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Roads Analysis Report

San Juan National Forest
Forest-Scale Roads Analysis

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Forest-Scale Roads Analysis

July 26, 2006

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Introduction

Background

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

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

On January 12, 2001, the Forest Service issued the final National Forest System Road Management Rule. This rule revises regulations concerning the management, use, and maintenance of the National Forest Transportation System. Consistent with changes in public demands and use of National Forest System resources and the need to better manage funds available for road construction, reconstruction, maintenance, and decommissioning, the final rule removes the emphasis on transportation development and adds a requirement for science-based transportation analysis. The final rule is intended to help ensure that additions to the National Forest System road network are those deemed essential for resource management and use; that construction, reconstruction, and maintenance of roads minimize adverse environmental impacts; and that unneeded roads are decommissioned and restoration of ecological processes are initiated.

In November 2005, the Forest Service issued the final Travel Management Rule for designation of routes and areas for motorized vehicle use. The rule requires that the Forest Service designate a system of roads, trails and areas for motor vehicle use by vehicle class and, if appropriate by time of year. While the Rule does not define vehicle classes, the National Implementation Team has provided the following direction:

- Highway-legal vehicles
- Off-highway vehicles (OHVs) 50 inches in width, or greater
- OHVs less than 50 inches in width

The process of implementing the Rule will include performing a Travel Analysis, which builds upon the Roads Analysis process and includes analysis of maintenance level 2 through 5 roads and motorized trails. The process will culminate with the publication of a Motor Vehicle Use Map (MVUM) that will display routes where motorized use is allowed.

Process

Roads analysis is a six-step process. The steps are designed to be sequential with the understanding the process may require feedback and iteration among steps over time as an analysis matures. The amount of time and effort spent on each step differs by project based on specific situations and available information. The process provides a set of possible issues and analysis questions for which the answers can inform choices about road system management. Decision makers and analysts determine the relevance of each question, incorporating public participation as deemed necessary. The six steps that guided the process are:

Step 1: Setting up the analysis

Step 2: Describing the situation

Step 3: Identifying the issues

Step 4: Assessing benefits, problems and risks

Step 5: Describing opportunities and setting priorities

Step 6: Reporting

This Report

This report documents the roads analysis procedure used for the San Juan National Forest roads analysis. It contains a table for each ranger district that prioritizes each level 3, 4, and 5 road according to its values and risks. It contains management guidelines and opportunities for future actions that could impact the forest road system. Four maps are included with the report; one map displays the Forest and the three ranger district boundaries and the remaining three, one of each ranger district, display the existing maintenance level 3, 4, and 5 roads.

Step 1 Setting up the Analysis

Background

The San Juan National Forest (SJNF) and San Juan Field Office of the Bureau of Land Management (BLM) are pioneering a concept known as Service First. Service First is a partnership strategy to provide better customer service and be more cost effective in the delivery of services to users of the public lands in southwest Colorado. Under Service First, public lands have combined management and offer a single point of contact for all customers—commercial users, partners, and visitors. The project has merged the SJNF, the BLM San Juan Field Office, the Anasazi Heritage Center, and the newly created Canyons of the Ancients National Monument under the management of the San Juan Public Lands Center (SJPLC) in Durango with Field Office/Ranger Districts in Pagosa Springs, Durango, Bayfield, and Dolores, Colorado.

The San Juan Public Lands (SJPL) encompass approximately 700,000 acres of federal land managed by the Bureau of Land Management and 1,867,800 acres within the SJNF The SJPL includes lands in Archuleta, Conejos, Dolores, Hinsdale, La Plata, Mineral, Montezuma, Montrose, Rio Grande, San Juan, and San Miguel counties. The west boundary extends to the Utah/Colorado State line. The southern boundary extends to the New Mexico/Colorado State line. The eastern boundary is the Continental Divide. The northern boundary is comprised of the administrative boundaries with the Rio Grande, Gunnison, Grand Mesa and Uncompahgre National Forests and the BLM Uncompahgre Field Office.

Although the SJPL are managed jointly by the Forest Service and BLM, the roads analysis process is only a requirement of the Forest Service. So, only those roads located within the jurisdictional boundaries of the SJNF were analyzed.

Objectives of the Analysis

This roads analysis is conducted on a Forest-wide scale so that it may be used to support the SJNF Plan Revision, the Northern San Juan Basin EIS, and future project-specific environmental analyses. A descriptive inventory of the existing Level 3, 4, and 5 roads was developed that identifies and prioritizes opportunities to address management of the road system and its effects on the forest. The objective of the analysis is to define the minimum sustainable road system needed to provide access to the Forest that is considerate of ecological, social, and economical issues.

The analysis:

- is conducted for the entire SJNF, although road data is presented by Ranger District;
- focuses on level 3, 4, and 5 roads, though some reclassifications between level 3 and level 2 roads were evaluated;
- does not evaluate level 3, 4, or 5 roads located within developed recreation sites (campgrounds, etc.);
- is based on existing data available at the time the analysis was conducted;
- uses a 20-year planning horizon;
- utilizes public input received during the forest planning process;

- serves as the first step toward development of the Travel Analysis for implementation of the Travel Management Rule.

Interdisciplinary Team Members and Participants

The Interdisciplinary team and roles are presented below:

Core Interdisciplinary Team		
Mary J. Blanchard	Roads Analysis Team Leader Engineering and Lands	Supervisor's Office
Gary Ferdinando	Engineering	Dolores District
Jessey Tase	GIS	Supervisor's Office
Kay Zillich	Hydrology	Supervisor's Office
Dave Dallison	Timber	Supervisor's Office
Technical Interdisciplinary Team		
Jeff Redders	Biology, Ecology and Soils	Supervisor's Office
Mark Ball	Wildlife	Supervisor's Office
Dave Gerhardt	Fisheries	Supervisor's Office
Glen Raby	Minerals and Geology	Supervisor's Office
Julie Coleman	Archaeology	Supervisor's Office
David Baker	Recreation	Supervisor's Office
Julie Schaefers	Socio-economics	Regional Office
Sally Zwisler	GIS and vegetation mapping	Supervisor's Office
Bill Ivy	Roads	Supervisor's Office
Mark Tucker	Range and invasive species	Supervisor's Office
Vicki Duvall	Infra/Roads Inventory	Supervisor's Office
Kim Round	Landscape architecture	Supervisor's Office
Pattie Smith	Administrative assistance	Supervisor's Office
District Recreation Representatives		
Penny Wu	Recreation	Dolores District
Ron Decker	Recreation	Pagosa District
Tracey McInerney	Recreation	Columbine District

In Addition, the team was supported by the following supervisory staff:

Howard Sargent	Associate Forest Supervisor/Center Manager
Thurman Wilson	Planning
Robert Sieger	Forest Engineer

Information Needs

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

- SJNF Plan (1983) and subsequent amendments
- Infra travel routes inventory
- Infra deferred maintenance costs
- Suitable timber base

- Aquatic Ecosystem Analysis
- Draft Forest Plan revision documents
- List of potential road projects
- Annual road reconstruction and maintenance budget
- Roadless area inventory done for the SJNF plan revision
- Draft Northern San Juan Basin EIS
- Socio-economic assessment done for the forest plan revision
- Inventory of right-of-way easement needs

The IDT identified the following mapping needs:

- Forest and district boundaries
- All Level 2-5 roads
- Major water bodies, streams and riparian areas
- Geologic hazards
- 6^{th}–level hydrologic unit boundaries (6^{th}-level HUB)
- Soil maps
- Management area prescriptions from the 1983 Forest Plan
- Developed recreation sites
- Land status/ownership
- Occurrence of T&E species
- Existing Research Natural Areas and Wilderness areas

Analysis Plan

The roads analysis plan implemented by the San Juan NF IDT followed the 6-step roads analysis process outlined in Roads Analysis: Informing Decisions About Managing the National Forest Transportation System (FS-643, August 1999). The team began by first developing an inventory of level 3, 4, and 5 roads for each ranger district (Dolores, Columbine and Pagosa) and establishing the roads analysis objectives and scale. The core IDT and district recreation representatives then developed a list of values and risks that would be used in developing priorities for investing in road improvements, maintenance or decommissioning. The core IDT and district recreation representatives performed a route-by-route analysis that determined the appropriate value and risk assignments for each route and resulted in a High or Low value and a High or Low risk assessment for each route. High values and risks were assigned a numerical value of two (2), and low values and risks were assigned a numerical value of one (1). When a specific value or risk did not apply to a specific road, a numerical value of zero (0) was assigned. This aided the core IDT in identifying issues and prioritizing routes for potential investment. Those routes with a high value and high risk would receive first consideration for investment, while those routes with low value and low risk would likely not be considered for additional investment. The following diagram illustrates this process. A table summarizing the route inventory, values, risks, and high/low assessments is located in Appendix C.

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Figure 1.1

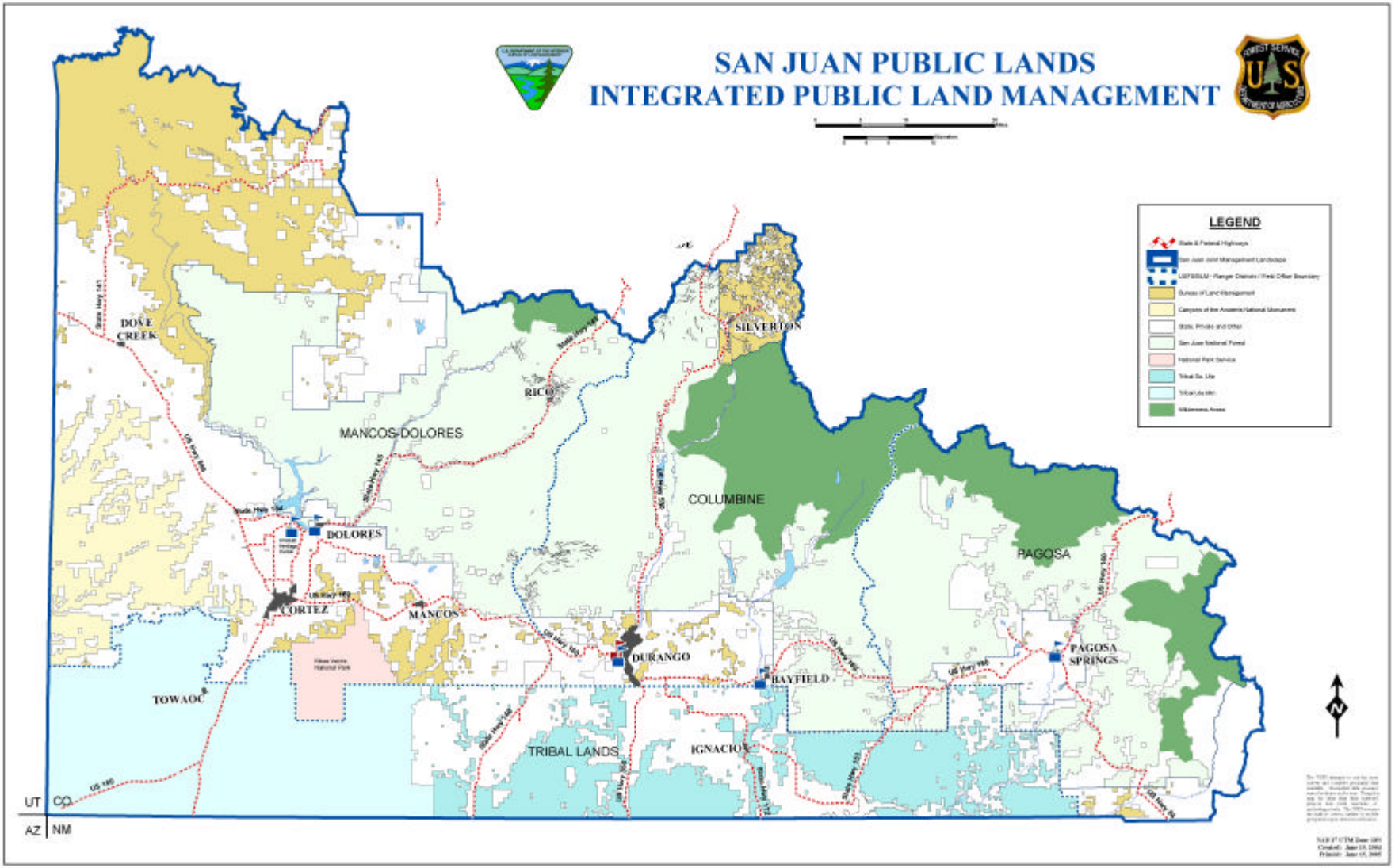
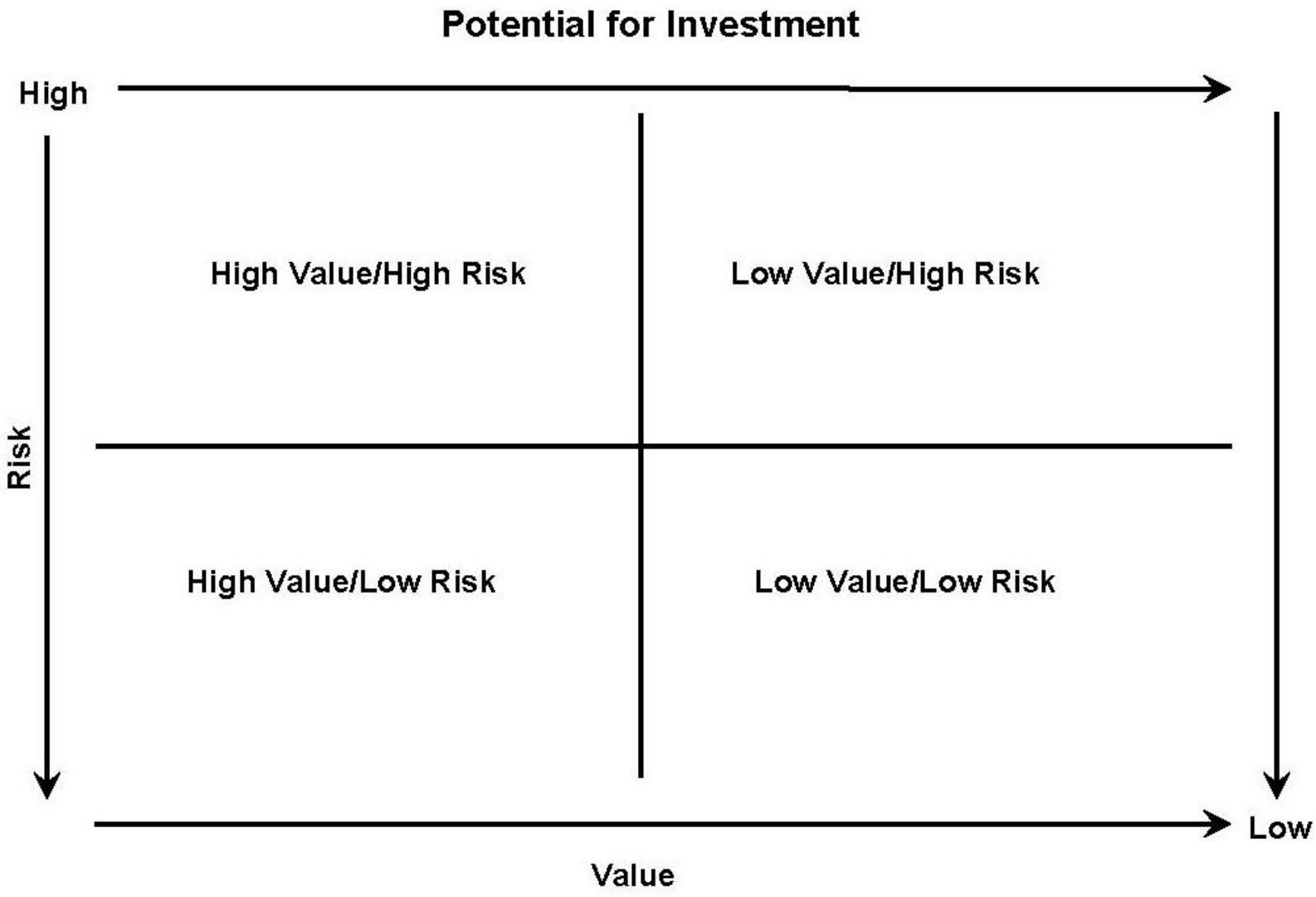

SAN JUAN PUBLIC LANDS
INTEGRATED PUBLIC LAND MANAGEMENT
LEGEND
DOVE CREEK
RICO
SILVERTON
MANCOS-DOLORES
COLUMBINE
DOLORES
PAGOSA
CORTEZ
MANCOS
DURANGO
BAYFIELD
PAGOSA SPRINGS
TOWAOC
TRIBAL LANDS
IGNACIO
UT
CO
AZ
NM

Figure 1.2


Potential for Investment
High
High Value/High Risk
Low Value/High Risk
Risk
High Value/Low Risk
Low Value/Low Risk
Low
Value

Current Planning Efforts

San Juan National Forest Plan Revision

The Forest and Renewable Resource Planning Act of 1974, as amended by the National Forest Management Act of 1976, requires preparation and revision of Forest Plans (Sec. 6, 16 U.S.C. 1600). USFS published a Notice of Intent to revise the San Juan Forest Plan in the "Federal Register" on September 23, 1999. On December 14, 2004, the San Juan Public Lands published a second Notice of Intent to prepare an environmental impact statement in conjunction with the revision of the land and resource management plan for the SJNF.

