroat trout. The Camino Real Ranger District fishing poaching is located along NFSR's 437, 438, 440 and 439. The fish poached are brown, rainbow, and other nonnative trout species.

Habitat loss for at-risk aquatic species occurs where the road prism results in direct or indirect loss of habitat. Direct loss of habitat results from the placement of roads in or near streams and riparian areas. For example, loss of stream habitat can occur by the placement of culverts in a stream, where a culvert and associated fill replaces native streambed materials. Encroachment of the road prism along streams also indirectly affects habitat by reducing riparian habitat that provides food, and shade that helps cool stream waters. In addition, added silt from roads that run parallel to streams affects spawning habitat by covering gravel beds and suffocating eggs and larvae. Roads that rank as a high risk for watershed values will likely be a high risk for aquatic species as well.

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

The introduction of non-native aquatic species will likely be greater where access to waters is made easier. The introduction of non-native wildlife species and non-native aquatic plants occurs where access is made easier and faster. Waters located along passenger roads are more likely to receive non-native introduced species than waters located in back country areas or along more rugged high clearance roads. In addition, waters with high recreational fishing use will tend to receive more bait bucket introductions than waters located in back country areas where access is limited to foot travel.

The New Mexico Department of Game and Fish (NMGF) uses the level 3, 4, and 5 roads to stock nonnative fish species in lakes and streams. State Highways 38, 578, and US Highway 64 are examples of nonnative fish stocking. Several streams on the Carson are put and take streams.

The status of non-native aquatic species has not been fully assessed by the Carson National Forest.

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

Analyses as to the extent in which roads overlap with areas of exceptionally high aquatic diversity or productivity have not been conducted on the Carson National Forest.

Appendix A

Terrestrial Wildlife

TW 1. What are the effects of the road system on terrestrial species habitat?

Direct affects to terrestrial species habitat from the Carson National Forest road system include: 1) loss of habitat due to conversion of native vegetation to a particular road surface (paved, gravel, dirt), 2) fragmentation of habitats due to road system development, 3) interruption in migratory patterns of wildlife to reach breeding habitat or winter range habitat, and 4) lack of habitat use by wildlife due to disturbance caused by use of the road system.

Loss of wildlife habitat can be correlated to road miles by converting road width and road distance into acres of habitat. Most level 3 roads have a width standard of 12 to 14 feet. Most level 4 roads have a width standard of 24 feet. For this analysis, an average width of 16.5 feet will be used. A road 16.5 feet wide and one half mile long is equivalent to 1 acre. Most level 4 paved roads have a width standard of 40 feet. Since not all paved roads have this width an estimated average of 24 feet will be used. The following table illustrates each administrative units total road miles for road levels 3, 4 and 5, and the amount wildlife habitat in acres that has been converted to a road surface over time. Level 1 and 2 roads are not included in this analysis. They will be included in project level analysis or incorporated at a later time.

Table 2. Miles of road per Administrative Unit and associated acres of wildlife habitat converted.

Ranger District	Miles of Road			Acres of Habitat Converted
	3	4	5	(Total)
Canjilon	57.7	19.3	30.5	284.4
El Rito	67.3	51.2	42.3	421.7
Jicarilla	80.4	0.0	8.3	176.7
Camino Real	134.3	8.8	77.0	618.8
Tres Piedras	96.1	7.2	59.7	466.9
Questa	39.8	73.4	40.0	408.3
Total	475.7	159.9	257.8	2,376.8

Totals may vary slightly due to rounding

Lack of wildlife use in habitats along roads can also be correlated to the level of use a road receives over a period of time. Low use roads tend to have wildlife using roadside habitats more frequently than roads with higher traffic volume

The "Coeur d' Alene Elk Ecology Study" by David Leptich and Zater Spetember 1993 recommends less than 2.5 miles per square mile for elk. Above that, and bull elk number

decline dramatically because it doesn't leave enough secure areas to allow good survival rates. The lower road density, the better the habitat. "Effects of Timber Management Practices On Elk" by Richard Brown, indicated habitat effectiveness declines to approximately 35 percent as open road densities approach 3 miles per square mile and increases to approximately 50 percent at road densities of approximately 1.7 miles per square mile.

TW 2. How does the road system facilitate human activities that affect habitat?

Human activities that affect habitat that are facilitated by the existing road system include; 1) Off road vehicle travel, 2) Dispersed shooting or target practice, 3) Dispersed camping, 4) Large group special uses, 5) Forest Service commodity production (i.e. livestock, timber and mining), and 6) special use permit activities such as guided fishing trips.

Off-road vehicle travel on undesignated routes (i.e. cross country) is facilitated from existing roads on gentler terrain, whether it's a 3, 4 or 5 level road. Off-road vehicle travel affects habitat through trampling of vegetation, compaction of soil, loss of vegetation and soil, and contributing sediment to stream waters. Impacts to habitat can either be short term or long term. Short term impacts maybe where an off-road vehicle makes one pass across a stream and the resulting sediments clear up in a few minutes. Long term impacts are where multiple passes occur across the stream resulting in eroded banks and loss of vegetation and soils for an extended period of time (i.e. years).

Recreational uses such as dispersed shooting areas, camping or large group events also impact wildlife habitat to varying degrees. For example, large group events occur periodically and over a short period of time. Most often, they occur over a weekend or holidays and result in trampling of vegetation in a meadow or grassland. The effects of such an activity are likely to last only a short period of time, a few days or a week. In contrast, dispersed shooting areas, many scattered over the forest, receives continued use that has evidently occurred over a long period of time. At these sites, affects to wildlife habitat are seen in trash accumulations, broken glass, and disturbed soil and vegetation. Other affects include displacement of wildlife due to noise associated with the discharge of firearms.

Past Forest Service commodity production has resulted in large part to the existing road system and network present today. Activities such as fuelwood harvest, livestock management, mining, and special use permit operations affect wildlife to varying degrees. Wildlife forage, nesting, and thermal cover habitat are affected by these activities to varying degrees, depending on the degree of tree harvest, forage use, mining activity, and number of permit operations that occur.

Appendix A

TW 3. How does the road system affect legal and illegal human activities (including trapping, hunting, poaching, harassment, road kill, or illegal kill levels)? What are the effects on wildlife species?

The existing road system provides access for legal and illegal human activities. Poaching is an ongoing problem. The New Mexico Game and Fish Department would like to eliminate loop and unnecessary roads where possible. Wildlife species avoid potentially useable habitat along the more heavily used roads.
Legal activities such as hunting and trapping are facilitated by the existing road system. The road system facilitates hunting and trapping by making access to areas easier and faster, and also helps distribute road hunters (sportsmen who hunt from their vehicles or along road ways) over a greater area. In addition, level 2 roads (not included in this analysis) and above, levels 3, 4 and 5, facilitate access for sportsmen with disabilities. In contrast, the same benefits of roads for legal activities such as hunting and trapping also help facilitate some illegal activities such as poaching. Poachers prefer road systems with loops or interconnected road networks, and tend not to use "dead end" roads or roads with no secondary outlet (i.e. one way in, one way out).

However too many roads (high road densities) can also affect wildlife negatively through harassment, displacement, or vulnerability to hunters and poachers. The Rocky Mountain Elk Foundation has funded several studies on the effects of road on elk, and in particular to effects on mature bulls (Stalling, 1994). These studies have found that hunter densities increase in proportion to road densities. The more roads you have in an area, the more hunters you will have, resulting in more hunting pressure and harvesting of mature bulls. Stalling (1994) summarized one study that looked at elk mortality in three different areas; 1) High density of open roads, 2) Roads closed to motorized vehicles during hunting season, and 3) area with no roads. In the area with a high density of open roads, only 5% of all bulls lived to maturity (4.5 years). None of the bulls lived past 5.5 years, and the herd contained about 10 bulls for every 100 cows. In the area with roads closed during the hunting season, 16% of the bulls lived past maturity, most reaching 7.5 years. The herd contained 20 bulls for every 100 cows. In the area with no roads, 30% of the bulls lived to maturity, most reaching 10 years. This herd contained 35 bulls per 100 cows. The study found that as road access increases, elk become increasingly vulnerable to hunting mortality. This trend will result in elk populations with undesirable sex and age structure, increasingly complex and restrictive hunting regulations to protect elk herds, and a loss of recreational opportunity.