The purpose of the plan revision is to establish guidance, objectives, policies, and management actions for lands and resources under the jurisdiction of the SJPL. The plan will be comprehensive in nature and will resolve or address major revision topics and issues within the planning area that have been identified through agency, interagency, and public scoping efforts.

Plan decisions will:

- Establish desired conditions that describe the ecological, economic and social attributes that characterize the desired outcome of land management.
- Establish objectives that describe the focus of management and set priorities aimed at achieving desired conditions.
- Establish guidelines that provide guidance and information for carrying out projects and activities to help achieve the objectives and desired outcomes.
- Identify areas of each National Forest System unit as generally suitable for various uses.
- Identify or designate special areas, which are places with unique or special characteristics.

The Draft Forest Plan and DEIS are scheduled for release for public comment in November 2006 and are scheduled to be adopted in September 2007 by the agency. An analysis of oil and gas leasing availability and stipulations is being conducted for the San Juan Public Lands concurrently.

Northern San Juan Basin Coal Bed Methane Draft Environmental Impact Statement (Northern San Juan Basin EIS)

The Environmental Impact Statement for the Northern San Juan Basin Coal Bed Methane Project analyzes the impacts of additional Fruitland coalbed methane wells on USFS, BLM, state, and private land in the Northern San Juan Gas Field of southwestern Colorado. The field can potentially produce 2.5 trillion cubic feet of methane over the next 30 years, with an estimated $15 billion in gross revenues. The EIS is a joint effort of the USFS and BLM.

The preferred alternative in the draft EIS would result in the development of about 127 new wells, an estimated additional 72 miles of access roads and pipelines, and approximately 650 acres impacted. Issues analyzed include property values, noise, visual impacts, tax revenues, water depletions, gas seepage into domestic water wells, impacts on vegetation, wildlife, roadless values, archaeological resources, and air quality.

The Draft Northern San Juan Basin EIS was issued this in the spring of 2006. The Final EIS is projected to be completed in July 2006 and the record of decision is expected to be issued in late in

the summer of 2006. Forest personnel have also interacted with the task force on subsequent occasions.

Roadless Areas Review Task Force

The Roadless Areas Review Task Force is a bipartisan 13-member group, created under Colorado Senate Bill 05-243. This group will recommend the future of roadless areas in Colorado, including what uses, if any, will be allowed in the applicable forest areas. Based upon public comment, the task force will make recommendations to Governor Owens regarding how inventoried roadless areas should be managed. The Governor will then submit a petition to the United States Forest Service on behalf of the State of Colorado.

On Dec. 9, 2005, the roadless area review task force held a public comment meeting in La Plata County. San Juan NF staff attended this meeting and has taken into account the local comments regarding roadless area components of the plan revision.

Public Involvement

Due to the extensive public involvement conducted as part of the forest plan revision process, as part of the development of the Northern San Juan Basin EIS, and recreation interviews conducted for various user groups, no addition public involvement was conducted for the roads analysis. A summary of the public involvement related to travel management conducted during these planning processes is summarized below.

Forest Plan Revision

The forest plan revision process hosted 29 study group meetings during 2005 and in early 2006. There were more than 450 registered attendees (many of which attended several meetings). Each study group meeting was open to the general public and was heavily advertised through newspapers, television and radio. All study group meetings were well attended by San Juan NF staff representing the full spectrum of land management disciplines, and creating a broad knowledge base for meeting discussions.

Participants both recorded their written comments on individual comment sheets, and placed icon stickers representing various comment categories (motorized uses, pet impacts, wildlife habitat, mineral and gas development, etc.) onto full-sized maps to specify the location specific to the comment. Well over 3,000 specific comments were collected. Participants also discussed proposed land allocations, travel management suitability, and other land management topics.

Northern San Juan Basin EIS

The Northern San Juan Basin EIS process included four public open houses and one public hearing prior to issuance of the DEIS in the spring of 2006. In addition, there were four BLM Southwest Colorado Resource Advisory Council (RAC) meetings, and tribal briefings with Hopis and Southern Utes, in addition to consultation with 20 other tribes.

The comment period on the DEIS was extended to six months to ensure the public had sufficient time to submit comments. The project team received about 68,000 responses that were predominantly submitted in email format. The responses contained 4,505 unique comments that identified 412 areas of public concern. Some of the roads-related concerns are listed below.

- Protect roadless values and address impacts to wildlife, steep unstable slopes, and highly erosive soils.
- Protect regional air quality.
- Protect water resources by addressing surface and ground water impacts, water depletions, and watershed impacts.
- Protect cultural resources and old-growth.
- Prevent noxious weeds.
- Obtain financial guarantees for future reclamation work.

Recreation Interviews

Recognizing the importance of recreation for public lands planning and to lifestyles in the Southwest, SJPL initiated a recreation group interview process, conducted by Fort Lewis College-Office of Community Services partnering with RPI Consulting LLC. A total of 83 interviews were conducted with leaders of organized recreation groups, commercial outfitters, stewardship groups, outdoor equipment retailers, and other organized groups with an interest in recreation on public lands. Interviews were conducted in nearly even numbers for the three districts comprising the San Juan Public lands.

These interviews were conducted during the winter of 2004. The summary report is available on the Forest Planning Web site at http://ocs.fortlewis.edu/forestPlan/reports.asp

Step 2 Describing the Situation

Existing Road and Access System Description

The transportation system on the SJNF serves a variety of resource management and access needs. Most roads on the SJNF were originally constructed for commercial access purposes which included grazing, timber, and mineral extraction. Other roads resulted from construction of gas pipeline and power transmission projects. Over the past 100 years, an extensive road network was developed and continues to serve commercial, recreation, and administrative purposes and provide access to private lands located within the Forest.

There are currently 2,712 miles of National Forest System Roads (NFSR) on the SJNF. The three Ranger Districts, Columbine, Dolores, and Pagosa, share management of the road system. The Colorado counties of La Plata, Montezuma, Dolores, Archuleta, Mineral, San Juan, and Hinsdale have roads that are within or provide access to the Forest. Twenty-seven percent or 735 miles of the NFS roads are managed and maintained for public use by low-clearance vehicles (passenger cars). These roads receive the highest traffic and are the most costly to maintain to standard. These roads are the focus of this forest-scale roads analysis.

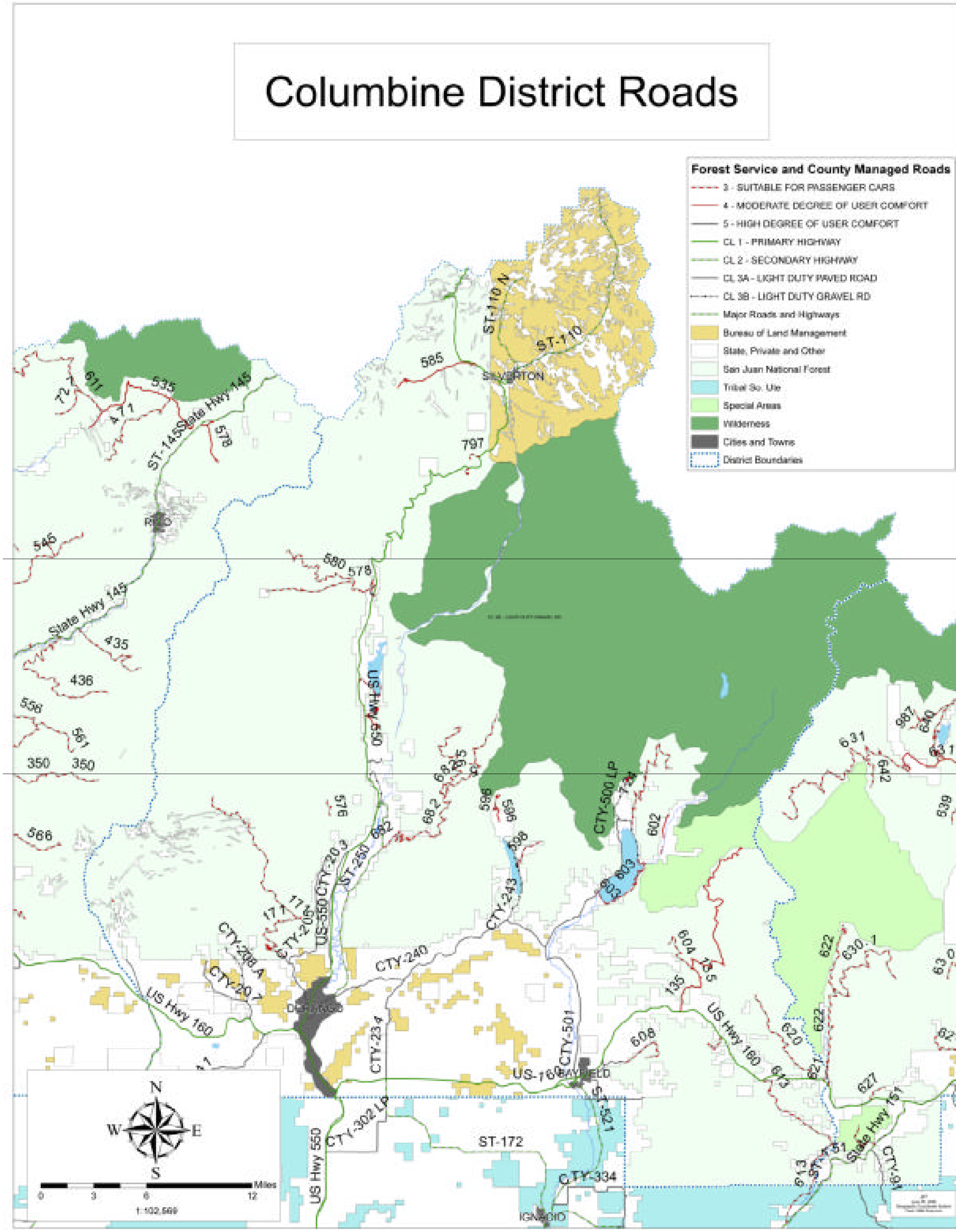
NFS roads are maintained to varying standards depending on the level of use and management objectives. There are five levels, also referred to as maintenance levels, used by the Forest Service to determine the work needed to preserve the investment in the road. These maintenance levels are described in *FSH 7709.58- Transportation System Maintenance Handbook.* Level 3, 4, and 5 roads provide access for passenger car traffic and make up the backbone of the Forest transportation system. Table 1 summarizes the miles of Maintenance Level 3 through 5 roads under Forest Service jurisdiction.

Table 2-1
Miles of Inventoried Maintenance Level 3, 4, and 5 Roads (USFS Jurisdiction)
By Ranger District

Maintenance Level	Columbine	Dolores	Pagosa	Forest Total
3	134	244	220	598
4	27	64	26	117
5	1	18	1	20
Total	162	326	247	735
Percent of Forest Roads				27%

The remaining 1,977 miles of inventoried NFS roads consist of level 1 roads that are closed, except for specific project use, and level 2 roads that are managed only for high-clearance vehicles such as pickup trucks and four-wheel-drive vehicles. These roads are generally single-use, low-volume roads, and single-lane with native surface.

Figure 2.1


Columbine District Roads
Forest Service and County Managed Roads
3 - SUITABLE FOR PASSENGER CARS
4 - MODERATE DEGREE OF USER COMFORT
5 - HIGH DEGREE OF USER COMFORT
CL 1 - PRIMARY HIGHWAY
CL 2 - SECONDARY HIGHWAY
CL 3A - LIGHT DUTY PAVED ROAD
CL 3B - LIGHT DUTY GRAVEL RD
Major Roads and Highways
Bureau of Land Management
State, Private and Other
San Juan National Forest
Tribal So. Ute
Special Areas
Wilderness
Cities and Towns
District Boundaries
SILVERTON
DURANGO
BAYFIELD
IGNACIO
State Hwy 145
US Hwy 550
US Hwy 160
State Hwy 151
ST-110
ST-172
CTY-240
CTY-243
CTY-234
CTY-501
CTY-500 LP
CTY-302 LP
CTY-334
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W
Miles
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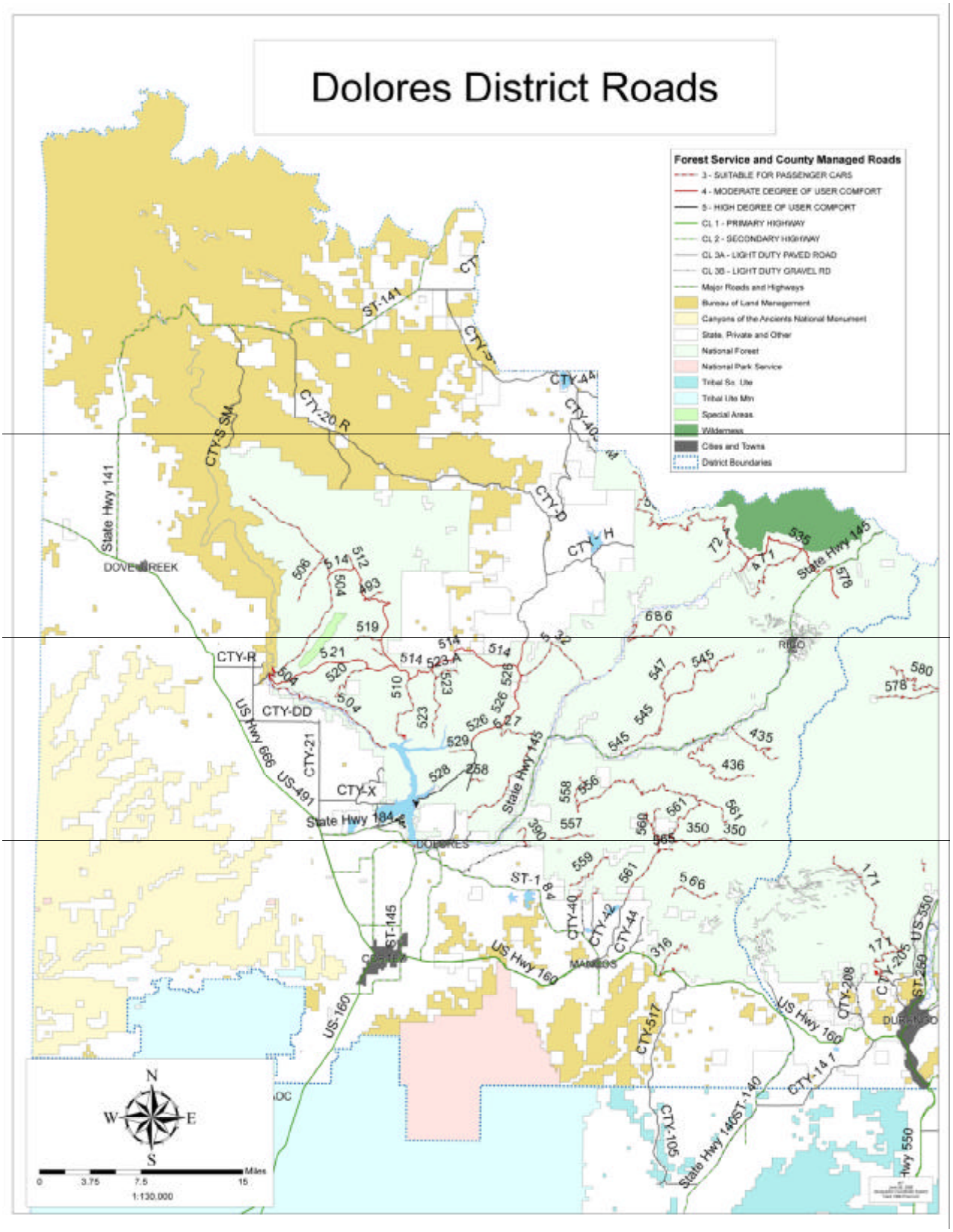
Figure 2.2


Dolores District Roads
Forest Service and County Managed Roads
3 - SUITABLE FOR PASSENGER CARS
4 - MODERATE DEGREE OF USER COMFORT
5 - HIGH DEGREE OF USER COMFORT
CL 1 - PRIMARY HIGHWAY
CL 2 - SECONDARY HIGHWAY
CL 3A - LIGHT DUTY PAVED ROAD
CL 3B - LIGHT DUTY GRAVEL RD
Major Roads and Highways
Bureau of Land Management
Canyons of the Ancients National Monument
State, Private and Other
National Forest
National Park Service
Tribal So. Ute
Tribal Ute Mtn
Special Areas
Wilderness
Cities and Towns
District Boundaries
State Hwy 141
DOVE CREEK
CTY-R
CTY-DD
CTY-21
US Hwy 666
US-491
CTY-X
State Hwy 184
DOLORES
State Hwy 145
RICO
CTY-20 R
CTY-S SM
CTY-H
CTY-D
CTY-40
CTY-42
CTY-44
ST-145
CORTEZ
US Hwy 160
MANCOS
US-160
CTY-517
CTY-105
State Hwy 140
ST-140
CTY-147
CTY-205
CTY-208
ST-260
US-550
DURANGO
Hwy 550
N
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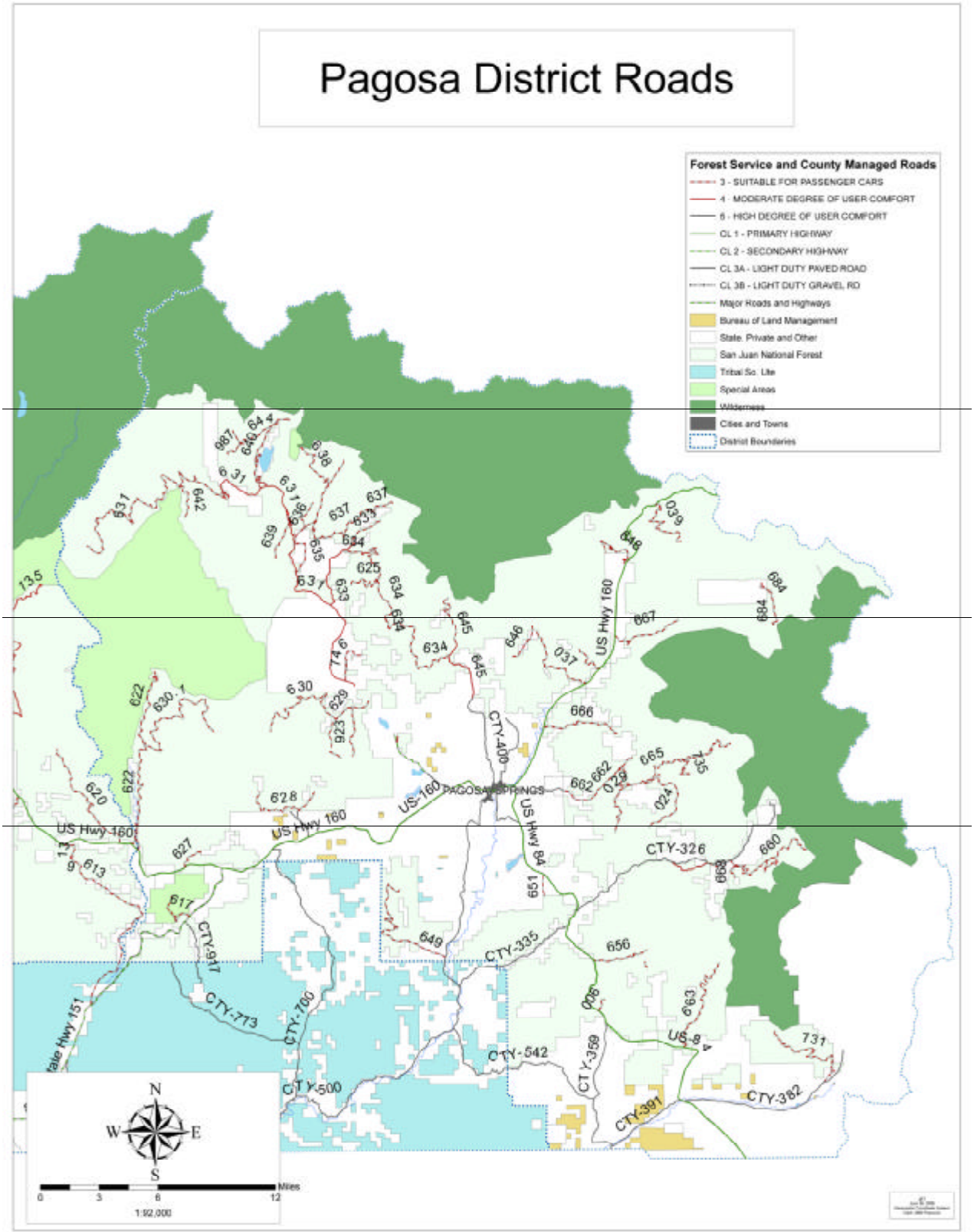
0
3.75
7.5
15
Miles
1:130,000

Figure 2.3


Pagosa District Roads
Forest Service and County Managed Roads
3 - SUITABLE FOR PASSENGER CARS
4 - MODERATE DEGREE OF USER COMFORT
5 - HIGH DEGREE OF USER COMFORT
CL 1 - PRIMARY HIGHWAY
CL 2 - SECONDARY HIGHWAY
CL 3A - LIGHT DUTY PAVED ROAD
CL 3B - LIGHT DUTY GRAVEL RD
Major Roads and Highways
Bureau of Land Management
State, Private and Other
San Juan National Forest
Tribal So. Ute
Special Areas
Wilderness
Cities and Towns
District Boundaries
US Hwy 160
US-160
PAGOSA SPRINGS
US Hwy 84
CTY-400
CTY-326
CTY-335
CTY-917
CTY-773
CTY-700
CTY-500
CTY-542
CTY-359
CTY-391
CTY-382
US-8
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The definition of jurisdiction has been subject to different interpretations over the years, which has led to some inconsistent entries in the Infra database. "Jurisdiction is the legal right to control or regulate use of a transportation facility derived from fee title, an easement, an agreement, or other similar method. While jurisdiction requires authority, it does not necessarily reflect ownership" (FSM 7705). This analysis will focus primarily on roads under Forest Service jurisdiction. Roads under other jurisdictions will be included where they are needed to show the connection to National Forest System Roads (NFSR).

Unauthorized roads on National Forest System lands are identified in the field during project analysis. Most of these roads were created by off-road vehicle users or are temporary roads that were not closed after project completion. The SJNF estimates there are over 1,000 miles of these unauthorized roads.

Meeting Forest Plan Objectives

The national objectives for the transportation system (FSM 7702) are incorporated into the Forest Plan by reference and are as follows.

1. Provide sustainable access in a fiscally responsible manner to NFS lands for administration, protection, utilization, and enjoyment of NFS lands and resources consistent with the applicable land management plan.
2. Manage the forest transportation system and motorized use of NFS roads, on NFS trails, and in areas on NFS lands within the environmental capabilities of the land.
3. Provide a wide range of recreation experiences for National Forest visitors and minimize conflicts among users of NFS lands.
4. Manage the transportation system to address user safety and convenience and efficiency of operations in an environmentally responsible manner and, where needed, to restore ecosystems along NFS roads and NFS trails within the limits of current and anticipated funding levels.
5. Coordinate travel planning and analysis on NFS lands with national, regional, State, local, and tribal government transportation needs and allow the public to participate in the designation of NFS trails, and areas on NFS lands for motor vehicle use.
6. Designate those roads, trails, and areas on NFS lands open to motor vehicle use. Designation of motor vehicle routes and areas is intended to enhance management of NFS lands, sustain natural resource values, enhance opportunities for motorized and non-motorized recreation experiences, provide access to NFS lands, and preserve opportunities on each administrative unit for non-motorized travel and experiences.
7. Provide for regulation of use by over-snow vehicles on roads, on trails, and in areas on NFS lands.
8. Make appropriate use of transit and intermodal transportation systems when those best meet transportation needs to NFS destinations in a sustainable and environmentally acceptable manner.

Table 2-2
Projected Road Miles (Experienced Budget Level) and Actual Accomplishments
FY 2000-FY 2005

Activity	Projected Miles at Experienced Level	Actual Accomplishments
Roads Maintained Level 1-2 Level 3, 4, 5	 200 735	 462 755
Road Construction	0.0	0.0
Road Reconstruction	15.0	20.0
Road Decommissioning	10.0	13.5

Arterial and collectors are the roads used to provide primary access to large portions of the National Forest. Arterials normally serve as connections between towns, major county roads, or state highways and are main thoroughfares through the forest. Collectors link large areas of the forest to arterials or other main highways. Local roads distribute traffic from arterials and collectors to end destinations on the Forest. Little new construction within the arterial and collector system is anticipated. A review of the existing road maintenance levels by functional class is shown in Table 2-3. Periodic updating of the Road Management Objectives (RMOs) to reflect the current and objective use of the road can help prioritize road maintenance funding.

Table 2-3
Inventoried Maintenance Levels of Forest Arterial and Collector Roads (Miles)

Maintenance Level	Arterial	Collector	Local	Totals
1	0	0	961	961
2	0	108	903	1011
3	53	300	252	605
4	74	31	11	116
5	7	9	3	19
Total Miles	**134**	**448**	**2130**	**2,712**

Source: Infra database

Federally Designated Forest Highways

There are seven Forest Highways in the San Juan Public Lands designated under the Federal Lands Highways program of the Transportation Equity Act for the 21st Century (TEA 21). These routes are state, county, or Forest Service owned roads qualifying for Highway Trust funding for improvement or enhancement. They provide access to and within the National Forest. These roads are listed in Table 2-4.

Table 2-4
Federally Designated Forest Highways

Forest Hwy#	State Hwy, County, or FS Route #	Name	Termini	Length (Miles)
1	State HWY 145	Dolores – Rico	Dolores to Lizard Head Pass	61
2	U.S. HWY 550	Durango-Red Mountain.	Durango to Red Mountain Pass	76.6
8	U.S. HWY 160	Mancos-Hesperus	Mancos Hill to Cherry Creek	8.5
60	NFSR 535	West Dolores	State HWY 145 to State HWY 145	33.4
61	NFSR 631	Piedra	US HWY 160 to Williams Creek	22.1
63	N/A	Dolores-Norwood	Dolores to Norwood	57.3
64	County Road 501	Vallecito	Bayfield to Vallecito Work Center	19

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

Budget

The SJNF budget allocation for road maintenance and management of roads has been averaging $1,080,000 per year from FY 2003 to FY 2006. Of this amount, approximately $550,000 per year actually goes towards annual road maintenance activities. However, the annual cost to maintain the entire road system to standard is considerably higher than the amount allocated by Congress. In prior years, congressionally appropriated road funding was supplemented by road construction and maintenance work performed by timber purchasers through the commercial timber sale program. This program has steadily declined over the past 20 years thus increasing demands on appropriated dollars for road maintenance. Beginning in 1999, the Forest conducted road condition surveys to determine the actual cost of maintaining the road system to standard. Work items were also recorded to determine the cost of road maintenance deferred in previous years due to lack of funding. Finally, road improvement work necessary to bring the roads up to the desired maintenance level was identified and documented. Analysis of the data collected showed that the Forest is substantially under-funded for the size of the road system it manages (see Table 2-4).

Table 2-4.
Summary of estimated funding needs for road maintenance and operations.

Maintenance Level	Total Miles	Annual Maintenance		Deferred Maintenance		Capital Improvements[1]	
		$/mile	Total $	$/mile	Total $	$/mile	Total $
1	961	$170	$163,370	$6,755	$144,549	-	-
2	1,011	$3,284	$3,336,544	$25,020	$6,662,958	-	-
3	605	$6,153	$3,679,494	$50,763	$30,804,332	-	-
4	115	$6,854	$801,918	$70,951	$8,103,483	-	-
5	20	$6,537	$130,740	$4,574	$32,977	-	-
Total	**2,712**		**$8,112,066**		**$45,748,299**	**-**	**-**

Source for Annual Maintenance: Forest Infra Condition Surveys as of October 1, 2005. Source for Deferred Maintenance: Infra database as of June 23, 2006. Average $/mile are determined using only those roads for which costs have been entered into Infra.

[1] *Capital Improvement* needs have not been fully documented. Therefore, the costs for this work are not included.)

There are many miles of maintenance level 1 and 2 roads for which cost information is not available in Infra. The "Total $" columns for both annual and deferred maintenance were calculated by multiplying total miles by the average $/mile. Capital improvements costs are difficult to obtain due to the fact that very little road data on the Forest has been entered into Infra.

The road program budget has been about $1,080,000 annually for FY 2002 through FY 2006. Due in large part to this funding shortfall, there is a need to identify and prioritize the potential minimum road system necessary for access to, and management of, the San Juan National Forest.

The Forest Service and the counties and the State of Colorado have signed agreements (Schedule A) whereby the counties are paid to perform road maintenance on Forest Service roads. The work performed by the counties contributes to the annual road maintenance accomplishments for the Forest. The counties are funded to perform this work through State of Colorado allocations of the Highway User Tax Funds (HUTF). Table 2-5 displays the current mileage of roads under the jurisdiction of the Forest Service being maintained by county entities.

Table 2-5
Miles of road on the SJNF roads (maintenance level 3-5) being maintained in part by counties (or covered by agreements with counties)

	Miles Maintained		
County	**Maintenance Level 3**	**Maintenance Level 4**	**Maintenance Level 5**
La Plata	**65.5**	**6.0**	**0**
Montezuma	**127.5**	**7.3**	**13.1**
Dolores	**103.0**	**56.9**	**0**
Archuleta	**132.2**	**11.0**	**0**
Mineral	**21.8**	**0**	**0**
San Juan	**10.5**	**4.8**	**0**
Hinsdale	**53.9**	**11.3**	**0**
Total	**514.4**	**97.3**	**13.1**

Step 3 Identifying Issues

Process

The SJNF has several issues related to the existing transportation system that this roads analysis proposes to address. A list of key issues was developed through meetings and interviews with the core and technical IDTs, recreation representatives and supervisory staff, as well as review of public comments received during the Plan Revision workshops and the recreation interviews.

Issue Summary

1. Road maintenance funding is not sufficient to maintain NFS roads to their assign maintenance level standard. Congressionally appropriated road maintenance funding is approximately 7% of what is needed ($8,112,000) to maintain the current road system. Deferred maintenance funding is approximately 0.4% of the estimated deferred maintenance backlog of $45,748,299.

2. Unrestricted mixed use of highway legal and non-highway legal vehicles (ATVs, motorcycles, and other off-highway vehicles (OHVs)) is occurring on NFS roads across the forest. Some NFS roads have high traffic volumes, a vehicle distribution comprised of a large percentage of semi-tractor trailer trucks and RVs, narrow travel widths, poor sight distance, and other characteristics that create safety issues for mixed use.

3. Road damage can occur when maintenance activities are performed by others.

    a. In some cases, road maintenance performed under Schedule A agreements has caused damage to NFS roads. Grading practices that create windrows, berms, flatten the road crown, or blade off the gravel surfacing, contribute to roadway drainage problems and road surface deterioration.

    b. Some counties and private parties are removing snow on Forest roads without a FS permit. This allows vehicle access during wet or snowy conditions on roads that were not constructed as all-weather roads. This practice often results in surface deterioration.

4. Some roads may not be under the appropriate jurisdiction and there are some R.S. 2477 jurisdiction claims that may not be valid. Some roads would be better managed within a county road system, particularly where they provide access to large private inholdings and developments. One factor that should be taken into account when considering transfer of jurisdiction to a county is that the cost of upgrading roads to county standards can be high and cannot be borne solely by the SJNF.

5. The rights-of-ways across private properties on which NFS roads are located may not be adequate for Forest access. In a number of cases, there is no or poor documentation of rights-of-ways for NFS roads that cross private lands.

Status of Current Data

The SJNF has good access to data documenting the above-referenced transportation system issues. The Infra database is updated continuously with road construction and maintenance

accomplishments and deferred maintenance costs generated from ongoing road condition surveys. Law enforcement and ranger district staff report that OHV use occurs primarily on maintenance level 4 and below roads and that this use is increasing. The Guidelines for Engineering Analysis of Motorized Mixed Use on National Forest System Roads (EM-7700-30, December 2005) provides guidance in assessing if mixed use is appropriate for a specific route. Roads data and information sources for road jurisdictional issues will be developed through various sources including the roads database in Infra, in-house files on specific roads, and records of meetings with counties on road-related issues. The Forest has developed an inventory of routes and landowners where right-of-way easements are needed for NFS roads that cross private land. This inventory was originally developed in the mid-1970's, so it will need to be reviewed and updated to the current land status.