Illegal motorized vehicle use off road has become a problem that is possibly linked to road systems. New roads/trails are constantly being created on the Forest by illegal use of off road vehicles such as all terrain vehicles and four-wheel drive vehicles. Currently large portions of the Carson National Forest are open to off road vehicle travel. These portions tend to be the gentler terrain areas of the forest. The problem has become the off

road travel in the portions of the Forest closed to off road travel. These portions tend to provide wildlife habitat security needs.

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

Unique communities or special features for wildlife that may be affected by the road system include wet meadows such as 'dry lakes', Research Natural Area (RNA) candidate areas, riparian habitats, old growth stands and wilderness areas. Research Natural Area candidate areas are special features on the Carson National Forest due to the fact that they are set aside to provide and protect natural diversity for non-manipulative research, observation and study.

The Tres Piedras Ranger District contains a RNA candidate area for a plant; other districts contain proposed areas set aside in the Carson Forest Plan. Roads in this analysis are not found in the proposed RNA's.

The El Rito, Canjilon, and Tres Piedras Ranger Districts all contain areas known as dry lakes. These areas fill with water during normal years and become dry toward the end of the summer season. They are used by wildlife for water and other habitat needs. Road access to these areas is not by level 3 to 5 level roads

Based on analysis of the road system in relation to Research Natural Areas, there appears to be no conflicts at this time. The Carson National Forest has several Endangered Species Act listed plants and Regional Forester designated sensitive plants. These scattered species habitats are sometimes dissected by a road. The effect of the road will vary by species. Where habitat includes a road, some habitat is lost to the road surface. Sometimes the road's drainage design can be beneficial to existing rare plants by providing moisture rich sites need to propagate the species.

Economics

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. There is a lack of sufficient data to present a detailed cost/benefit economic assessment.

The Carson National Forest Road Analysis Team considered roads with an Objective maintenance level of 3, 4, and 5. The Risk and Value assessment determined that the

current majority of roads in this Analysis are classified as High Value/ High Risk Roads. The Forest's challenge is to develop an ongoing process that will identify those level 3, 4, and 5 roads, which might not be meeting current and future access and land management needs. This process will help identify opportunities to reduce road maintenance costs on some roads.

These roads were originally developed over the years for a variety of access needs, and considerable capital investments were incurred to construct these roads. Construction and maintenance costs are allocated according to access needs, construction design standards, environmental considerations, and economic assessment prior to their development. Many of the existing roads were developed prior to ownership by the federal government. For example are national forest system roads, NFSR 437 and 438 located on the Camino Real Ranger District. These roads were constructed while the lands were in private ownership. Due to their usefulness, the roads have remained in place.

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 is a project-level or watershed level question, not a forest scale question.

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

The current road system allows the communities adjacent or located in the Forest to access fuel wood, forest products, wildlife, and recreational opportunities.

This is properly a project-level or watershed level question, not a forest scale question.

Timber

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

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

Harvest activities whether it's conducted in the commercial forest land (Mixed Conifer, Ponderosa, Aspen, spruce-fir) or the woodland zone (pinyon-juniper), are harvested with ground-based equipment. The trees are felled by hand with chain saws and then yarded to the landing with rubber or tracked skidders. Harvest operations using feller buncher and tree shears have been proposed. However, harvest operations on the Carson National Forest have been mostly curtailed for the past several years.

In general, a road spacing of 2,000 to 3,000 feet would be economical for ground-based skidding. 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.

Generally, road construction is only allowed where it is determined to be economically and technically necessary to achieve resource management objectives. The most efficient road spacing that would maximize timber stumpage values is not acceptable because it usually conflicts with other resource management objectives.

TM 2. How does the road system affect managing the suitable timber base and other lands?

When the Forest Plan was signed in 1986, 379,472 acres were identified as lands suitable for timber production from the tentatively suitable land base of 601,356 acres. Suitable and tentatively suitable lands were comprised of Mixed Conifer, Ponderosa Pine, spruce-fir, and Aspen species capable of growing 20 cubic feet per acre per year. The allowable Sale Quantity was calculated from growth and yield projections based on these areas only.

When the Carson National Forest prepares their forest plan revision, scheduled to begin in 2007, the suitable timberland and transportation plan will be reanalyzed and revised as appropriate.

The Carson National Forest has an active program of planned pre-commercial treatment (harvesting trees less than 9 inches DBH) for the purpose of reducing fire hazard. These treatments, mainly within the Wildland Urban Interface (WUI), need to be continued with material thinned (biomass) that needs to be removed and utilized if possible. This activity will require construction of new access roads. In addition it will use and maintain existing roads.

TM 3. How does the road system affect access to timber stands needing silvicultural treatment?

There are many timber stands needing silvicultural treatment such as thinning, prescribed burning, and dwarf mistletoe reduction. Many non-commercial timber stands in the woodland area (pinyon-juniper) also need silvicultural treatments to maintain the stands. The current road system, level 3, 4 and 5's, provides access to many of these stands. The access is adequate with off-road travel where permitted by the Forest Plan supplementing the road system.

Appendix A

Minerals Management

MM 1. How does the road system affect access to mineral resources on the forest?

The maintenance level 3, 4 and 5 roads in this analysis serve as access to general areas and provide adequate access. Most mineral operations occur on maintenance level 1 or 2 roads.

Range Management

RM 1. How does the road system affect range allotments?

The road system is vital for efficient administration and management of permitted grazing allotments. Forest Service personnel must be able to monitor, inspect and evaluate range conditions on a regular basis to effectively administer existing grazing permits. The current road system allows for rapid access to allotments to react to the numerous public issues challenging the range program today.

Grazing permittees need reasonable vehicular access within allotments to maintain existing range improvements and to manage and care for permitted livestock. Care for livestock often includes transporting large trailers and truck loads of cattle and sheep on Forest Service roads to allotment entry points such as a corral system.

As the road network on the Carson National Forest has advanced from a few maintained roads to many miles of good roads, so has the dependency on those roads for the commercial and recreational activities on the forest. Range management and livestock grazing activities are certainly one of the many uses of the Carson National Forest that have grown dependant on the current road system to manage livestock operations.

Water Production

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

There are many acequias (community ditches) on the Forest. The level 3, 4, and 5 roads existing today access head gates and many portions of these ditches. These roads provide the needed access to monitor these facilities.

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

Carson National Forest does not have any designated municipal watersheds within it boundaries.

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

There is no hydroelectric power generation, current or planned, in the analysis area. The road system will have no effect on hydroelectric power generation.

Special Forest Products

ST 1. How does the road system affect access for collecting special forest products?

The current maintenance level 3, 4, and 5 road system provides adequate access for collecting special forest products such as mushrooms, seed cones, transplants, Christmas trees, firewood, etc. If road closure or seasonal closure is considered in a project or watershed analysis, access for special forest products will be considered.

Special Use Permits

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

The maintenance level 3, 4 and 5 roads in this analysis serve as general access to "areas" that lead to maintenance level 1 and 2 roads that are adequate for management and administration of special use permits.

General Public Transportation

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

County roads, U.S. and State highways give communities, tourists, and industries access to the National Forest. The towns of Petaca, Las Tablas, Servilleta Plaza, and Canon Plaza rely on FS Roads 42 and 519 as the primary access.

These roads connect to arterial, collector, and some local FS roads, where traffic is dispersed into the Forest for a variety of uses. Some county roads and state highways traverse into or through the National Forest, as shown in **Appendix C** and listed in **Figure 1**.