Step 4 Assessing Benefits, Problems, and Risks

Current Road System Benefits, Problems, and Risks

This section utilizes a question and answer format for assessing the benefits, problems, and risks of the existing and potential road system. This format was developed as a guide in *Roads Analysis: Informing Decisions about Managing the National Forest Transportation System* (USDA Forest Service Report FS-643). Some of the original questions were subsequently modified and some were added or deleted by Region 2 and the Washington Office. Region 2 modifications are found in the *R2 Roads Analysis Supplement to FS-643* (March 23, 2004) and the Washington Office guidance is found in a paper entitled "Economic Issues" prepared by Jerry Ingersoll and dated December 2, 2002.

Not all of the questions were answered in this Forest-scale roads analysis as they were more appropriately addressed at the project level. Table 4-1 lists each question by its abbreviation, identifies if the question was answered in this roads analysis, and lists the rationale for questions excluded from the analysis.

Table 4-1
Questions Addressed in Forest-Scale Roads Analysis

Question Number	Addressed (Yes/No)	Rationale if not addressed	Comments
EF1	Yes		
EF2	Yes		
EF3	Yes		Answered with EF4
EF4	Yes		Answered with EF3
EF5	No	Not a programmatic issue	
AQ1	Yes		
AQ2	Yes		
AQ3	Yes		
AQ4	Yes		
AQ5	No	Not a programmatic issue	
AQ6	Yes		
AQ7	Yes		
AQ8	No	Not a programmatic issue	
AQ9	Yes		
AQ10	Yes		
AQ11	No	Not a programmatic issue	
AQ12	Yes		
AQ13	No	Not a programmatic issue	
AQ14	No	Not a programmatic issue	
TW1	Yes		
TW2	Yes		
TW3	Yes		
TW4	Yes		
EC1	Yes		
EC2	No	Not a programmatic issue	
EC3	Yes		
TM1	Yes		
TM2	Yes		Answered with TM 3
TM3	Yes		Answered with TM2
MM1	Yes		

Question Number	Addressed (Yes/No)	Rationale if not addressed	Comments
RM1	Yes		
WP1	Yes		
WP2	Yes		
WP3	Yes		
SP1	Yes		
SU1	Yes		
GT1	Yes		
GT2	Yes		
GT3	Yes		
GT4	No	Not a programmatic issue	
AU1	Yes		
AU2	Yes		
PT1	Yes		
PT2	No	Not a programmatic issue	
PT3	No	Not a programmatic issue	
PT4	Yes		
UR1 & RR1	Yes		
UR2 & RR2	Yes		
UR3 & RR3	No	Not a programmatic issue	
UR4 & RR4	Yes		Answered with UR5 & RR5
UR5 & RR5	Yes		Answered with UR4 & RR4
UR6 & RR6	Yes		
RR7	Yes		
SI1	Yes		
SI2	Yes		
SI3	Yes		
SI4	Yes		
SI5	Yes		
CR1	Yes		
CH1	Yes		
CH2	Yes		
CH3	Yes		
WU1	Yes		

Ecosystem Functions and Processes (EF)

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

Roading of current unroaded areas on the SJNF could affect the following major existing vegetation types (map available): ponderosa pine forests, warm-dry mixed-conifer forests, cool-moist mixed-conifer forests, spruce-fir forests, aspen forests, mountain grasslands, riparian areas, and wetlands. Of these, aspen forests, narrowleaf cottonwood/willow riparian areas, wetlands, and old-growth ponderosa pine forests are noted in the Biological Diversity Assessment for the Rocky Mountain Region Guide as being important components of the Region's biological diversity. Additionally, mountain grasslands, riparian forests, fens, wet montane meadows, upper- and lower-montane willow carrs, aspen wetland forests, and coniferous wetland forests occur in unroaded areas on the SJNF, and are described as "Sensitive Plant Communities" in the Biological Diversity Assessment for the Rocky Mountain Region Guide.

Effects of roading to the unroaded vegetation types listed above include cutting and removal of trees, snags, large woody forest floor material, and other vegetation along the road corridor, which would adversely affect the stand-level composition, structure, and function of the vegetation types. New

road construction would remove vegetation, expose mineral soil, and cause soil compaction along the road corridor. This would increase the potential for soil erosion and stream sedimentation, since roads are the dominant source of erosion and sediment in forests (Elliot et al 1994, Swift 1985, Swank and Crossley 1988, Reid 1981). Sedimentation could adversely affect riparian areas and wetlands. New roads into unroaded areas, which tend to be weed-free, would provide an avenue for the introduction, invasion, and establishment of exotic plants and noxious weeds into these lands. Exotic plants and noxious weeds would compete with native plants for space, light, water, and nutrients, and could adversely affect the composition and ecological function of the associated ecosystems. In addition to these direct effects, roading into unroaded areas would provide an avenue for a variety of activities to occur including timber harvest, the extraction of other plants and forest products, livestock grazing, fire suppression, and recreational activities including use of off-road vehicles. These activities would remove and disturb ecological components, affect wildlife habitat and security, and reduce or eliminate the isolation and solitude some people seek in relatively pristine unroaded areas. Roading into unroaded areas could also affect ecological disturbance regimes in the area by providing an avenue or vector for disturbance agents, including fire, to occur. Fire could affect the stand-level composition, structure, and function of the associated vegetation types, and would have a major affect on the vegetation types at the landscape level if a large fire occurred.

Roading of current unroaded areas could adversely affect late-seral and old-growth stages of the forest types listed above, including old-growth ponderosa pine forests which are rare on the SJNF and throughout the Rocky Mountain Region (SJNF Old Growth Inventory, Biological Diversity Assessment for Rocky Mountain Region Guide). Effects could include changes to stand-level composition, structure and function of affected stands, and loss of undisturbed reference sites which could be used for research. Wildlife habitat could also be adversely affected for old-growth-dependant wildlife species including lynx, wolverine, grizzly bear, and boreal owl.

Roading of current unroaded areas could affect plant species identified as "Sensitive" on the Rocky Mountain Regional Foresters Sensitive Species List. Direct effects to existing populations could occur through road construction and maintenance, and adverse effects to the habitat of these species could occur including the introduction, invasion, and establishment of exotic plants and noxious weeds. Exotic plants and noxious weeds would compete with the rare plants for space, light, water, and nutrients, and could affect the composition and ecological function of the associated ecosystems.

Roading of current unroaded areas could affect wildlife species, including those listed as threatened and "Sensitive" on the Rocky Mountain Regional Foresters Sensitive Species List. Species that require large relatively undisturbed patches of land (lynx, wolverine, grizzly bear, elk) such as those within the current unroaded areas, would be most adversely affected. Elk are particularly sensitive to lands with high road densities. Roading into unroaded areas would adversely affect the late-seral and old-growth stages of forest types, which are common in these unroaded areas, and could adversely affect habitat for old-growth-dependant wildlife species including lynx, wolverine, grizzly bear, and boreal owl. Roading into unroaded areas would provide an avenue for a variety of activities to occur including timber harvest, the extraction of other plants and forest products, livestock grazing, fire suppression, and recreational activities including off-road vehicles. These activities could remove and disturb ecological components important to wildlife, and adversely affect wildlife habitat, solitude, and security.

Roading of current unroaded areas in the Hermosa Creek watershed could adversely affect the Colorado River cutthroat trout which is "Sensitive" on the Rocky Mountain Regional Foresters Sensitive Species List. Roading of current unroaded areas could also adversely affect potential new habitat for this species.

The SJNF has some of the largest patches of unroaded areas in the Rocky Mountain Region. Roading of current unroaded areas would fragment these forested landscapes. Fragmentation as

used here is defined as the disruption of continuity of natural landscapes from human-caused sources (Knight et al. 2000). Roads are the most significant agent of forest fragmentation in national forests of the southern Rockies (Reed et al. 1996, Tinker et al. 1998). Including roads as edges is an important part of a general fragmentation analysis, since roads significantly decrease patch size and interior area, and increase the number of patches and the amount of patch edge ((Knight et al. 2000). Fragmentation of forest patches (with each patch, in most cases, including multiple forest types) could have many adverse ecological affects including wide-ranging impacts on biodiversity (Wilcove 1987), which include reductions and losses of late-successional species, increased predation on interior species, increased competition from habitat generalists, and increased mortality inflicted by humans through hunting and collisions with vehicles. Other effects of fragmentation include behavioral disturbance of wildlife by humans and their vehicles, increased predation by generalist vertebrates, increased nest parasitism by birds, and increased windthrow and tree death along forest edges (Buskirk et al. 2000).

Roading of current unroaded areas could affect potential Research Natural Areas (RNAs) on the SJNF, which were selected due to their undisturbed, unroaded, relatively pristine character, and because they represent some of the ecological diversity on the SJNF and in the Rocky Mountain Region. Roading these areas would likely make them unsuitable for RNA designation.

Roading of current unroaded areas that have high risk of mass movement (landslides) or soil erosion, could cause detrimental mass movement (landslides) or soil erosion, which could adversely affect the ecological components associated with those lands and make those lands unproductive, at least in the short term.

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

Roads are prime spread vectors for noxious and other invasive species. Seeds can easily attach themselves to different vehicles and be carried for relatively long distances. Roads constructed through existing weed populations have a high potential of spreading noxious weed populations.

In general, roads constructed to a higher standard usually require some shoulder reseeding and the use of weed-free gravel which does help limit direct road impacts on the introduction and spread of noxious weed species. However, an indirect impact is that higher standard roads improve access with resultant higher traffic volumes, which in turn increases the potential to introduce or spread noxious weeds. Lower standard roads usually receive less annual use; therefore, the spread potential is less.

Roads do provide access to weed-infested areas which facilitate control activities.

Roads constructed into unroaded areas, which tend to be weed-free, could provide an avenue for the introduction of new noxious and invasive species. These newly established invasive species could directly compete with native species for light, water, and nutrients which could affect species composition and ecological function. In addition, invasive species are generally unpalatable to wildlife and domestic livestock.

EF(3) & EF(4): To what degree do the presence, type, and location of roads contribute to the control of insects, diseases, and parasites? How does the road system affect ecological disturbance regimes in the area?

Insects, diseases, and parasites are of most concern in the forest types on the SJNF. The ponderosa pine forest type is well roaded with level 3, 4, and 5 roads, so access to this forest type in order to

control insects, diseases, and parasites (pine beetle, mistletoe, *Armillaria*) is good. Access to the mixed-conifer, spruce-fir, and aspen forest types is good in places and not good in other places, since these forests are not as well roaded with level 3, 4, and 5 roads. So, control of insects, diseases, and parasites (spruce budworm, spruce beetle, pine beetle, mistletoe, *Armillaria*) in these forest types would be more difficult.

Roads can serve as vectors to increase the chances for disturbance events, particularly fire, to occur in lands accessed by those roads. Fires caused by people using roads (sparks from motorized vehicles, campfires, smoking, fireworks, and other human activities) could increase the frequency of fires and shorten the fire return intervals, which would affect fire disturbance regimes. Roads can also serve as avenues for insects, diseases, and parasites to access lands by transport via vehicles or people (hikers), which could initiate disturbance events and affect the disturbance regimes associated with these organisms.

Roads can also serve as avenues to access lands and suppress fire starts, whether natural or human caused. This suppression can decrease the frequency of fires and lengthen the fire return intervals, which would affect fire disturbance regimes. Roads can also serve as avenues to access lands in order to control insects, diseases, and parasites, which would affect the disturbance regimes associated with these organisms.

The existing road system of level 3, 4, and 5 roads provides easy access for people into all forest types, especially into the ponderosa pine type which is the most heavily roaded.

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

This question is not a programmatic issue and should be addressed at the project-level roads analysis.

Aquatic, Riparian Zone, and Water Quality (AQ)

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

On the SJNF, roads primarily intercept overland flow (flow not confined to streams), and to a lesser extent direct streamflow. Roads intercept shallow subsurface flow only at localized areas. Water intercepted by a road prism is often concentrated and channelized until it leaves the road. This is a common mechanism of erosion when road drainage is not properly designed or maintained. Water intercepted and concentrated by roads can periodically increase the amount of flow naturally carried by streams, especially during large runoff events such as spring snowmelt and thunderstorms (King and Tennyson, 1984). Road-derived sediment and increased volumes of water delivered to streams can lead to negative channel impacts.

The Aquatic Ecosystem Analysis has analyzed paved system roads and unpaved system roads by watershed. While neither of these categories is equivalent to the level 3-4-5 roads being analyzed here, the trends are likely similar. Below are listed the highest densities (80 to 100 percentile) of system roads, calculated as road miles per square mile of watershed.

Table 4-AQ(1)-1
HUB Numbers And Calculated Road Densities (Mi/Sq.Mi) for NFS Roads within the 80-100 Percentile, SJNF

6th-Level HUB	6th-Level HUB Name	NF System Road Density (mi / sq mi)
140801070105	East Fork of Mud Creek	5.6
140801040402	East Fork Hermosa Creek	4.0
140802020103	Hartman Canyon	3.5
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	2.7
140801040401	Hermosa Creek headwaters	2.7
140801010304	Upper Pagosa Springs	2.6
140801070103	Upper Mancos Valley	2.5
140300020509	Pine Arroyo	2.5
140300020511	Disappointment Valley-Wild Horse Reservoir	2.5
140300020401	Upper Lost Canyon	2.4
140801040503	Upper Animas Valley-Stevens Creek	2.4
140300020605	Dolores Canyon-Joe Davis Hill	2.3
140300020302	Upper Plateau Creek	2.2
140300020407	House Creek	2.2
140300036101	Naturita Creek	2.2
140300020507	Dawson Draw	2.1
140801010203	Wolf Creek	2.1
140801010504	Navajo River-Weisel Flat	2.1
140801010405	Rito Blanco	2.0
140300020510	Upper Disappointment Valley	2.0
140300020205	Roaring Forks Creek	2.0
140801040604	Animas River-Spring Creek	2.0
140801070102	West Mancos River	2.0
140801011601	Upper Beaver Creek	1.9
140801010305	McCabe Creek	1.9
140300020502	Disappointment Creek Headwaters	1.9
140300020305	Beaver Creek-Trail Canyon	1.9

Note: Shaded watersheds are located entirely on the National Forest.

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

This Forest-level roads analysis primarily addresses high maintenance level roads (levels 3-5) that are surfaced with gravel or pavement. High maintenance level roads are not the roads that generate the majority of surface erosion on the SJNF for three reasons:

1. There are over twice as many miles of maintenance level 1and 2 roads compared to high maintenance level roads on the Forest. There are an undetermined number of miles of unauthorized roads (two-track roads) that receive no maintenance.

2. The majority of low maintenance level roads have native dirt surfaces and are more susceptible to surface erosion because they are not armored with gravel or pavement. Native-surface roads built across erosive or sensitive landforms tend to be large sources of surface erosion.

3. High maintenance level roads are maintained every year. Low maintenance level roads tend to be evaluated every 3-5 years. Rutting, plugged culverts, blocked ditches etc. may go long

periods of time before the problems are discovered and fixed, which increases the likelihood of erosion.

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

Landslide frequency is greater in areas disturbed by logging and road construction activities in comparison to undisturbed sites (Cacek 1989, LaHusen 1984, Gray and Megahan 1981, Megahan et al. 1978, Swanson and Dyrness 1975, and Megahan and Kidd 1972). Some lands are more prone to mass wasting than others. Criteria used to identify lands on the SJNF which have high potential for mass wasting (landslides and erosion) include geologic formation, landform, percent slope (units with slopes greater than 40%), climate zone, vegetation type, soil texture, bedrock dip, rock fragment content, and evidence of past or present landslide activity (R2 Interpretation Guide). In some cases, lands with high potential for mass wasting which contain roads are lands where mass wasting has occurred and are also lands where mass wasting is likely to occur in the future.

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

Road-stream crossings are sites where direct interaction between the road and stream occurs. Culverts typically constrict natural floodplains and can restrict the passage of fish and other aquatic life. Because crossings occur over water, they are efficient sites for sediment delivery directly into streams. Sediment is the primary road-generated pollutant on the SJNF. Sediment is commonly produced when roads are poorly drained and rutted, when unrestricted travel occurs on saturated roadbeds, or when road drainage ditches flow directly into streams.

In general, road-stream crossings tend to have the highest risk of stream impacts in two areas on the SJNF:

1. Road-stream crossings in steep-dissected topography. Roads at these locations tend to require large cut and fill slopes with deep road fills over streams.

2. Road crossings over streams with wide floodplains. To maintain a road at these locations requires modification of the floodplain. Culverts at these locations tend to modify floodplains more than bridges.

The number of paved and unpaved stream crossings per mile of stream in each 6th-level watershed was calculated in the Aquatic Ecosystem Analysis. While neither the paved nor unpaved road calculations is the same as a level 3-4-5 calculation, the trends are likely similar. Below are the highest ranking watersheds.

Table 4-AQ(4)-1
Summary o Paved System Road Crossing Ratios Within the 80-100 Percentile Range, Management Scale, SJNF.

6th-Level HUB	6th-Level HUB Name	NF System Paved Ratio (# / stream mi)
140802020103	Hartman Canyon	4.8
140801070103	Upper Mancos Valley	1.6
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	1.3
140801040504	Upper Animas Valley-Trimble	0.3
140801010203	Wolf Creek	0.3
140801010602	Montezuma Creek	0.2
140801040502	Elbert Creek	0.2
140801050105	Upper Cherry Creek	0.2

6th-Level HUB	6th-Level HUB Name	NF System Paved Ratio (# / stream mi)
140801050102	Mayday Valley	0.2
140300020408	McPhee Reservoir-Dolores River	0.2
140801040303	Lower Cascade Creek	0.2
140300020404	Stapleton Valley	0.2
140801010507	Coyote Creek	0.2
140300020209	Upper Dolores River-Taylor Creek	0.1
140801010406	Lower Rio Blanco-San Juan River	0.1

Note: Shaded watersheds are located entirely on the National Forest.

Table 4-AQ(4)-2
Summary of Unpaved System Road Ratios within the 80-100 Percentile Range Management Scale, SJNF.

6th- Level HUB	6th- Level HUB Name	NF System Unpaved Ratio (# / stream mile)*
140801040901	Lower Florida River-Ticalotte	122.9
140300020510	Upper Disappointment Valley	35.7
140801070105	East Fork of Mud Creek	27.0
140801040604	Animas River-Spring Creek	4.2
140300020605	Dolores Canyon-Joe Davis Hill	3.2
140300020511	Disappointment Valley-Wild Horse Reservoir	2.8
140300036101	Naturita Creek	2.7
140801040402	East Fork Hermosa Creek	1.7
140300020405	Lower Lost Canyon	1.7
140300020509	Pine Arroyo	1.1
140801010504	Navajo River-Weisel Flat	1.1
140300020502	Disappointment Creek Headwaters	1.1
140300020401	Upper Lost Canyon	1.0
140300020102	Fish Creek	1.0
140801070103	Upper Mancos Valley	1.0
140801040401	Hermosa Creek headwaters	1.0
140801010203	Wolf Creek	1.0
140801040503	Upper Animas Valley-Stevens Creek	1.0
140801070102	West Mancos River	0.9
140300020604	Dolores Canyon-Lake Canyon	0.9
140300020104	Groundhog Creek	0.9
140300020302	Upper Plateau Creek	0.9
140300020305	Beaver Creek-Trail Canyon	0.9
140300020507	Dawson Draw	0.9
140300020205	Roaring Forks Creek	0.9
140801010304	Upper Pagosa Springs	0.8

Note: Shaded watersheds are located entirely on the national forest.

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?

This question is not a programmatic issue and should be addressed at the project-level roads analysis.

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)?

Stream and road connectivity has been defined as "the number of stream crossings and areas where roads and streams are near enough to strongly interact" (Gucinski et al., 2000). It has been suggested that watersheds with high road densities and high stream densities are likely to have high stream and road connectivity. A GIS analysis was conducted on large-scale watersheds (5th level HUC) across the SJNF. Watersheds with the highest road and stream densities (connectivity) are as follows:

Table 4-AQ(6)-1
Watersheds with Highest Road/Stream Connectivity Density

Lost Canyon Creek	House Creek	Upper Disappointment Creek
Upper Animas Valley	Lower Florida River	Upper La Plata River
Headwaters Mancos River	Upper Dolores Canyon	Beaver Creek near McPhee

A finer-scale (6th-level watershed) analysis was done for the Aquatic Ecosystem Analysis (see question AQ(4), above) though that analysis was done using all roads, not level 3, 4, and 5 roads.

The most common hydrologic connection between streams and roads occurs when water intercepted by roads is concentrated and subsequently diverted into streams. Roads with ditches can function as artificial streams on the landscape, increasing watershed drainage densities (the total length of streams per watershed area). Because roads collect flow primarily during storm and snowmelt events, increased drainage densities can change the timing and volume of water carried by natural streams (King and Tennyson, 1984).

As discussed in AQ (1, 2) sediment is the primary pollutant derived from roads on the SJNF. The higher the drainage density attributable to roads, the more easily sediment is delivered into streams and floodplains.

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? Are there any streams in the area listed in the State 303(d) list or 305(b) report as impaired due to road-derived pollutants such as sediment? Answer in conjunction with WP(2).

Information for AQ (7) was derived from a recent report entitled *Status of Water Quality in Colorado, 2000*, prepared by the Colorado Water Quality Control Division.

a) Downstream beneficial uses in the San Juan/Dolores/Animas watersheds in Colorado are:

Aquatic Life Cold 1, Aquatic Life Cold 2, Aquatic Life Warm 1, Aquatic Life Warm 2, Primary Contact Recreation Class 1, Secondary Contact Recreation Class 2, Drinking Water Supply, and Agriculture.

b) Most of the major towns and communities are expected to continue growing and demand more water for domestic, commercial, and municipal uses. Several studies are currently underway to determine the feasibility of diverting, storing, and developing water on the SJNF for future use.

The State of Colorado projects that "Population growth is a major concern to water quality in the basin…agriculture and tourism are the two main components of the region's current economy. Although there are no water quality impairments due to municipal wastewater, planned recreational

developments in the upper reaches of the San Juan River and above Electra Lake on the Animas River may impact those water bodies. Recent growth in the Durango area may require treatment beyond secondary for some dischargers." (Colorado Department of Public Health and Environment, 1999).

c) As discussed in AQ (5) above, few if any chemical threats are road-derived on the National Forest. Sediment would be the major road-derived physical pollutant on the National Forest. Sediment is a pollutant that can result in an Impaired Waterbody designation on the State of Colorado as required by section 303(d) of the Clean Water Act. (Colorado Department of Public Health and Environment, 1999). The beneficial uses most at risk to sediment pollution would be:

Aquatic Life Cold 1, Aquatic Life Cold 2, Aquatic Life Warm 1, Aquatic Life Warm 2

No streams within the SJNF are currently (2006) on the 303(d) list for sediment. Two streams have a plan in place to reduce sediment. Box Canyon, a tributary to the West Mancos River has a plan in place to reduce road-contributed sediment (Total Maximum Daily Load Plan) approved by the State of Colorado. The Rio Blanco River has a TMDL for sediment, and some portion of the sediment may be from roads.

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

This question is not a programmatic issue and should be addressed at the project-level roads analysis.

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 constructed along streams often directly change the way channels and floodplains function. During frequent to moderate flood events, roads can confine streams by restricting access to floodplains. Roads constructed near streams tend to straighten streams by limiting sinuosity and increasing channel steepness. Changes in the physical characteristics of a stream often lead to undesirable channel adjustments.

A Forest-wide GIS analysis was conducted on all level 3-5 roads constructed within 50 and 100 feet of a stream. Roads constructed this close to streams were considered to have the highest probability of interacting directly with channel/floodplain processes. Approximately 95 miles (9 percent) of level 3-5 roads are located within 50 feet of a stream. The results of the analysis show that paved State/County/Forest Service roads constructed along major river valleys account for many of these miles. For example, approximately 15 miles of State Highway 145 are located within 50 feet of the Dolores River.

Approximately 270 miles (25 percent) of level 3-5 roads and highways on the SJNF are constructed within 100 feet of a stream. Again, many of these road miles are located along major rivers with wide floodplains such as the Dolores, West Dolores, and Blanco Rivers.

Roads built along streams can affect future woody debris recruitment. Trees that might otherwise fall and recruit into streams are often removed as firewood or hazards along roads. Large wood does not tend to be mobile in stable, high elevation, steep gradient streams common to the SJNF. An exception would be during very large floods. During these events, if large wood becomes mobile, it can plug culverts causing major road failures. An example of this occurred in 2000 where the Eagle Creek Road (471) failed over Eagle Creek due to a large debris jam at the culvert. On big rivers, large wood can be moved by common high flows. Bridges tend to be used over big rivers, so failures due to debris jams are not common.

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

Migration and movement of aquatic organisms are primarily restricted at road-stream crossings with culverts. Generally, the restriction is on upstream migration, although downstream migration can also be affected. This results from hanging culverts, high flow velocities within culverts, and inadequate depths for fish migration. In some locations, migration barriers are desirable to protect native species against the upstream movement of competing exotic species. While roads and culverts can affect the migration of amphibians or aquatic invertebrates, the greatest concern is the effect on fish species.

The identification of sub-watersheds with high densities of stream crossings gives an indication of the potential for migration barriers. These watersheds would be considered high priority for site-specific analysis at the watershed and project scales to determine whether a barrier exists and which species are affected. Tables 4-AQ(1)-1, 4-AQ(4)-1 and 4-AQ(4)-2 describe the density of road-stream crossings and the related analysis.

In addition, the potential for migration barriers that may affect Colorado River cutthroat trout was evaluated by identifying the actual number of road crossings across streams occupied by designated conservation populations. No road crossings were identified for these streams.

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

This question is not a programmatic issue and should be addressed at the project-level roads analysis.

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

Roads crossing, or roads running adjacent to streams that are occupied by at-risk species, may contribute to illegal fishing and poaching. The at-risk species of concern related to overfishing on the San Juan National Forest is the Colorado River cutthroat trout. In general, Colorado River cutthroat trout no longer occur in waters near high traffic roads. Most of these streams and lakes have been stocked with exotic trout species such that cutthroat either no longer occur, or are genetically compromised and are no longer considered conservation populations. There are exceptions to this, however, such as the East Fork Hermosa Creek. Further analysis is recommended to better assess risks to these populations.

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

This question is not a programmatic issue and should be addressed at the project-level roads analysis.

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

This question is not a programmatic issue and should be addressed at the project-level roads analysis.

Terrestrial Wildlife (TW)

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

The direct effects of levels 3, 4, and 5 roads on terrestrial species habitat across the SJNF depend primarily on three important factors; location of roads within suitable habitat areas, road densities (miles of open and closed roads) within suitable habitat, and amount and type of use received. In order to more effectively assess impacts to habitat, all roads, regardless of use level need to be considered as they all contribute to the quantity and quality of habitat, and corresponding use by wildlife species. In general, the leading contributor of road densities across the Forest stem from level 3 roads followed by levels 4 and 5. In most cases, level 3 roads are the result of past timber harvest activities, and have likely had the most direct effects to wildlife habitat as they have modified habitat to a greater extent by allowing access to occur deeper into forested and non-forested areas, and they serve as sources for development and access to other roads (levels 1 and 2) and trails. They have provided access to formerly remote areas where additional human activities and physical changes to habitat (ex. fuelwood removal of large-diameter snags) has had effects to habitat components and effectiveness to species

Roads can directly remove habitat affecting those species with limited dispersal capabilities, or greatly reduce the amount of interior forest (patch size) available for species that are interior habitat specialists. Species considered late-successional habitat specialists, such as marten, can be dramatically affected by reductions in forest patch size. Species such as elk and coyote, which are considered habitat generalists, have the ability to adapt to changed landscapes more effectively than a habitat specialist. However, road densities exceeding 1 mile per square mile can significantly reduce elk habitat effectiveness, especially on winter range. Increased forest perforation, or reducing patch size and increasing edge, influences the success of many migratory birds that breed on NFS lands. Early successional species such as certain types of rodents may benefit from the right-of-way disturbance regimes and structures such as bridges can provide limited habitat for species such as the American dipper or bat species if of a beneficial design. Indirect effects on wildlife may include loss to vehicle collision, displacement, and disruption of migration corridors.

Increased road densities, noise, and activity by humans and their pets (such as increased recreational use and wildlife harassment by dogs from increased access) can reduce habitat effectiveness and security areas for many species such as deer, elk, and black bear. Additional snow compaction into lynx habitat can occur due to access for winter recreation. Disturbance associated with roads in critical wintering areas can force animals to move out of higher quality habitats and be displaced into lower quality habitats, as well as cause use of limited energy reserves in big game and other species such as raptors that can result in loss of vigor, reproductive failure, and even death. Residual salts from ice control can concentrate animals within road right-of-ways under certain conditions increasing exposure to vehicle collision.

Road construction and maintenance activities across the Forest have affected habitat attributes utilized by many species. Downed logs and other woody debris as well as live trees and snags that might have been utilized as food and cover are removed during road construction and maintenance activities. This affects the overall habitat structure and influences the type and number of species that use the area. The direct effects to wildlife habitat from current level 3, 4, and 5 roads are described below by major cover type (pinyon-juniper, ponderosa pine, aspen, warm-dry mixed-conifer, cool-moist mixed-conifer, and spruce-fir).

Across the Forest, the ponderosa pine cover type is considered to be the most roaded forested cover type, followed by aspen, spruce-fir, cool-moist mixed-conifer, warm-dry mixed-conifer, and pinyon-juniper. As mentioned earlier, the extent to which these roaded areas affect habitat are influenced by location of roads within suitable habitat areas, road densities within suitable habitat, and amount and

type of use received. The ponderosa pine cover type encompasses approximately 241,602 acres, and contains approximately 249 miles of level 3, 4, and 5 roads with the majority being level 3 roads (typically low speed, single lane with turnouts). This specific amount of roads across such a large area would suggest not having significant affects on habitat, however, if largely concentrated in a particular area, effects to habitat attributes and overall use of the area by wildlife may be more pronounced.

In many locations, habitat attributes such as snag densities within the ponderosa pine cover type are well below optimal densities for many primary and secondary cavity-nesting bird species, and small mammals such as bats and squirrels that use these structures for nesting and shelter. Additionally, many raptors (northern goshawk, Cooper's hawk, and red-tailed hawk) use them as perching and plucking posts, and a variety of woodpecker species (hairy, downy, and three-toed woodpeckers, and Williamson's sapsucker) use them for nesting, feeding and drumming. The decrease in snag densities is largely the result of past, and to some extent, ongoing land use activities (e.g., fire suppression, timber harvest, livestock grazing, and firewood gathering) all of which have been influenced by the presence of roads. In many areas, ponderosa pine encompasses large acreages of wintering big game habitat (deer and elk). The majority of the roads entering these areas are closed during winter to minimize impacts to wintering habitat and disturbance to wintering animals. Disturbances to wildlife and habitat during summer are likely greater given the higher volume of motorized and non-motorized activity that occurs, especially with additive usage on level 1 and 2 roads.

As with the ponderosa pine cover type, the vast majority of road densities within aspen (approx. 134 miles across 299,114 acres), spruce-fir (approx. 110 miles across 516,370 acres), cool-moist mixed-conifer (approx. 57 miles across 170,258 acres), and warm-dry mixed-conifer (approx. 41 miles across 71,527acres) forests stem from level 3 roads. Collectively, these cover types lie within mid to higher elevation forested and non-forested areas that provide habitat for neo-tropical migratory birds (western tanager, ruby-crowned kinglet, and purple martin) who spend their summers nesting on the Forest, provide spring/summer/fall and migration habitat for species such as big game, and year-round habitat for numerous birds and mammals (e.g., Canada lynx, American marten, snowshoe hare, blue grouse, and golden-crowned kinglet). General effects to habitat and habitat attributes are similar to those described above.

Across the Forest, the pinyon-juniper cover type, which encompasses approximately 31,034 acres, is considered to be the least roaded. These areas generally provide big game winter range for mule deer and elk. In most cases, roads accessing these low elevation winter range habitats are closed to the public to minimize impacts to soil and vegetation, and minimize disturbance to the animals. General effects to habitat and habitat attributes are similar to those described above for the other major forested cover types. Effects to species are further addressed in question TW(3).

TW(2): How does the road system facilitate human activities that affect habitat?

Across the Forest, level 5 roads encompass an extremely small percentage of the existing road density, but along with county roads, and federal and state highways, serve as access routes into forested and non-forested habitats. Level 3 and 4 roads serve as further access routes into the major cover types discussed under TW(1). Collectively, these systems facilitate activities such as motorized and non-motorized travel to pursue forest uses that may affect wildlife habitat.

Motorized use, primarily vehicles and off-highway vehicles (OHVs) directly affect wildlife habitat attributes by causing ground disturbance to soil and vegetation, or the loss of habitat attributes (logs on forest floor) such as the case during land management activities (timber sales, fire suppression, etc.). Vehicles indirectly reduce wildlife habitat quality by disturbing animals and forcing them to move to lower quality habitats to avoid disturbance. These impacts occur when vehicles venture off designated roads either legally (to camp, collect firewood, gather forest products) or illegally (for

challenge and enjoyment, retrieve big game during hunting seasons, or to get to a key destination easier and faster.