Appendix A

National Forest system roads connect to numerous public roads managed and operated by the U.S. DOT, State of New Mexico, and county governments. Forest Service jurisdiction roads create the sole or primary access to many parcels of private land within the Forest Boundary. No Forest Service jurisdiction roads serve as the primary through-routes that connect the larger communities

Cooperative maintenance agreements between the Counties and FS help to address our combined road maintenance needs. When larger developments or subdivisions occur and in-holding traffic is expected to exceed that generated by the users of the National Forest, agency policy is to pursue turning jurisdiction of the Forest road over to another public road authority such as the county or state.

Traditional road access to the National Forest is being lost by lack of legal right of way through private lands within the Forest. This issue is expected to grow as private land parcels change hands and use of the roads increases. The Forest Service negotiates with landowners to gain public access with varied result. Where these roads create access that is of interest to the County, they may assert jurisdiction and public right-of way on the road, but that is uncommon, even on roads that have been maintained by the County under cooperative agreement. As population increases, recreation and commercial use of the road system is also expected to increase.

These roads and others are important to and used by 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 Forest is important for recreation, timber, ranching, and mining.

GT 2. How does the road system connect large blocks in other ownership to public roads (ad hoc communities, subdivisions, inholdings and so on)?

The amount and dispersion of private and other ownership lands varies across the five Ranger Districts. Private lands are widely interspersed with National Forest land. In addition to private ownership, Carson national forest lands are bordered by or surrounded by lands of the Taos Pueblo, Bureau of Land Management, State of New Mexico, Taos County, State of New Mexico, and municipalities.

Level 3, 4 and 5 roads and public roads access the majority of private and non-federal land holdings. Level 1 and 2 roads also access several parcels; some land parcels have no vehicle access. Access need to inholdings is 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 National Environmental Policy Act (NEPA) process to determine possible environmental effects and the level of reasonable access required. When subdivision occurs, the Forest policy is to request the landowners to create an

association or some type of consolidated organization to represent all of the landowner interests. This eliminates the need for the Forest to enter into road use or special use permits with each individual landowner. Responsibilities for improvements and maintenance should be passed on to the county or state entity determined through a commensurate share process. If access is being provided by a public road agency such as the county or state, then the Forest Service may not be obligated to provide any additional access over federal lands. When larger developments or subdivisions occur and where inholding traffic is expected to exceed that generated by the users of the National Forest, agency policy is to pursue turning jurisdiction of the Forest road over to a public road authority

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

The amount of private land inside or bordering the Carson National Forest and pattern of population growth indicate a need to increase road management cooperation, refine road jurisdictions, and maintenance responsibilities.

Many roads on the Carson National Forest call for a higher level of maintenance and construction for the private lands that they access. Use and management of the Carson National Forest often requires access by high clearance vehicle, while access to private lands may dictate a need for passenger car access.

Numerous roads crossing the National Forest fall under the jurisdiction of State, County or private organizations. When desirable, cooperative agreements should be established to share road improvement and maintenance responsibilities when all partners can benefit.

The Forest Service, Federal Highway Administration and the New Mexico State Department of Transportation have Memorandum of Understanding (MOU). This document set forth general procedures for planning, programming, environmental studies, design, construction and maintenance of highways. The Carson National Forest has cooperative road maintenance agreements with all three counties that it lies in. The Carson National Forest has several road use and maintenance agreements with private landowners on the Forest.

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 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 lands and roads. The courts have established that such valid outstanding rights may be subject to some federal regulation. See *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 certainly honor such rights when it is subsequently determined that the specific facts surrounding any claim to such rights meet the criteria set forth in any respective statute granting such occupancy and use (see *Washington County v. The United States,* 903 F. Supp. 40 [D. Utah, 1955]).

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

In 1975, the Forest Service developed a Memorandum of Understanding with the Federal Highway Administration that required the Forest Service to apply the requirements of the National Highway safety program, established by the Highway Safety Act, 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. Safety work such as surface maintenance, roadside clearing and installation and maintenance of warning and regulatory signs are performed on an annual basis. Traffic control signing follows standards set forth in the Manual on Uniform Traffic Control Devices (MUTCD). **See Figures 2-4**

When accidents occur on Forest roads, often the Forest Service may not be immediately informed. Accidents are usually reported to the local sheriff or state patrol, if reported at all. When the Forest becomes 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. Presently, there is no comprehensive program on the Carson National Forest for identifying or tracking accident locations and for maintaining surveillance of those locations having high accident rates or losses as is required by Highway Safety Act. The Forest needs to address this area of non-compliance.

With increased use by more urbanized visitors, expectations have changed. Forest users expect to be safe, to have ready access to emergency medical services and evacuation routes.

Appendix A

Administrative Use

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

The road system provides adequate access for research, inventory, and monitoring. [110, 279, Forest Travel Map]

In all five districts of the Carson national Forest, the road system appears to provide adequate access for research, inventory, and monitoring.

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

The level 3, 4, and 5 road system on the Carson National Forest generally provides good access for investigative and enforcement activities. These roads provide access to developed and dispersed recreation sites where many common violations occur. These roads also provide access to the many developed trailhead-parking areas for the trail system that provides backcountry access. While the road system provides access to perform investigative and enforcement activities, it also provided access for increasing public use of the National Forest System lands. The result is an increase in criminal activities.
Most of the unauthorized uses are in the form of illegal outfitting and guiding. These roads also provide access to the backcountry trailheads where non-permitted commercial snowmobiling and hunting activities occur.

Theft of forest products is also usually directly related to the level 3, 4, and 5 road system. These violations mostly involve thefts of firewood, transplants, and Christmas trees. Some commercial level thefts of these products occur most years, and these thefts are usually dependant upon the level 3, 4, and 5 roads system.

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 areas just off level 3, 4, and 5 roads. These gatherings often result in other resource and property vandalism.

While the road system on the Forest facilitates illegal activities, there are no known direct road-related causes of significant illegal activities.

Appendix A

Protection

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

The maintenance level 3, 4 and 5 roads in this analysis provide adequate access to the general areas where fuels management activities occur. Most fuel management projects require maintenance level 2 access. To access areas for efficient fuels management, sometimes closed roads are opened or short temporary roads are constructed. Many of the most critical fuels management project areas are in the Wildland Urban Interface (WUI), and access to them is gained through the bordering private lands. Road use agreements with private lands owners are negotiated in these cases.

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

The current forest densities, weather conditions (drought), and increasing populations, minimizing response time to suppress wildfires is important to keeping the size of fires and their the burned area minimized. Road condition affects the response time to wildfires.

There are areas of the Carson National Forest and bordering private lands that have only one main access route (dead end road). It is possible that a wildfire burning close to these single access routes could delay response to the area or prevent a more aggressive response, allowing the fire to burn longer.

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

The road system affects risk by its ability to provide evacuation routes and by its level of safety for the vehicles using the road. Carson National Forest jurisdiction roads provide the main access to several occupied private lands. Location, rate and direction of travel of a fire and inadequate road conditions could combine to create a dangerous situation for the life safety of private residents and firefighters responding to the wildfire.

Evacuation routes for growing communities can be provided by existing or new roads on the Carson National Forest. These roads need to be in such a condition that they can pass a passenger car without damage, but may be placed in a maintenance level 1 (closed).

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

Unpaved roads whether native soil or graveled can contribute airborne dust during times of dry weather conditions. Dust emissions also increase with traffic and vehicle weight. Winds can pick up fine dust from unpaved roads and release them whenever winds die out. Winds can also transport fine dust at appreciable distances close to active road use

areas such as nearby resident houses or campgrounds affecting those who are particularly sensitive to the fine dust. Reduced visibility may result from unpaved roads, especially graveled roads, during windy periods. Higher road density values of graveled roads have the potential to reduce visibility and, in some cases, increase health concerns in localized areas.

Some FS jurisdiction roads on the Carson National Forest also provide primary access to private land. With subdivision of these lands, traffic may increase significantly on these Forest roads, increasing the dust emissions. Dust emissions can be reduced with dust abatement, or paving unpaved roads.

Unroaded Recreation

UR 1. Is there now or will there be in the future excess supply or excess demand for unroaded recreation opportunities?