Non-motorized uses (hiking, mountain biking, horseback riding, cross-country skiing) generally tend to have minimal overall impacts to habitat because of limited ground-disturbing impacts, and essentially no changes to forest structure that would appreciably influence species use of an area.

Firewood harvesting, by its nature, is limited to the immediate vicinity of open forest roads. Personal use, and some limited commercial use, firewood harvesting has significantly reduced snag densities in close proximity to open roads to levels well below Forest Plan standards. This has been a long-standing problem particularly in heavily roaded ponderosa pine stands at lower elevations where access is good. In response to this problem, the Pagosa Ranger District prohibits harvesting standing dead ponderosa pine District-wide. The loss of large-diameter standing snags (those greater than about 16 inches in diameter) which are preferred by firewood gatherers has a much greater impact on wildlife habitat and cavity-dependant species than the loss of smaller diameter snags or downed logs. Firewood gatherers typically select the largest trees closest to roads and thus snag densities and average diameters of remaining snags increases in direct proportion to distance from open roads.

Further discussion of impact to habitat effectiveness is under TW(1) and TW(3).

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 direct and indirect effects on wildlife species?

The current level 3, 4, and 5 roads permit human activities that may result in direct and/or indirect effects to wildlife species. Leg-hold trapping is currently illegal under the State constitution of Colorado as a means of predator control or commercial trapping on public lands; consequently, the road system likely has little influence. We are unaware of any significant events surrounding the illegal use of leg-hold traps and the relation to the current road system. Live trapping of animals is permitted under Colorado Division of Wildlife regulations. The current road system facilitates access into the Forest where these activities occur. Across the Forest and privately owned lands, predator control activities are administered by the Animal and Plant Health Inspection Service – Wildlife Services (APHIS-WS). The vast majority of the predator-control activities occur on private land where predators pose more of a threat to domestic livestock. The current road system likely has minimal influence on predator-control activities.

The Forest Plan contains Forest Plan Guidelines for open road densities that are specific to "Management Prescription Areas." In some areas, open road densities exceed Forest Plan Guidelines, and in other cases, road densities are well below the guidelines. In general, it appears that moderate to high degrees of displacement and shift in species use patterns occur in areas with high road densities (greater than about 1 mile of open road per square mile). Conversely, areas with low road densities generally result in limited affects to species. Effects to species generally depend on the time of year (winter use has much greater impact on animal survival and energy loss than does summer use) and are strongly influenced by the type of activity.

During the regulated big game hunting seasons (roughly from the end of August to mid-November), there is a dramatic increase in use of the road system (levels 1-5) across the Forest. Most of this use occurs during the rifle seasons normally beginning around the first part of October and extending through mid-November. Use occurring during the archery and muzzleloader seasons occurs at a lesser degree, however, this trend appears to be increasing. The increase in motorized use via vehicles and OHVs increases the level of disturbance to big game and other wildlife especially in areas where illegal ATV use occurs, primarily on closed roads that stem from level 3, 4, and 5 roads.

Most poaching events generally occur after the regulated hunting seasons in lower elevation winter range areas where the animals are more concentrated. As mentioned earlier, most of the roads in these lower elevation areas are closed to motorized travel to minimize disturbance to wintering species. Consequently, the road system likely does not significantly contribute to poaching or other illegal kills.

As alluded to earlier, the current road system facilitates a variety of motorized and non-motorized uses that can directly or indirectly affect wildlife species. Often times, motorized (primarily driving for pleasure, and OHVs) and non-motorized activities (hiking, biking, horseback riding, cross-country skiing) have the potential to result in harassment to wildlife. Direct harassment can elicit a very pronounced negative reaction by wildlife. Harassment has the potential to reduce the amount of time animals spend feeding, affect critical periods such as breeding, and influence distribution patterns of species. Currently, there are few reports of direct harassment of wildlife such as chasing animals with an ATV, snowmobile, or vehicle. It is hard to predict whether this type of harassment will increase in the future, but as the Forest continues to host more people, the risk may increase. Unintentional harassment of wildlife by OHV use has increased in most roaded landscapes across the Forest with significantly increased numbers of vehicles being used by the public. This problem reduces wildlife habitat quality most during winter.

The degree to which roads cause wildlife mortality (i.e. road-kill) depends heavily on the type of road and amount of use received, and more importantly, the species in question and habitat quantity and quality juxtaposed to roadways. There have been no studies on the effects of roads and road-kill levels on wildlife species on the Forest. Level 5 roads are normally double lane, graveled, or sometimes paved. Based on past observations, level 5 roads generally pose a greater threat to small mammals (mice, ground squirrels, etc.) than larger animals (deer, black bear, elk, moose) as evidenced by the greater number of road-killed small mammals observed. This is likely due to the greater speeds vehicles are able to attain given the conditions of the road. Level 4 roads generally have similar road-kill levels given the similarities in road characteristics and use. Level 3 roads are typically low speed, single lane, and still prone for road-kill events, but typically occur at lower levels as animals are better able to avoid the slower moving vehicles.

Roads have generally provided access for firewood gathering. This activity has resulted in a reduction in standing dead and downed timber within accessible reach along roads in certain areas of the Forest. This has become a concern in some habitats that do not currently meet Forest Plan standards for snag retention, notably ponderosa pine. This has an effect on cavity-nesting birds and other species such as bats that utilize snags as part of their life cycles.

Effects of roading include cutting and removal of trees, snags, large woody forest floor material, and other vegetation along the road corridor, which would adversely affect the stand-level composition, structure, and function of the vegetation types.

Roading of current unroaded areas could adversely affect late-seral and old-growth stages of the forest types listed above, including old-growth ponderosa pine forests which are rare on the SJNF. Wildlife habitat could also be adversely affected for old-growth-dependant wildlife species including large forest carnivores and interior forest species such as the American marten.

Roading of current unroaded areas could affect wildlife species, including those listed as threatened under the federal Endangered Species Act and species designated as Sensitive by the Rocky Mountain Region's Regional Forester. Species that require large relatively undisturbed patches of land (e.g. lynx and wolverine) would be most adversely affected by the loss of current unroaded areas. Elk and black bear are particularly sensitive to lands with high road densities. Roading of unroaded areas would adversely affect the late-seral and old-growth stages of forest types, which are more common in these unroaded areas, and could adversely affect habitat for old-growth-dependant wildlife species. Roading of unroaded areas would provide avenues for a variety of activities to occur

including timber harvest, mineral extraction, and the extraction of other plants and forest products, livestock grazing, fire suppression, and recreational activities including off-road vehicle use. These activities could remove and disturb ecological components important to wildlife, and adversely affect wildlife habitat, solitude, and security.

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

Across the Forest, unique communities and/or special habitat features include talus slopes and other rock formations, cliffs, caves, waterfalls, old-growth, snags, wetlands, and other vegetative communities of concern. Talus slopes and other unique rock formations are typically found at mid to upper elevations in coniferous/deciduous forests, and alpine tundra habitats. Talus slopes provide habitat for a variety of small mammals such as pika, marmot, and several species of shrew. In most cases, the current road system has minimal effects on these features, as most are generally located in areas far from roads. In a few instances, roads dissect these habitat features and could influence dispersal patterns, especially for less mobile small mammals.

Most roads associated with cliff and/or canyon habitats are located at the bottom of drainages; therefore likely have minimal direct effects to them. Indirectly, effects to species inhabiting these areas (ringtails, peregrine falcons, white-throated swifts, and swallows) from human disturbances are generally limited given the limited amount of activity occurring around these habitats.

Most of the caves across the Forest are located away from roads and generally receive few visits from humans. Consequently, direct impacts (habitat modification) and indirect impacts (human disturbance) to cave-species (bats, black bears, and mountain lions) are likely limited.

Waterfalls are a special feature providing nesting habitat for the black swift. The San Juan NF provides a large number of the occupied nest sites for this species in Colorado. Most waterfalls are located away from roads but can be a destination for recreationists utilizing roads to travel to access points. Habitat features utilized by the swift are generally inaccessible to the general public, being limited by severe topography. Therefore, direct and indirect impacts to waterfall habitat and the black swift are probably rare and limited to a few locations.

Wetlands provide habitat for numerous wildlife species including amphibians, waterfowl and other bird species, and a variety of large and small mammals. In many instances, road construction has avoided wetland areas. In other cases, roads have been built in areas near wetlands and have caused impacts through erosion associated with improper drainage. Where this has occurred, impacts to wildlife species are very localized and generally do not result in appreciable impacts to populations.

Roading has occurred through some late-seral and old-growth stages of the forest types including old-growth ponderosa pine forests which are rare on the SJNF and throughout the Rocky Mountain Region (SJNF Old Growth Inventory, Biological Diversity Assessment for the Rocky Mountain Region Guide). This has caused changes to the stand-level composition, structure, and function of these forests, eliminated them from use as reference sites for research, and diminished their value as habitat for wildlife species including forest carnivores and other forest interior species such as the American marten.

Economics (EC)

EC (1): What are the monetary costs associated with the current road system? How do these costs compare to the budgets for management and maintenance of the road system?

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

When looking at all maintenance levels of roads, the R2 Guidance is appropriate. The maintenance level 3, 4 and 5 roads on the SJNF are all open except during winter when most are closed by snow or gated to prevent road damage due to snow or wet road surface conditions. These roads were developed over the years to meet a variety of access needs, and considerable capital investments were incurred in their construction. Most of these roads were analyzed prior to or during construction. The analyses may have included use needs, construction design standards, environmental considerations, and economic assessment.

An examination of funding levels needed to maintain and improve the level 3, 4, and 5 roads shows that the annual road maintenance funding for this Forest was still significantly less than needed for annual work or deferred maintenance. (See Step 2 Describing the Current Situation, Existing Road and Access System Description, National Forest System Roads, Maintenance Level 3, 4, and 5 Roads.)

The average annual road funding of the past four years (2003 – 2006) on the San Juan NF has been $1,080,000. Approximately $550,000 of this is spent on actual road maintenance. An estimated amount of $200,000 per year is spent on deferred maintenance. The funding does not begin to cover annual maintenance needs of over $8,112,000, much less the deferred maintenance needs of $45,748,299.

The SJNF needs to take advantage of opportunities to increase revenue to address the shortfall of road maintenance funding. Opportunities for road maintenance funding include Federal Lands Recreation Enhancement Act collections for developed campgrounds, and ensuring that special-use permit holders pay a share of road maintenance where appropriate. Another approach to reduce road maintenance costs while increasing revenue would be to more intensely manage the suitable timber base that currently has road access. Timber purchasers would be required to perform road maintenance on the roads they use, and the Forest would collect surface rock replacement funds from the purchasers to help keep these access roads better maintained to standard. The same concept can be applied for access to mineral and oil and gas development sites.

Agreements with seven counties in the SJNF jurisdiction (La Plata, Montezuma, Archuleta, Mineral, San Juan, Hinsdale, and Dolores) provide surface blading on 819 miles of maintenance level 2 through 5 roads. The value of the maintenance performed by the counties is estimated at approximately $200,000 per year.

EC (2): What are the indirect economic contributions of roads including market and non-market costs and benefits associated with road system design, management, and operations?

This question is not a programmatic issue and should be addressed at the project-level roads analysis.

EC (3): What are the direct economic impacts of the current road system and its management upon communities around the forest?

Most travelways provide access to permitted users of the Forest in addition to providing access to the public for recreational pursuits. Permitted users include livestock permittees, timber purchasers, mineral access developers, summer home and cabin owners, electronic site owners, utility owners, outfitter-guides, state agencies that administer wildlife and off-highway vehicle groups for special events.

Roads to electronic sites benefit the general public from television and radio stations to law enforcement to public/private corporations that directly or indirectly benefit the whole population of western Colorado. Roads that access utilities including natural gas lines and power lines benefit the general public over the service area which can span many states. Outfitters and guides, Jeep tour companies, ski areas, and water development projects provide tangible and intangible benefits to diverse populations. Roads were necessary for the development and maintenance of these projects.

Distribution of costs and benefits: Costs of road construction are generally borne by the project needing the roads (e.g. the timber sale or the water project or the minerals project).

Affected people:

- Dispersed recreationists – Hunters, fishermen, and campers, car touring
- Developed Recreation – Users of Forest campgrounds, ski areas

Income derivation: Timber purchasers, ski areas, jeep touring, guides and outfitters, livestock grazing

Minerals development: mines, gas and oil, and coal.

Administration: Forest Service, BLM (minerals), Colo. Division of Wildlife, Colo. Division of Parks and Recreation

Public works: Water companies, natural gas lines, power lines

Timber Management (TM)

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

This question is most applicable at the sub-forest scale during project analysis. It is an important consideration, however, for determining timber suitability, management area allocation, and economic efficiency. In general, close road spacing results in quick turn times and higher production, which reduces skidding and yarding costs and increases stumpage value. Although closer road spacing can increase the total road cost from added construction and maintenance, this total cost can be reduced with the use of temporary roads.

Most timber sales on the SJNF are logged with ground-based methods. The trees are harvested and skidded to landings with ground-based equipment. In general, a road spacing of 2,000 – 3,000 feet would be considered economically feasible for ground-based skidding.

Helicopter logging has recently been used in Region 2, but use on the SJNF has been very limited. Helicopter logging feasibility is improved by locating roads and landings to provide downhill yarding and short yarding distances (less than ½ mile).

Cable-logging systems are not common in Region 2 and have seldom been used on the SJNF. Road location is particularly important for cable logging. Most cable-logging systems employ uphill yarding, and roads located above the unit and along the "break" (where the slope changes from gentle to steep), provide better cable deflection that usually increases production and reduces ground disturbance. Most of the SJNF road system has been located for use with ground-based systems. Short temporary spurs or new road locations will normally be required to implement Skyline or other cable-logging systems. The amount of steep slope cable yarding opportunities will be analyzed during sub-Forest scale project analysis.

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

General: currently 22% of the suitable base is considered roadless. These roadless lands for the most part are in the spruce-fir cover type, and are not well served by the current collector road system. A small percentage of this area is actually roaded and is well served by the arterial and collector systems, but is considered roadless under current definitions, primarily due to mapping errors in RARE II or road construction since RARE II.

In the urban-interface zone, there are many small parcels which are considered suitable and roaded, however, the Forest lacks rights-of-way through private lands for timber management purposes. These lands contain primarily ponderosa pine and mixed-conifer forest stands.

Ponderosa Pine

The ponderosa pine type has the greatest need for silvicultural treatment due to past harvest and fire suppression. Many stands are overly dense and at risk from uncharacteristically intense wildfire and insect outbreak. These stands are outside the range of natural variation in terms of density and structure. Approximately 48% of the ponderosa pine type is currently considered suitable. The ponderosa pine type is well served by the arterial and collector system with the exception of the access problems described above. The primary need in this area is reconstruction and maintenance. Due to the lower elevations and proximity to population centers and private land, some collector and arterial roads are in poor condition and in need of relocation or reconstruction. The low value material produced by the restoration silvicultural prescriptions often applied to the pine type cannot support the maintenance needs.

The primary silvicultural system used in ponderosa pine is single and group selection which requires a short 10-20 year re-entry cycle.

Mixed Conifer

The mixed-conifer type also has a great deal of need for silvicultural treatment for similar reasons as the ponderosa pine type. The most pressing need is in the dry phase of mixed-conifer. In general, the mixed-conifer type is not as well served by the arterial and collector systems as the pine type since it occurs at higher elevation and often on steeper terrain. Approximately 23% of the mixed-conifer type is considered suitable for timber harvest. Large blocks of mixed-conifer forest are included within lands such as the Piedra special management area and others where road construction is not allowed. Short sections of new collector construction will be required to access portions of the currently suitable and tentatively suitable mixed-conifer type. Further analysis will be completed as a part of the San Juan Forest Plan Revision to determine the exact location and quantity of these construction needs. The primary silvicultural system used in mixed-conifer stands is single and group selection which requires a short 10-20 year re-entry cycle

Aspen

Currently 30% of the aspen type on the SJNF is considered suitable for timber harvest. The silvicultural need to regenerate aspen stands to provide age class diversity, and maintain aspen on the landscape is high, particularly in seral or "unstable " aspen where conifer is regenerating in the understory, and will eventually convert the stand to a conifer type. The currently suitable aspen lands are well served by the collector and arterial systems, however, short sections of collector road construction will be required to reach tentatively suitable lands in the future if forest plan revision decisions include tentatively suitable land not currently suitable. Heavy maintenance and reconstruction are often needed on arterial and collector roads in the aspen type since the slopes tend to be unstable. The re-entry cycle in aspen is fairly long (80-100 years), since clearcuts are the primary silvicultural system.

Spruce Fir

The spruce-fir Type has the lowest need for silvicultural treatment in terms of ecological need. Fire suppression has had much less of an effect since fire-return intervals are much longer in spruce-fir and the type as a whole has not "missed" many fire cycles. Approximately 20% of the spruce-fir type is currently considered suitable. Much of the non-suitable land is within Wilderness or other areas which do not allow road construction. Much of the "roadless" portion of the suitable base is in the spruce-fir type. Short sections of collector road would be required to reach these suitable lands. The primary silvicultural system used in spruce fir is single and group selection, which requires a short 10-20 year re-entry cycle. Due to high elevation, harsh weather conditions, and lack of the other sources of funding available closer to population centers, the arterial and collector system in the spruce-fir type has some of the greatest maintenance and reconstruction needs.

Minerals Management (MM)

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

Locatable Minerals

Locatable minerals are those mineral deposits subject to location and development under the General Mining Law of 1872 (as amended). The Secretary of the Interior manages the mineral resources on both Bureau of Land Management and National Forest System lands. The Forest Service manages the surface use of National Forest System lands for locatable mineral activity.

Roads needed for locatable mineral activities are required to be constructed and maintained to minimize or eliminate damage to resource values. Unless otherwise authorized, roads that are no longer needed for operations are closed to normal traffic, bridges and culverts removed, and the road surface shaped to as near a natural contour as practicable, and stabilized. Access is provided to people with mineral rights and these routes may be closed to the general public. Arterial and collector roads are used to access individual claims and access is addressed on an individual basis. Most new roads constructed for mining claim access are temporary. Where reconstruction, new construction and reclamation are necessary for access, bonding is required as part of the required Operating Plan.

Existing maintenance level 3-5 roads are generally adequate to handle present and anticipated near future exploration and development of locatable minerals. It is likely that future locatable mineral development will occur in areas previously mined. New development in areas not currently affected will likely require local upgrading of existing level 2 roads. Constraints on improvement of existing roads and construction of new roads will reflect resource concerns and requirements of each Management Theme. Because most new mineral deposits or expansion of existing developments

will be small scale and of marginal economic value, these constraints will influence the cost of locatable mineral development.

Specific areas with potential for locatable mineral development include Dove Creek, La Plata Mountains, Rico-Dunton, Graysill Mountain, the Needle Mountains, and Silverton.

Saleable Minerals/Mineral Materials

Saleable minerals include mineral materials, otherwise known as "common varieties" which generally include deposits of sand, gravel, clay, rock or stone used for a number of purposes including road surfacing, construction materials, and landscaping. The disposal of saleable minerals is the sole discretion of the land management agency. All sale contracts contain requirements for reclaiming the sites.

Most saleable mineral deposits on the San Juan NF are natural concentrations, such as landslides, stream terraces, glacial till, or weathering outcrops and talus slopes. Road cuts and other areas exposed by construction or use provide additional material. There are no developed quarries or collecting areas of significant size on the San Juan NF.

The value of saleable minerals is very sensitive to transportation costs. Existing arterial and collector roads are sufficient for access to currently developed deposits. However, increasing demand especially for gravel for road surfacing will drive expansion of existing gravel pits, and development proposals for new sources. Constraints on improvement of existing roads and construction of new roads will reflect resource concerns and requirements of each management theme in the Forest Plan Revision and Resource Management Plan. These constraints will influence the cost of saleable mineral development.

Leasable Minerals

Leasable minerals are considered under the following categories:

Oil and Gas – federally owned oil, natural gas, and carbon dioxide are subject to exploration and development under leases, permits, or licenses issued by the Secretary of the Interior, with Forest Service consent.

Coal – federally owned coal is subject to exploration and development under leases, permits, or licenses issued by the Secretary of the Interior, with Forest Service consent. Surface coal mining on public lands in Colorado is subject to State regulation

Geothermal – federally owned geothermal steam deposits are subject to exploration and development under leases, permits, or licenses issued by the Secretary of the Interior, with Forest Service consent.

Oil & Gas

The 1920 Mineral Leasing Act (as amended) and the 1989 Federal Onshore Oil and Gas Leasing Reform Act provide the authority and management direction for federal leasable minerals on public lands. The Revised San Juan Land Use Plan will identify the portions of the SJPL that are available and authorized for oil and gas leasing, and also the stipulations (resource protection measures) that will apply to those lands if they are leased. Refer to the Affected Environment section of the associated EIS for a detailed discussion of current and projected leasable mineral activity.

The need to provide road access for leasable minerals is commensurate with the level and type of oil and gas development activity.

Exploration activities, which seek to discover new deposits and determine their extent and quality, typically use existing road systems whenever possible. Road improvements for exploration are generally limited due to the high cost and speculative nature of this activity. Most roads constructed for exploratory leasable mineral activity are of minimal standard (maintenance level 2 or 3) and are temporary. In most cases, the special-use permit has provisions for rehabilitation should the activity not proceed to development.

If an economic deposit is discovered, development and production will use existing road systems. The existing system arterial and collector roads are sufficient for primary access to areas of known and potential leasable mineral potential; however, some roads may need improvement to higher standards to accommodate the increased traffic volume and types of vehicles that will be used during the development phase. New roads will be required to connect the production well pads and facilities to the primary access roads. A full transportation plan is required for development and production of leasable minerals.

The areas that are known or expected to contain significant deposits of oil and gas are the Paradox Basin area (largely the area west of State Highway 145 to the Utah state line), the northern edge of the San Juan Basin (generally the area south of US Highway 160 between Durango and State Highway 151) and the San Juan Sag area (generally the lands east and south of Pagosa Springs). Oil and gas exploration has been conducted since the early 1900's and will continue primarily in these areas.

Road access is generally adequate for the current and expected level of leasable mineral activity for the southeast portion of the Paradox Basin area for the planning period. Road constraints are not expected to impact the exploration for these resources. If a producible deposit is discovered, a full Transportation Plan will be required. Based on the likely limited extent of any new producing fields, the cost of improving existing roads and building new roads for a similar field within the Paradox Basin area will be a factor in developing the resource.

The Northern San Juan Basin area has proven and producing reserves of natural gas (coalbed methane). An Environmental Impact Statement for the proposed development of this deposit has assessed the road system and identified the need for improvement of existing roads, construction of new roads, and eventual reclamation standards for the post-development road system. The existing road system is unable to accommodate the proposed development. Some portions of the proposed development are identified as roadless. New roads will be constructed in those areas. Overall, local upgrading and relocation of portions of the existing system will occur.

The San Juan Sag area, east and south of Pagosa Springs, has seen exploratory leasable mineral activity since the early 1900's. No production has ever occurred on the San Juan NF, although two producing fields are located just outside the Forest on private lands. Road access is generally adequate for the current and expected level of leasable mineral activity for this area for the next 10-15 years. Road constraints are not expected to impact the exploration for these resources. If a producible deposit is discovered, a full Transportation Plan will be required. Based on the small size of the known producing fields, the cost of improving existing roads and building new roads for a similar field within the San Juan Sag area will be a factor in developing the resource.

Local road location and construction standards are developed at the project level and should generally provide for single-purpose use. Improvements needed to accommodate additional traffic on arterials and collectors will also be evaluated at the project level.

Coal

Producing coal mines are located in the Durango area along the Fruitland Formation coal seams. There are untapped coal reserves remaining in the area and some increase in production is

expected in the next 10-15 years, which may include opening new mines in the area. The producing area is adequately served by the existing road system, most of which consists of non-SJPL roads.

A formerly producing coal mine, also in the Fruitland Formation, is located south of Chimney Rock near Pagosa Springs. This mine has been closed and is in reclamation. Some reserves remain in place but are not expected to be developed in the next 10-15 years. Road access is by State Highway 151. Road constraints are not expected to impact future development of this coal deposit.

Geothermal

Known and historically used hot springs occur on the San Juan NF in the Rico-Dunton area and north of Pagosa Springs. Although similar hot springs are developed on private land in the Trimble and Pagosa Springs areas, there are no proposals for development of the San Juan NF's geothermal reserves. The low temperature and limited potential do not indicate significant future use. Road access to the existing and historical used hot springs is adequate. Road constraints are not expected to impact the development of these resources.

Range Management (RM)

RM(1): How does the road system affect rangeland management?

Roads provide access to grazing allotments which benefit grazing permittees because livestock management costs are less. Roads also facilitate intensive livestock management practices which have increased stocking rates on suitable rangeland, over time, by providing access for heavy equipment to construct reservoirs and fences. Roads also allow public land rangeland management specialists to effectively administer the rangeland management program. The lack of a road system would increase costs, reduce stocking rates, and reduce effectiveness of both the grazing permittee and the rangeland management specialist.

By and large, roads have replaced traditional stock driveways, which has resulted in improved vegetative conditions, on stock driveways. Improved vegetative conditions have indirect positive benefits to water quality, recreation, and wildlife habitat.

The downside of roads is that they provide increased public access and therefore the opportunity to harass and rustle livestock is greater. In addition, the opportunity to vandalize range improvements such as gates, fences, and springs, is increased.

Finally, increased public access allows those with off-road equipment to gain motorized entry further and further into the backcountry which can have unintended consequences to wildlife, and native vegetation.

Water Production (WP)

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

Many water diversions and impoundments exist on the SJNF. Most diversion sites and water conveyances have existing road access, although they are typically unclassified roads or maintenance level 1-2 roads. Many ditches have roads or ATV trails built along the ditch in places for maintenance and monitoring. Trans-basin diversions and other water conveyances located in the Weminuche Wilderness and the South San Juan Wilderness do not have road access. Some roads have been built on the Uncompahgre National Forest to access trans-basin diversions in

Wilderness areas near the Continental Divide. Almost all of the large reservoirs on the SJNF have road access.

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

There are seven municipal watersheds on the SJNF. Sediment is the primary road-derived pollutant that could affect water quality on the National Forest. The municipal watersheds that are minimally or unaffected by roads upstream of diversion points are Fourmile Creek, Silver Creek, Bear Creek and the Florida River. The Animas and Dolores watersheds are very large watersheds -- each over 500 square miles. The extent to which maintenance level 3-5 Forest roads affect water quality in these municipal watersheds is small from a cumulative effects perspective.

The West Mancos River supplies municipal water to the town of Mancos and to Mesa Verde National Park. It is highly impacted by road-derived sediment. In years 2000-2002, the Forest Service has focused on the rehabilitation and decommissioning of high sediment-delivery roads.

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

There are few hydroelectric facilities on the SJNF. The largest is the Tacoma Power Plant. Existing roads provide adequate access to this facility.

Special Forest Products (SP)

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

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

The current Forest maintenance level 3 through 5 road system provides adequate access for the existing demand for collecting special forest products such as mushrooms, transplants, post and poles, firewood, and Christmas trees.

Special-Use Permits (SU)

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

The existing road system is sufficient to deal with almost all recreation special uses. Safe and efficient access to areas under special-use authorization has a direct effect on the economics of an operation, either thru volume of customers, or operation and maintenance costs. Most recreation special-use proposals/authorizations are designed around the existing road system.

The San Juan has many non-recreation special-use authorizations. Many of these rely on existing roads for access or utility corridors to accommodate construction, operation, and maintenance. New requests are analyzed through the NEPA process and are addressed in separate decisions.

General Public Transportation (GT)

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

The NFS road system is a subset of a larger road system that is comprised of State highways, county arterials and collectors, and arterials located within incorporated areas. Few NFS roads serve as the primary through-routes that connect communities. Rather NFS roads connect to arterial and collector roads under local, county, or state jurisdiction that offer communities, tourists, and industries access to the National Forest for a variety of uses.

The public roads that are important to link communities as well as provide access between communities and the National Forest are listed in Table 4-GT(1)-1.

Table 4-GT(1)-1
Public roads that provide community access through the National Forest.

Public Road Number/Name	Value
State Highways	
U.S. Highway 550	North-south route linking communities from the CO-NM state line through the Forest's north boundary including Durango, Hermosa, Purgatory, and Silverton. Part of the *San Juan Skyway*, a National Scenic Byway. Provides direct access to National Forest as well as numerous NFS roads.
U.S. Highway 160	East-west route linking communities from the CO-UT state line through the Forest's east boundary including Cortez, Mancos, Durango, Hesperus, Bayfield, and Pagosa Springs. Part of the *San Juan Skyway*, a National Scenic Byway. Provides direct access to National Forest as well as numerous NFS roads.
State Highway 145	North-south route linking communities between Cortez through the Forest's north boundary including Dolores and Rico. Continues north providing indirect access to Telluride and Ridgeway. Part of the *San Juan Skyway*, a National Scenic Byway. Provides direct access to National Forest as well as numerous NFS roads.
State Highway 184	Provides link between U.S. Highway 160 at the town of Mancos and State Highway 145 at the town of Dolores. Provides no direct National Forest access, but there are several intersecting county roads that access National Forest.
State Highway 151	Provides link between U.S. Highway 160 and the town of Ignacio. Provides minor National Forest access.
State Highway 84	Extends south of Pagosa Springs to the CO-NM state line, and ends in Chama, NM. Provides direct access to National Forest as well as numerous NFS roads.

Public Road Number/Name	Value
County Roads	
Columbine Ranger District	
C.R. 501 and C.R. 500	Provides connection between Bayfield and community at Vallecito Reservoir. Provides direct access to National Forest as well as numerous NFS roads.
C.R. 250/East Animas Road	Provides connection between Durango and residential developments in the North Animas Valley and the lower portion of Missionary Ridge. Provides access to NFS roads on Missionary Ridge.
Dolores Ranger District	
C.R. 38/West Dolores Road	Provides connection between Dolores and community at Dunton. Provides direct access to National Forest as well as numerous NFS roads.
Pagosa Ranger District	
C.R. 600/Piedra Road	Provides connection between Pagosa Springs and rural residential developments and inholdings to the north. Road changes jurisdiction at National Forest boundary. Provides access to NFS 631/Piedra Road.
C.R. 326/Blanco Basin Road	Provides access to large rural residential inholdings.
National Forest System Roads	
NFS Road 526/Dolores-Norwood Road	North-south route extending from Dolores through the Forest's north boundary. Provides connection between communities of Dolores and Norwood. Provides direct access to National Forest as well as numerous NFS roads.
NFS Road 135/Beaver Meadows Road	Extends north of U.S. Highway 160 and provides access to rural residences in the Beaver Meadows development.
NFS Road 631/Piedra Road	Extends from C.R. 600 north providing access to rural residential development and ranch inholdings as well as numerous other NFS roads.

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

The San Juan NF contains a significant amount of non-federal land in contiguous blocks and as isolated inholdings along the primary and county public roads. These land units are fully served by the public road system. There are also numerous non-federal inholdings which are connected to public roads (US, State, and County) by Forest Service roads. Although these roads are often considered to be public roads, they are not public in the same sense as US, State, and County roads. The San Juan NF is obligated under the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) to provide reasonable access to private inholdings; however, NFS roads are subject to the regulations of the Secretary of Agriculture, and do not provide the same level of access to the public and to the landowners within the San Juan NF as does the US, State, and County public road system. The standard of NFS roads is typically less than that of the public road system, existing in a variety of forms from low-clearance, two-wheel-drive roads to four-wheel-drive roads to trails. The

condition of the individual NFS road or road segments serving the inholding depends on the original purpose of the road's construction, the level of maintenance it has received, the type of access needed by the landowner(s), and the location of the inholding. Access is normally limited to summer or non-snow periods, but permits may be issued for snowplowing during the winter.

Many projects and activities rely on access via the NFS road system. Before improvement, maintenance, use, or closure on a NFS road can occur, agency staff conduct an analysis under NEPA regulations including land status, right-of-way, and access needs for the proposed project. Affected landowners are informed of any proposal that would impact their access.

Generally, the use of NFS roads for other than public land purposes requires a permit or other authorization, and may require bonding for road damage and surface-rock replacement (minor or occasional use may not rise to the level of bonding or permit requirements). Commercial use of NFS roads may also require public liability and property damage insurance.

San Juan NF policy recognizes that users of NFS roads contribute to the degradation of the road and impacts to adjacent resources. Where such uses are outside the purpose of the public lands, or exceed the design or actual capacity of the road, it is appropriate to require the user to contribute to maintenance or improvement of the road to accommodate the user's desired level of use. Where other uses significantly outweigh or replace public-land uses, it is appropriate to seek the transfer of jurisdiction of the affected road to a private user group or public road agency, depending on the dominant use.

ANILCA guarantees that landowners within public lands have a reasonable right of access commensurate with their use, and obligates the land management agency to regulate such access to limit resource damage. When such use of NFS roads becomes dominant, or requires significant improvement of the roads, the users must contribute to maintenance or improvement of the roads. Otherwise, the San Juan NF must limit the use to levels which will not cause unacceptable damage to the road.