Temporary road construction in unroaded areas may reduce the supply of unroaded recreation opportunities as a temporary condition. There are no plans to construct roads in the inventoried roadless areas (areas larger than 5000 acres). The supply of large unroaded recreation opportunities in the inventoried roadless and designated wilderness areas will be unchanged. As populations increase, demand for all types of recreation, including unroaded, is expected to increase.

UR 2. 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 recreation opportunities?

None of these are causing substantial changes.

UR 3. What are the adverse affects of noise and other disturbances caused by developing, using, and maintaining roads, on quantity, quality, and type of unroaded recreation opportunities?

None, there are areas of the forest providing unroaded opportunities for recreation.

UR 4. Who participates in unroaded recreation in the areas affected by constructing, maintaining, and decommissioning?

All Forest users travel the level 3, 4, and 5 roads. Other roads such as Level 2 roads, allow dispersed access into otherwise inaccessible areas. Many bicyclists and horseback riders, for instance, use these roads for riding. Road decommissioning would be contentious for these users, depending on the road. Conversely, some users would not welcome a road into their favorite unroaded area. Road construction and/or road decommissioning is a decision to be made at the project level.

UR 5. What are forest user attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

The Carson National Forest was developed from lands both in the public domain and lands in under land grants. Land grants were of several types and were granted to both Native American people (Pueblos) and Spanish colonists/settlers. Within community grants, where a group of settlers were given land in common, settlers received individually owned building sites and agricultural lands near the ditch or stream. Because communal use of large tracts of unsettled land had been sanctioned and handed down under Spanish law they came to be thought of as ancestral lands.

The villagers used lands in common for grazing, timber and community pastures. Because groups of kinsmen often tilled their fields cooperatively and herded their animals together they were able to manage on scattered small-sized agricultural plots. Additionally, their relationship with the land assumed an intrinsic, spiritual value that also passed to succeeding generations. Today, residents of these rural villages retain their traditional values and depend on the use of natural resources, including grazing and forest products. Grazing cattle contributes to a sense of personal identity, prestige within a community, pride of life-style, and feeling of self-sufficiency which all contributes to a strong sense of community. Grazing livestock within the National Forest represents to the permittees a "tie to the land" or "right of use" dating back to the subsistence-based life-styles of earlier generations.

Users are attached to existing roads. Alternative locations and opportunities are not generally available unless the local residents leave the area.

UR 6. How are developing new roads into unroaded areas affecting the Scenic Integrity Objective, SIO(s)? Note: Some forests are still using the Visual Management System (VMS). If that is the case, substitute Visual Quality Objective (VQO) for SIO. (Region 2 added this question. There is no corresponding National direction).

There are no new roads being developed into unroaded areas. There is not change from the current conditions.

Roaded recreation

RR 1. Is there now or will there be in the future excess supply or excess demand for roaded recreation opportunities?

No excess supply. Current supply should meet next 50-year demand.

RR 2. 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 roaded recreation opportunities?

No, all of the Recreation Opportunity Spectrum are offered somewhere on the forest.

RR 3. What are the adverse affects of noise and other disturbances caused by developing, using, and maintaining roads, on quantity, quality, and type of roaded recreation opportunities?

None

RR 4. Who participates in roaded recreation in the areas affected by constructing, maintaining, and decommissioning?

Participants include; sightseers, hunters, almost all recreation users, local community members, and many who visit the forest from areas outside the forest boundaries.

RR 5. What are these participants' attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

See answer to UR 5 above.

Users are attached to existing maintenance level 3-5 roads. Alternative locations and opportunities are not available unless the local residents leave the area.

RR 6. How does the road system affect the Scenic Integrity Objective, SIO(s)? Note: Some forests are still using the Visual Management System (VMS). If that is the case, substitute Visual Quality Objective (VQO) for SIO. (Region 2 added this question. There is no corresponding National direction).

There would be no measurable effect.

Passive Use

PV 1. Do the areas planned for road constructing, closure, or decommissioning have unique physical or biological characteristics, such as unique natural features and threatened or endangered species?

There are no roads (level 3, 4 or 5) planned for road construction, closure, or decommissioning in this road analysis.

PV 2. Do areas planned for road construction, closure, or decommissioning have unique cultural, traditional, symbolic, sacred, spiritual, or religious significance?

Many groups claim affinity for the land that is now the Carson National Forest, among them people who have lived on, hunted, gathered, ranched, logged or farmed in the area. Specific groups who have expressed this relation are the Jicarilla Apaches, Taos Pueblo, Picuris Pueblo, Pojaque Pueblo, the Hopi Tribe the Zuni Tribe, Navajo tribe. Local ranchers and land grant decendants have expressed a value for their traditional land-based lifestyle. "Traditional cultural properties" (TCPs) exist on the Carson National Forest but have not been identified as to specific location.

There are no roads (level 3, 4 or 5) planned for road construction, closure, or decommissioning in this road analysis.

PV 3. What, if any, groups of people (ethnic groups, subcultures, and so on) hold cultural, symbolic, spiritual, sacred, traditional, or religious values for areas planned for road entry or road closure?

See PV(2)

PV 4. Will constructing, closing, or decommissioning substantially affect passive-use value?

There are no roads (level 3, 4 or 5) planned for road construction, closure, or decommissioning in this road analysis.

New road construction, reconstruction, temporary road use, closing, and decommissioning should have no affect on passive-use value. This is a project level scale decision.

Social Issues

SI 1. What are people's perceived needs and values for roads? How does road management affect people's dependence on, need of, and desire for roads?

People's needs and values for roads are very diverse. Some people become very attached to the road access that is available, and tend to desire the status quo. Some people prefer that roads be available, but be in a condition that makes driving them a challenge. Some people would like to reduce the amount of roads, and therefore vehicles and other people in the Forest. Some people want certain roads improved. Change in road management is often upsetting to some people if it results in a change in any one-road user's previous behavior. There are no roads (level 3, 4 or 5) planned for road construction, closure, or decommissioning in this road analysis. Therefore there is no change from the current conditions.

SI 2. What are people's perceived needs and values for access? How does road management affect people's dependence on, need of, and desire for roads?

People's needs and values for access is diverse. It ranges from people who want to be able to access all areas of the National Forest on motorized vehicles to people who want no (human) access at all. Most people's needs or values fall somewhere in the middle, valuing a mix of motorized and non-motorized access. Many people hold deep and strong feelings about roads and road management. Change in road management is often upsetting to some people if it results in a change in any one's previous behavior.

There are no roads (level 3, 4 or 5) planned for road construction, closure, or decommissioning in this road analysis. Therefore there is not change for the current conditions.

SI 3. How does the road system affect access to paleontological, archaeological, and historical sites?

Heritage sites (paleontological, archaeological, and historical) are distributed throughout the forest. The roads and trails system provides improved access to many of these sites, particularly for management purposes. Without the road system, access to most sites would be difficult, and would involve hiking or walking long distances to get to them. Many sites would be inaccessible to the handicapped, elderly, or others who could not walk long distances. Most site locations, however, are not marked or advertised for public use, and visitation is not encouraged.

SI 4. How does the road system affect cultural and traditional uses (such as plant gathering, and access to traditional and cultural sites) and American Indian treaty rights?

The road system provides access for cultural and traditional uses such as plant gathering, clay procurement, and access to traditional cultural or religious sites. Tribal elders, for example, may have some difficulty getting to certain areas of the forest without the road system. In some cases, roads can have an adverse effect on traditional use or religious sites by impacting the natural setting or affecting the quiet and solitude needed for such use. In these cases, the impact of the road system on the site would outweigh the advantage of easy access. No negative cases have been identified on the Carson NF. There are no established American Indian treaty rights involving the Carson National Forest.

SI 5. How are roads that constitute historic sites affected by road management?

Today's road system is often the result of upgrading or reconstructing existing roads and trails, and there are several examples of historic roads or trails that have been converted to roads on the Carson National Forest. State Highway 518, which crosses the Camino

Real Ranger District, is located on or adjacent to an old military road from the mid 19th Century. Many miles of historic railroad beds have been converted to roadways over the years. The Camino Real from Mexico City to Taos, and the Kiowa Trail from Taos through Questa and on into Colorado, are eligible for the National Register. Portions have undoubtedly been converted to roadways over the years. A stage line crosses the Tres Piedras Ranger District, and portions of the Santa Fe Trail cross the Camino Real Ranger District. It is likely that portions of the old stage line have been converted to road. This process has been going on for hundreds of years. Most major roadways follow old historic or even prehistoric routes. Historic trails, railroads, and roads that have been converted or upgraded to level 3, 4, or 5 roads have often lost much of their integrity as a result of road construction activities.

The roadbeds of historic roads and trails are protected by project level decisions in accordance with existing laws and regulations and in consultation with the State Historic Preservation Officer. Old roadways are preserved whenever possible to retain their historical significance. Where historic roads and trails cannot be avoided or protected, the adverse effects are mitigated through excavations and/or archival research and detailed recording.

Historic roads that are on or adjacent to the current road system offer opportunities for interpretation for the public, and in some cases contribute to a scenic byway or other special designation for a highway.

SI 6. How is community social and economic health affect by road management (for example, lifestyles, business, tourism industry, infrastructure maintenance)?

Road management is subtle, yet necessary to forest management. Use of the Carson National Forest is dependent on proper, timely road management. Commodity users rely on the existing road system, just as pleasure seekers do. For many communities in the West, the road system is the backbone of commerce, providing for the movement of products, services, and people through the Forest. Most of the roads on the Forest were built to facilitate log hauling or accessing homesteads. Today, recreation traffic is added to the importance of these roads.

Access to the Carson National Forest by tourists is an amenity advertised by the local chambers of commerce and is important to economic health. Recreation traffic includes local and non-local users, many of whom are sight seeing. Across the National Forest system, managers have indicated that nearly 40% of Forest use is by people who never get out of their vehicles.

In addition to increasing uses, the demographics in the U.S. indicate an ever-increasing urban population (NRSE 2001). These travelers expect to go long distances in short amounts of time and to be able to get through the Forest in comfort. With the exception

of state highways, the only paved roads on the Forest are in association with developed recreation sites. Maintenance is increasingly important to facilitating the demands of these users, who are replacing commodity production in the overall economic health of the local communities.

SI 7. What is the perceived social and economic dependency of a community on an unroaded area versus the value of that unroaded area for its intrinsic existence and symbolic values?

Unroaded areas within the Carson National Forest have a variety of social values. Some people value natural resources existing in unroaded areas for the economic contribution that could be afforded by their extraction such as timber, minerals, and roaded access. Other people value roadless areas for the contributions they provide in an undeveloped state such as increased solitude, quiet, and refuge for plants and animals.

SI 8. How does road management affect wilderness attributes including natural integrity, natural appearance, opportunities for solitude, and opportunities for primitive recreation?

There are three wilderness areas and one wilderness study area on the Carson National Forest. The wilderness and wilderness study areas account for nearly 8% of the total forest acreage on the Forest. Possible effects are dust and unauthorized motorized use facilitated by the road system. There is no information that shows the maintenance level 3-5 roads have any effect on wilderness attributes.

SI 9. What are traditional uses of animal and plant species in the area?

Use of animal and plant species on the Carson National Forest dates back to pre-historic hunters and gathers who occupied areas on the forest. There is evidence that humans inhabited the region approximately 10,000 years ago. In addition, hunting and gathering camps (200 – 500 AD) are also common throughout the Sangre de Christo, San Juan, Tusas and other mountain range in the Carson. Hunter-gatherer groups used upland areas where they could find a variety of edible plants and wildlife habitats within a relatively small area (Tainter and Tainter 1995). The development of agrarian communities created more permanent settlements throughout the region. People supplemented their crops by hunting local game such as deer, Merriam's elk, pronghorn, bison, rabbits and prairie dogs.

Following Spanish settlement of the Carson National Forest many medicinal plants have been used. Native residents likely helped the newcomers to find and use plants in and adjacent to the Forest.
Free ranging domestic livestock for forage used native grasses and forbs. Permitted livestock graze the native grasses and forbs.

Appendix A

SI 10. How does road management affect people's sense of place?

"Sense of place" describes the character of an area and the meaning people attach to it. The local residents have a special tie to the land.

People's sense of place is directly tied to the aspects of an area, including the area within a road corridor, that invoke a special feeling or attachment to the area. Factors include the area's vegetation, the amount of sunlight available, the views, the solitude, the opportunities that make it a destination, and the overall familiarity. The road itself facilitates a person'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. These attributes are directly related to road management. Changes in road management will alter an individual's sense of place, and such issues should be integrated into forest and road planning and management strategies.
Examples of these effects include those used in the discussion in recreation. If a road is managed as a Level 3 and the decision is made to upgrade it, that area may experience an influx of users due to easier accessibility. 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 5 and the decision is made to downgrade maintenance, the road will not be drivable, and the area becomes inaccessible for some current users. This problem is especially evident for the elderly, a group that has used the area for years. Rough roads are hard on bones, and users have to be considered in these decisions. Because a variety of different people use the existing road system, they need to be considered before changing road management.

This question is best answered at the watershed scale or project level scale.

SI 11. How does road location and road maintenance affect heritage sites (question added by forest)?

Heritage sites (paleontological, archaeological, and historical) cover much of the forest. There are sites located on or nearby roads on the Carson National Forest. The road system can have direct and indirect impacts to heritage sites. Sites that are in or immediately adjacent to the road can be directly impacted by road construction, maintenance and use. These sites are considered on a project-by-project basis for road maintenance or other ground-disturbing activities. Policy is to protect these sites in accordance with existing laws and regulations. Sites that cannot be avoided or protected can be excavated and/or recorded to mitigate the loss.

The road system can have indirect impacts on heritage sites as well. The road system can provide access to these sites, and increased or improved access can result in illegal artifact collecting, pot hunting, and site vandalism. However, the sites are not generally designated on the ground for the visiting public, and can be difficult to find.

Access can be positive as well, providing access to heritage sites for stabilization, interpretation, visitation, or other purposes. Heritage sites located adjacent to the road system could potentially be developed as interpretive sites for the public. In addition, sites that are adjacent to well traveled roads are often less susceptible to pot hunting than sites in remote locations where the pothunters would be less visible.

Road maintenance within the boundaries of heritage sites has the potential to directly affect these resources; conversely, the lack of maintenance within site boundaries can also result in site damage due to rutting or erosion. Maintenance activities on level 3, 4, and 5 roads is often less of a concern than maintenance on level 1 or 2 roads. For levels 3 and above, the regularly maintained road surface has likely already impacted the site, and continued maintenance will often do more to protect the site than harm it. This is particularly true for roads that have been surfaced with aggregate, asphalt or some other material. Road maintenance activities are considered at the project level, in accordance with the laws and regulations and in consultation with the State Historic Preservation Officer. Sites are considered on a case-by-case basis to determine whether they should be avoided, the roads maintained through the sites, or whether excavation is needed to mitigate any potential loss from maintenance activities or erosion.

Civil Rights and Environmental Justice

CR 1. How does the road system, or its management, affect certain groups of people (minority, ethnic, cultural, racial, disabled, and low income)?

A specific consideration of equity and fairness in resource decision-making is encompassed in the issue of environmental justice and civil rights. As required by law and Title XI, all federal actions will consider potentially disproportionate effects on minority or low-income communities. Potential impacts or changes to low-income or minority communities within the study area due to the proposed action should be considered. Where possible, measures should be taken to avoid negative impacts to these communities or mitigate the adverse affects.

Many communities in and adjacent to the Carson National forest the study area would fall under the minority and or low-income populations identified in the Environmental Justice Executive Order 12898. Generally, environmental justice is concerned with identifying these communities and ensuring that they are involved in and understand the potential effects of the proposed action.

Appendix B
Risk and Value Assessment

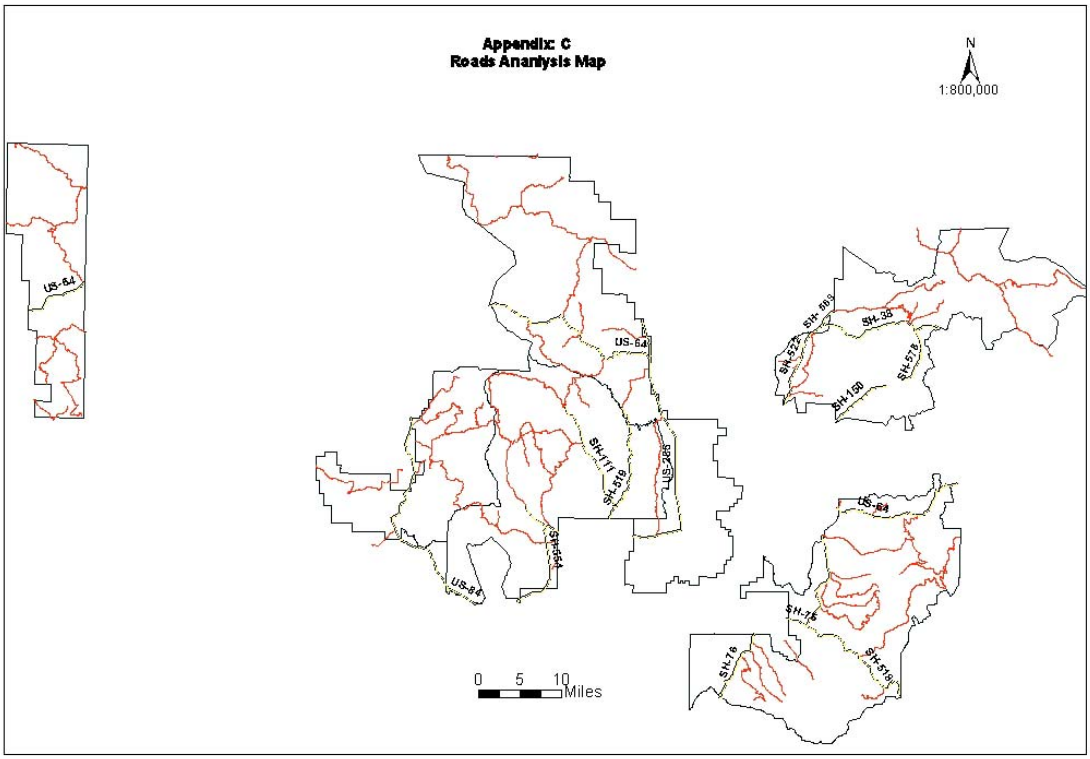
							Risk					Value				
Road	**Name**	**Seg. Length**	**Jurisc.**	**Obj. Mtc. Level**	**Funct. Class**	**CNF District**	**Human Caused Fire**	**Wildlife**	**Watershed**	**Cultural Resources**	**Overall Risk**	**Resource Access**	**Facility Access**	**Recreation Access**	**Safety**	**Overall Value**
124		13.6	FS	3	C	1	High	High	Low	High	High	High	Low	Low	Low	High
125	Trout Lakes	10.1	FS	3	C	1	Low	High	Low	High	High	High	Low	High	High	High
129		4.9	FS	4	L	1	Low	Low	High	High	High	High	Low	High	High	High
129A		1	FS	4	L	1	Low	Low	High	High	High	High	Low	Low	High	High
129B		0.3	FS	4	L	1	Low	Low	High	High	High	High	Low	Low	High	High
137	Pinon Mesa	14.7	FS	3	A	1	High	High	Low	High	High	High	Low	Low	Low	Low
145		17	FS	3	C	1	High	Low	Low	High	High	High	Low	Low	Low	Low
151		3.8	FS	3	C	1	Low	Low	Low	High	Low	High	Low	Low	Low	Low
24		2.4	FS	3	C	1	Low	High	Low	High	High	High	Low	Low	Low	Low
337B		1.3	FS	3	C	1	High	Low	Low	High	High	High	Low	Low	Low	Low
559		12.9	FS	4	A	1	High	High	High	High	High	High	Low	Low	High	High
8A	Echo Ampitheat.	0.3	FS	5	A	1	Low	Low	Low	High	High	High	Low	High	High	High
US-84		30.2	OF	5	A	1	Low	High	High	High	High	High	Low	High	High	High
ND*	Canjilon Lakes CG		FS			1	High	Low	Low	High	High	High	Low	High	High	High
106		13.2	FS	4	A	2	High	High	High	High	High	High	Low	Low	Low	Low
110		4.8	FS	3	C	2	Low	Low	Low	High	Low	High	Low	Low	Low	Low
123		8.1	FS	3	C	2	High	High	Low	High	High	High	Low	Low	Low	Low
137	Pinon Mesa	15	FS	3	A	2	High	High	Low	High	High	High	Low	Low	Low	Low
172		5.7	FS	3	C	2	High	High	High	High	High	High	Low	Low	Low	Low
20		1.8	FS	3	C	2	High	High	High	High	High	High	Low	Low	Low	Low
274		19.8	FS	4	A	2	High	High	Low	High	Low	High	Low	Low	Low	Low
42	Vallecitos	5.8	FS	3	C	2	High	High	High	High	High	High	Low	Low	Low	Low
44		15.6	FS	3	C	2	High	High	High	High	High	High	Low	Low	Low	Low
559		12.2	FS	4	A	2	High	High	High	High	High	High	Low	High	High	High
94		1.8	C	4	A	2	Low	Low	Low	High	High	High	Low	Low	Low	Low
97		13.8	FS	3	C	2	High	High	Low	High	High	High	Low	Low	Low	Low
SH-111		16.3	S	5	A	2	High	High	Low	High	High	High	Low	Low	High	High
SH-519		12.5	SH	5	A	2	High	High	Low	High	High	High	Low	Low	High	High
SH-554		13.5	SH	5	A	2	Low	High	Low	High	High	High	Low	Low	High	High
SH-110		3.7		4	A	2	High	High	Low	High	High	High	Low	Low	High	High
ND	El Rito Creek CG		FS			2	High	High	High	High	High	High	Low	High	High	High
218	Carracas Mesa	12.9	FS	3	L	3	High	High	Low	High	High	High	Low	Low	Low	Low
309	Cabresto Can.	7.43	FS	3	L	3	High	High	Low	High	High	High	Low	Low	Low	Low
310	American Mesa	19.2	FS	3	L	3	High	High	Low	High	High	High	Low	High	Low	High
314	West. Bdy	20.5	FS	3	L	3	Low	High	Low	High	High	High	Low	Low	Low	Low
316	Chief Brown	2.8	FS	3	L	3	Low	High	Low	High	High	High	Low	Low	Low	Low
357	Gas Buggy Jaramillo	17.8	FS	3	L	3	Low	High	Low	High	High	High	Low	High	Low	High
US-64		8.3	OF	5	A	3	High	High	High	High	High	High	Low	Low	High	High
1		1.3	FS	4	C	4	High	Low	Low	High	High	High	High	Low	High	High
10	Capulin	2.6	FS	3	L	4	High	High	High	High	High	High	Low	Low	Low	Low
10A		1.8	FS	3	L	4	High	Low	Low	High	High	High	Low	Low	Low	Low
116	Santa Barbara	6.5	FS	5	C	4	High	High	High	High	High	High	Low	High	Low	High
153	Upper Pot Creek	6	FS	3	C	4	Low	Low	Low	High	Low	High	Low	Low	Low	Low
160	Ojito	8.2	FS	3	L	4	High	Low	Low	High	High	High	Low	Low	High	High
161	Alamitos	4.5	FS	4	C	4	High	Low	Low	High	High	High	Low	High	Low	High
207	El Valle	8.2	FS	5	L	4	High	High	High	High	High	High	Low	High	High	High
437	Rio Chiquito	21	FS	3	C	4	High	High	High	High	High	High	Low	Low	Low	Low

Appendix B
Risk and Value Assessment

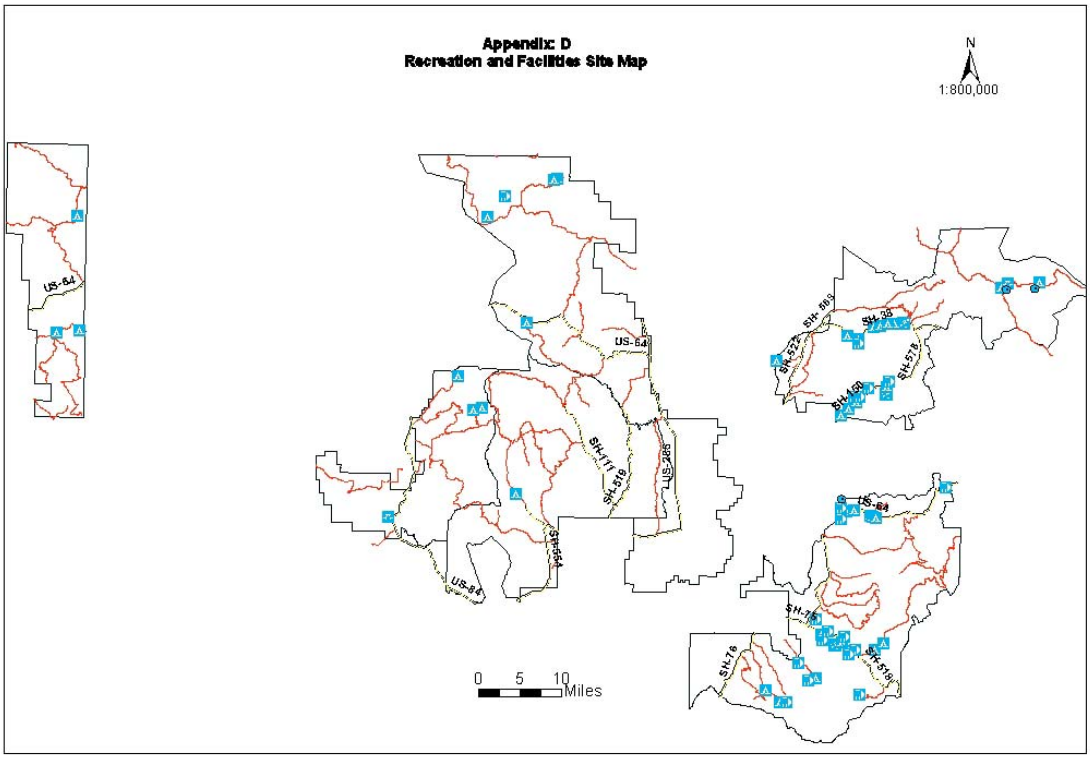
							Risk					Value				
438	Pot Creek	13.7	FS	3	C	4	High	High	High	High	High	High	Low	Low	Low	Low
439	Little Rio Grande	11.5	FS	3	C	4	High	High	High	High	High	High	Low	Low	Low	Low
440	Maestas Park	10.5	FS	3	C	4	High	High	Low	High	High	High	Low	Low	Low	Low
442	Gallegos	15.9	FS	3	C	4	High	Low	Low	High	High	High	Low	Low	Low	Low
703	Amole	0.7	FS	3	L	4	High	Low	Low	High	High	High	Low	High	Low	High
714	Los Alamos	12.6	FS	3	C	4	High	Low	Low	High	High	High	Low	Low	Low	Low
76	La Junta	29.8	FS	3	A	4	High	High	High	High	High	High	Low	High	High	High
SH-518		31.9	S	5	A	4	High	High	High	High	High	High	Low	High	High	High
SH-75		3.1	S	4	L	4	High	High	Low	High	High	High	Low	Low	High	High
SH-76		10.5	S	5	A	4	High	High	Low	High	High	High	Low	Low	High	High
US-64		19.6	OF	5	A	4	High	High	High	High	High	High	Low	High	High	High
708	Agua Piedra CG	0.5	FS	5	L	4	High	High	Low	High	High	High	Low	High	High	High
ND	Comales CG		FS			4	High	High	Low	High	High	High	Low	High	High	High
ND	Duran Canyon CG		FS			4	High	High	Low	High	High	High	Low	High	High	High
ND	El Nogal CG		FS			4	High	High	Low	High	High	High	Low	High	High	High
ND	La Sombra CG		FS			4	High	High	Low	High	High	High	Low	High	High	High
ND	Las Petacas CG		FS			4	High	High	Low	High	High	High	Low	High	High	High
ND	La Vinateria CG		FS			4	High	High	Low	High	High	High	Low	High	High	High
103		1.8	FS	3	C	6	Low	Low	Low	High	Low	High	Low	Low	Low	Low
133		12	FS	3	C	6	Low	High	Low	High	High	High	Low	Low	Low	Low
222		7.2	FS	4	C	6	High	High	High	High	High	High	Low	Low	High	High
42	Vallecitos	5	FS	3	C	6	High	High	Low	High	High	High	Low	Low	Low	Low
421		4.3	FS	3	C	6	High	High	High	High	High	High	Low	Low	Low	Low
712		3.7	FS	3	C	6	High	Low	Low	High	High	High	Low	Low	Low	Low
83		6.2	FS	3	C	6	High	High	Low	High	High	High	Low	Low	Low	Low
87		39.4	FS	3	C	6	Low	High	Low	High	High	High	Low	High	Low	High
87A		8.4	FS	3	C	6	Low	High	Low	High	High	High	Low	High	Low	High
91B		12.2	FS	3	C	6	High	High	Low	High	High	High	Low	Low	Low	Low
97		3.1	FS	3	C	6	High	High	Low	High	High	High	Low	Low	Low	Low
SH-519		2.4	S	5	A	6	High	High	Low	High	High	High	Low	Low	High	High
US-285		32.2	S	5	A	6	High	High	Low	High	High	High	Low	Low	High	High
US-64		25.2	OF	5	A	6	High	High	High	High	High	High	Low	High	High	High
ND	Hopewell Lake CG		FS			6	High	Low	Low	High	High	High	Low	High	High	High
134	Cabresto Can.	17.1	FS	4	C	7	High	High	High	High	High	High	Low	High	High	High
1900	Costilla Dam	3.6	FS	3	C	7	Low	High	High	High	High	High	Low	Low	Low	Low
1910	Middle Ponil	13.4	FS	3	C	7	Low	High	High	High	High	High	Low	High	Low	High
1916B	Shuree Pond	0.2	FS	3	L	7	Low	High	Low	High	High	High	Low	High	Low	High
1916	Shuree Lodge	0.87	FS	3	L	7	Low	High	Low	High	High	High	Low	High	Low	High
1918A	Valle Vidal	0.5	FS	3	L	7	Low	High	Low	High	High	High	High	Low	Low	High
1950		32.8	FS	4	A	7	Low	High	High	High	High	High	High	High	High	High
493	Old Taos Hwy	10.2	C	4	C	7	High	High	Low	High	High	High	Low	Low	Low	Low
597	Sawmill	8.7	FS	3	A	7	Low	Low	Low	High	High	High	Low	Low	Low	Low
597A	Gallagher/Mallette	1.7	FS	3	L	7	Low	High	Low	High	High	High	Low	Low	Low	Low
7	Lawrence Ranch	5	FS	4	C	7	High	Low	Low	High	High	High	Low	Low	Low	High
705X	Sewer Lagoon	1	FS	3	L	7	Low	Low	Low	High	Low	High	Low	Low	Low	Low
77	Bitter Creek	5.7	FS	3	L	7	Low	High	High	High	High	High	Low	High	Low	High
9	Cebolla Mesa	3.2	FS	3	L	7	Low	Low	Low	High	Low	High	Low	High	Low	High
SH-563	Cabresto 134	2.4	S	5	A	7	Low	High	Low	High	High	High	Low	High	High	High
SH-150		8	S	5	A	7	High	High	High	High	High	High	Low	High	High	High
SH-38		16.8	S	5	A	7	High	High	High	High	High	High	Low	High	High	High

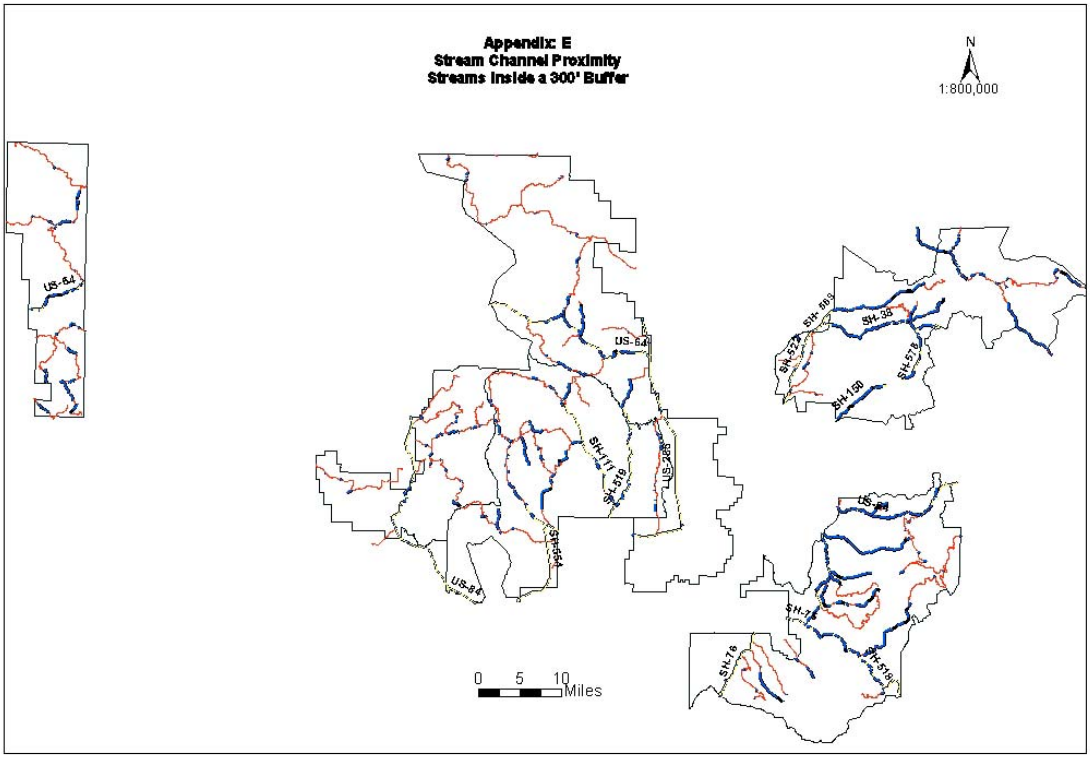
Appendix B
Risk and Value Assessment

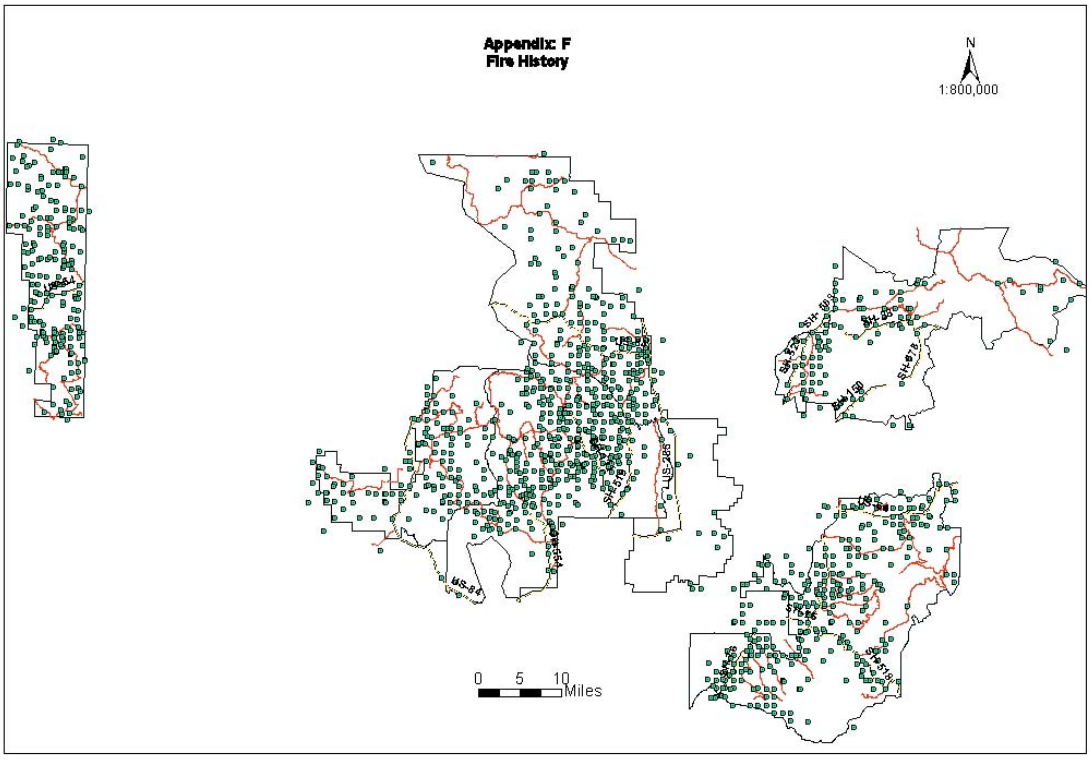
							Risk					Value				
SH-515		2	S	5	A	7	High	High	Low	High	High	High	Low	High	High	High
SH-522		11.2	S	5	A	7	High	High	Low	High	High	High	Low	High	High	High
SH-578		7.7	S	4	L	7	Low	High	High	High	High	High	Low	High	High	High
ND	Cimmarron CG		FS			7	High	High	Low	High	High	High	Low	High	High	High
109	Columbine CG	0.56	FS	4	L	7	High	High	Low	High	High	High	Low	High	High	High
497	Fawn Lakes CG	0.23	FS	3	L	7	High	High	Low	High	High	High	Low	High	High	High
61A	Lower Hondo CG	0.04	FS	3	L	7	High	High	Low	High	High	High	Low	High	High	High
6A	Questa District	0.2	FS	3	L	7	High	High	Low	High	High	High	Low	High	High	High
6B	Goat Hill CG	0.1	FS	3	L	7	High	High	Low	High	High	High	Low	High	High	High
6C	Elephant Rock CG	0.2	FS	3	L	7	High	High	Low	High	High	High	Low	High	High	High
6D	Junebug CG	0.2	FS	3	L	7	High	High	Low	High	High	High	Low	High	High	High
ND	McCrystal CG		FS			7	High	High	Low	High	High	High	Low	High	High	High
ND	Twining CG		FS			7	High	High	Low	High	High	High	Low	High	High	High


Appendix C
Roads Ananlysis Map
N
1:800,000
US-64
US-64
SH-111
SH-519
US-385
US-64
US-64
SH-76
SH-76
SH-519
SH-523
SH-503
SH-35
SH-519
SH-150
0 5 10
Miles

Appendix: D
Recreation and Facilities Site Map




Appendix: E
Stream Channel Proximity
Streams Inside a 300' Buffer
N
1:800,000
US-64
US-64
SH-111
SH-519
US-285
SH-554
US-84
SH-573
SH-86
SH-33
SH-516
SH-150
US-84
SH-76
SH-76
SH-516
0 5 10
Miles


Appendix: F
Fire History
N
1:800,000
0 5 10
Miles

Appendix G
Road Analysis ID Team

Jack Carpenter	Natural Resources Planner
George Devis, consultant	Assistant Forest Management Officer
Emilia Dicharry	Civil Engineering Technician
Armando Fernandez, consultant	Civil Engineering Technician
Dave Johnson, consultant	Forest Archeologist
Allan Lemley	GPS Coordinator
Greg Miller, consultant	Soils and Hydrology
Herb Vigil, consultant	Engineering Projects Manager