The following policies apply to NFS roads:

1. Commercial users must have a seasonal or annual road-use permit which includes an approved operating plan, collects costs for surface rock replacement and road damage bonds, and may require public liability and property damage insurance.

2. Subdivision and non-subdivided residential owners who use NFS roads for access must form a road users association or similar entity to:

    a. acquire a road easement for NFS roads which access their property;

    b. acquire a road-use permit or an amendment to the road easement authorizing snow removal for winter vehicle access, if desired; and,

    c. contribute to the cost of improvement of the road, commensurate with the type of desired use.

3. Developers of new residential subdivisions who rely on NFS roads for access must require property owners within their development to form a property owners association or similar entity to:

    a. acquire a road easement for San Juan NF roads which access their property;

b. acquire a road-use permit or an amendment to the road easement authorizing snow removal for winter vehicle access, if desired; and,

c. contribute to the cost of improvement of the road, commensurate with the type of desired use.

4. When NFS roads become dominantly residential or commercial access routes, the San Juan NF will pursue transfer of jurisdiction to an appropriate road agency or entity.

5. San Juan NF will limit the use of NFS roads to acceptable levels until:

a. the road use is under proper authorization;

b. the road is capable of handling the level and type of use without damage to adjacent resources; or

c. jurisdiction of the road is transferred to an appropriate agency.

GT(3): How does the road system affect managing roads with shared ownership or with limited jurisdiction? (RS 2477, cost-share, prescriptive rights, FLPMA easements, FRTA easements, DOT easements)

Numerous roads crossing the San Juan NF fall under the jurisdiction of agencies other than the Forest Service. The current system of Forest Service roads evolved to serve a variety of needs. Some roads predate the current land management agency, originating as horse trails, wagon roads, mining claim roads, and platted public highways. Some roads were constructed for commercial or public use after the land management agencies assumed administration of the San Juan NF.

Today, issues of jurisdiction, ownership of rights-of-ways, and ownership of the underlying lands (the subservient estate) dictate, to a large degree, how a particular road is managed, when it is open, how it is maintained, and whether a native or paved surface is necessary. Uncertain jurisdiction, poor record-keeping or long-established (or assumed) public right of use have led to challenges when a particular agency or individual asserts jurisdiction or ownership of a road. Several formerly San Juan NF roads have been conveyed to County jurisdiction over the years, due to changing use or clarification of original ownership. Public policy, in the form of the Homestead Act, the Mining Act of 1872 and later laws, established travelways whose status as public roads is uncertain.

San Juan NF policy is to establish cooperative agreements to share road improvement and maintenance responsibilities where all partners can benefit. If San Juan NF roads are more appropriate for public road use than for San Juan NF purposes, the agency's policy is to convey jurisdiction of the road to a public road agency. Where gaps exist in rights-of-way for San Juan NF roads, policy is to pursue acquisition of the needed rights-of-way.

The San Juan NF grants easements under the Federal Roads and Trails Act to public road agencies for the federal, State, and County public road system that cross federal lands. These easements include operating plans for routine maintenance, emergency repair, stockpile sites, and other needs.

The SJNF and Archuleta County are currently pursuing the improvement of the Piedra Road (County Road 600/Forest Road 631) as a Forest Highway. This road provides public access to the eastern portion of the San Juan NF and a significant portion of private land within Archuleta County. When funding is secured and improvements are made to bring this road up to Federal Highway Administration standards, jurisdiction of the Forest Service segment will be conveyed to Archuleta County.

The San Juan NF has agreements in place (Schedule A contracts) with seven Colorado counties (La Plata, Montezuma, Hinsdale, Archuleta, San Juan, Mineral, and Dolores) to share in road maintenance. These agreements specify maintenance types and intervals for the affected roads.

There are no cost-share agreements with private or public 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 San Juan NF that individuals or entities may have established valid rights, unknown to the San Juan NF 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 agency will honor such rights when such rights meet the criteria set forth in the specific 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?

This question is not a programmatic issue and should be addressed in a project-level roads analysis.

Administrative Use (AU)

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

The road system providing access to designated Research Natural Areas (RNAs) and Special Interest Areas is adequate to meet the needs of any anticipated research, inventory, or monitoring in the areas.

Studies by other agencies and universities are typically designed around access. Sometime access is via an administratively closed road. The Forest should be contacted and permitted approval given to use these roads.

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

Generally, the need for enforcement and investigation actions increases in areas where there is roaded access. The increased need is not necessarily directly related to motorized recreation but rather the ease at which large numbers of persons may access an area fairly quickly. The purpose for this access isn't always for recreational use. Use on the Forest is dominant in the areas accessed by and adjacent to the roadways.

A road system that is more compact and provide loop opportunities will reduce the need for law enforcement, especially in the summer. It will also make the area more efficient to patrol, thus reducing the time needed for an enforcement officer to cover an area. Isolated, low-use roadways near population centers may have a tendency to become dumping areas for trash and create problems for travel management.

Future road management decisions should look for opportunities to eliminate situations where several small, dead-end spurs occur in an area. Elimination of multiple routes accessing the same area will also reduce the need for enforcement.

Sources for information may include: Forest LEMARS reports, recreational use data, and INFRA GFA site data.

The level 3, 4, and 5 road system on the SJNF 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 that provides backcountry trail access. While the road system provides access to perform investigative and enforcement activities, it also provides access for increasing public use of the National Forest System lands, hence, the Forest is experiencing an increase of criminal activities.

Examples of five major criminal problem areas are:

1) travel management;

2) unauthorized uses;

3) theft of forest products;

4) minors in possession of alcohol and illegal drugs;

5) residential occupancy

Off-road motorized travel, primarily ATV use, is the most common travel management violation, and the level 3, 4, and 5 road system provides the access for these vehicles. The demand for ATV opportunities on the Forest is increasing, suggesting a need for more designated ATV trails. People driving around closed gates on level 1 roads is another travel management violation.

Most of the unauthorized uses are in the form of illegal outfitting and guiding. Many of these violations are directly related to the level 3, 4, and 5 road system when non-permitted commercial driving tour operators attempt to derive a profit off of this road system. 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. Sawtimber theft is also dependant upon this road system since it requires large log-hauling vehicles.

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

Protection (PT)

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

The presence or absence of roads can affect our ability to conduct fuels treatments. Roads allow access to treatment areas for personnel and equipment. In the case of prescribed burning, this is not as critical a concern but it does help reduce the cost of treatment by reducing travel costs to and from the treatment area. Where mechanical treatment is desired, the accessibility of an area is an important determining factor in deciding if we are able to perform the work using mechanical means. Without adequate access, many mechanical treatments are simply not practical.

Roads are very effective boundaries for use in planning and implementing prescribed burns. They greatly improve the effectiveness of holding forces by providing access to bring in engines and equipment.

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

This question is not a programmatic issue and should be addressed in the project-level roads analysis.

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

Forest roads are usually unpaved and are used for recreational purposes (such as mountain bike, motorcycle, ATV, passenger car and four-wheel-drive use), as well as resource management purposes related to timber harvest, mining, and oil and gas development. The effects of airborne-dust emissions are typically localized and temporary, and can recur on an annual basis. Dust concentrations vary with the amount of traffic, soils and geology, and increases with dryness and the amount of traffic and vehicle weight. Dust is often associated with native surface roads, especially in fine sedimentary geology.

Dust-abatement measures are typically applied during resource management activities such as timber harvesting, mining, and oil and gas development, especially when these uses see sustained and heavy traffic use. Other mitigation measures may also be applied, such as reducing haul speeds, watering, and limiting the number of trips per day and the time of day for operations. The Forest typically applies dust-abatement products to higher public use Forest roads that pass through or near residential areas as part of its annual maintenance plan when funds are available.

Recreation - Unroaded Recreation (UR) and Road-Related Recreation (RR)

UR(1) & RR(1): Is there now or will there be in the future excess supply or excess demand for unroaded recreation opportunities? What are the supply and demand relationships for unroaded and/or roaded recreation opportunities?

This analysis concludes that in general terms there is excess demand for both unroaded and roaded recreation opportunities on the Forest. Demand generally exceeds capacity around growing communities (Durango, Bayfield, Pagosa, Cortez, Dolores, and Rico) and at destination areas (Chicago Basin, Molas Pass winter sports area).

Roads are the primary means of providing access to recreation opportunities on the National Forest and may also be the primary recreation experience. While driving for pleasure had a 31 percent participation rate in the 2001 National Visitor Use Monitoring (NVUM) project for the San Juan National Forest, viewing scenery was the most popular activity with a 68% participation rate. Most of the roads on the San Juan National Forest were built, not for travelers, but for timber harvesting, livestock trailing, and mining. Recreation has increased over the years and so has the need for roads to safely transport travelers through the Forest.

The Recreation Working Group concluded that, although there were a few areas of overlapping use and desired changes, the overall current travel and recreation management is working fairly well. This same group emphasizes multiple-use recreation with education efforts focused on ethics as being key to keeping users from trying to segregate uses.

Legal requirements regarding OHV use on public lands in Colorado:

- An unlicensed motor vehicle owned by a Colorado resident must be registered with the state of Colorado when operated on public land. Two current registration decals must be permanently affixed to the unlicensed motor vehicle in a location where they can be easily seen.
- Non-resident OHV riders must have a valid registration or license from another state. A valid out-of-state registration may be used for up to 30 consecutive days, after which time a non-resident registration must be purchased. OHV owners from states not requiring registration must purchase a non-resident Colorado registration.
- All OHVs must have a working muffler, Forest Service-approved spark arrester, operable braking system, and head and taillights if ridden at night.
- OHV use in campgrounds is limited to entering or leaving the campground.

Recreation Opportunity Spectrum (ROS)

To evaluate the unroaded and roaded recreation opportunities, we looked at the roadless inventory and the Recreation Opportunity Spectrum (ROS) for the Forest. The roadless inventory and the ROS use different criteria. The roadless inventory describes the condition of the landscape without considering recreation. The ROS describes the condition of the land relative to the needs of recreationists.

The ROS is used to describe the recreation opportunities available on the landscape. It defines recreation areas based on different settings that provide different experiences. The presence of roads and the distance from roads are two criteria for determining an area's ROS class. The mix of ROS classes on the San Juan National Forest does not include urban opportunities.

Opportunities to Address Quality Recreation Experiences when Converting Roads to Trails, Consider the Needs of Different User Groups, and Use Types:

Motorized users and mountain bikers can travel farther than hikers, but mountain bikers would travel shorter distances than motorized users on the same corridor. These distance factors need to be considered when converting roads to trails for recreation. Motorcycle trails are narrow, and riders prefer not to ride on old roads unless the roads have been turned into a single-track with ripping and/or rock placement. Prior to designating roads as single-use, it is important to understand that recreation requirements vary by user type. There are numerous trail uses that can occur on both roads and single-track trails. Motorcycle riding, mountain biking, and hiking, are dependent on trails, and each of these activities require varying degrees of safety, challenge, trail length, loop opportunities, and scenery.

Motorized recreation is a fast way to get through the backcountry, but users need to have a destination, such as a fishing spot or viewpoint in mind. Some users, especially near communities, use public lands as an escape for a short period before or after work/school and take the same ride day after day. However, challenge of the ride is important as a rider becomes more proficient at their craft. Users' ages vary from late 60s to early teens and many OHV users spend time in favorite areas, especially where they are familiar with the road system and other nearby opportunities.

Nonmotorized Trails

The following guidelines should be used for considering opening and signing level 1 and 2 roads for mountain biking, horseback riding, and hiking:

- Look for opportunities to provide loop trails (long and short). Consider enhancing the opportunity with a view or a variety of terrain.
- Enlist the help of these trail users when designing for these opportunities.
- Develop at least a pull-out parking lot and sign with a map at the trailhead.
- Make mountain bike and horseback trails slightly longer (by 2/3) than hiking trails.

Motorized Trails

The following guidelines should be used for designing a motorized trail system out of the level 1 and 2 roads:

- Consider the users and their preference for features along the trail and at the end of the trail.
- Consider motorcycle riders' preferences for single-track trails, which can be developed by placing rocks or ripping through one of the lanes on a two-track road.
- Develop adjacent trail systems so users aren't loading and unloading multiple times during one day.

UR(2) & 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 unroaded recreation opportunities? 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 and roaded recreation opportunities?

Few roads have been built into unroaded areas since 1990 and none of the level 3, 4, or 5 roads have been decommissioned or obliterated during this time. Creation of new roads in roadless areas would be highly controversial; especially roads that would provide motorized recreation opportunities. Motorized trails already exist in some roadless areas and the creation of new motorized trails, while less controversial then new roads, could be proposed as a replacement in roadless areas.

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

This question is not a programmatic issue and should be addressed at the project-level roads analysis.

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

and,

UR(5) & RR(5): What are these participants' attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

Unroaded Recreation

Determining who the participants are in an unroaded area that may be affected by road construction needs to be done on a site-specific level in each project analysis. Staff observations and recreational use information from the analysis area will be the best sources of information.

The answer to why people use a particular nonmotorized area could vary widely from area to area and will be most closely tied to the attraction a particular area holds for someone. It could be that the only common denominator about why certain people use an area away from motorized access is the lack of noise and dust or it could be that the nonmotorized area is heavily used due to a unique attraction.

In many cases, roads provide access to unroaded areas and removal of these roads would diminish the unroaded use opportunities.

In most cases, similar opportunities will exist in areas outside the area in question except in the case of a unique attraction, like a geological feature or a cultural attraction. The questions can only be answered through an analysis of each specific area.

Roaded Recreation

Site-specific travel analyses will need to be conducted to determine which, if any, recreationists may be affected by changes to the existing transportation system. The intent of the travel analysis with respect to recreation is to identify user experiences sought on a particular route. The resulting transportation system changes may include modifications in the allowed uses, closure periods for a particular route, or new road construction in a previously unroaded area.

UR(6) & RR(6): How is developing new roads into unroaded areas affecting the Scenic Integrity Objective or SIOs? 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 two context variables that must be considered in regard to areas where roads are located: the aspect of being on, or traveling the road itself, and viewing a road or number of roads from an exterior viewing platform. This could be from another road, a trail, a body of water, or viewed from the air.

Being or traveling on a road

Generally speaking, when Forest visitors are traveling on a developed road, the physical appearance or existence of the road is a normal part of the driving experience. Roads are a part of visitor's visual expectation and are generally considered a normal part of the landscape, albeit a human alteration.

When traveling on a road the most noticeable and contrasting elements of the road lie in six components:

- Vertical alignment
- Horizontal alignment
- Vegetation alterations or additions
- Road cuts
- Road fills
- Road appurtenances (signs, bridges, fences, etc.)

A sensitively designed road lies lightly on the land and flows well with the characteristic landscape in its alignments. Cuts and fills are at a minimum. Here the existence of the road system may not affect the visual quality of an area, and in fact, may enhance the driving and aesthetic experience of the traveler. However, when proportionally large cuts and fills are evident and little sensitivity has been given to vegetation patterns and clearing, the road begins to visually dominate the landscape and

contrast strongly with the landscape in which it lies. These portions of the road system can adversely affect the scenic quality of the area.

Items such as signs, bridges, barriers, fences, and cattleguards are considered ancillary parts of a road system. These components can blend with the landscape and complement the visual experience, or contrast and visually conflict with other natural elements in the landscape. Signs, for example, are usually designed as attention-getters and may give directions, site or landscape identification, or serve as traffic regulations. Unfortunately many signs are poorly placed, designed, and maintained and seldom is effort given to sign continuity and uniformity in coloration, typography, materials, and scale.

Viewing a road or road system

In viewing a road system from another area, the elements of the road that contrast most with the existing landscape are usually manifested in color and texture contrasts exhibited by vegetation alterations, and in line and form contrast exhibited by horizontal alignment and cuts and fills. Observer position, scale, distance, and time are variable factors, which affect how the road elements are judged in terms of potential visual impacts.

These road system impacts are usually viewed in the middleground- or background-viewing zone of the observer, not the foreground. As suggested above, a sensitively designed road system usually contrasts mildly with the characteristic landscape and may, in fact, be hard to visually distinguish at all. On the other hand, a road that is located on a steep slope or with little vegetation screening usually contrasts strongly with the characteristic landscape and results in a negative visual impact.

Applying the two viewing constants above to new road construction would result either favorably or negatively to the scenic quality of the area as well as the viewer's aesthetic experience. A sensitively designed road would provide a pleasurable travel experience as well as be harmonious with the characteristic landscape when viewed from a distance. A road system that is not well designed would degrade the area's scenic quality and the travel experience.

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

Road management can greatly influence wilderness attributes. The ease of access into an area is a major factor in determining the amount of use the area receives. This does not necessarily mean that a high maintenance level road found near wilderness will overload the wilderness with users. It may not be a problem if there are no egress points or parking areas along the route. Each project-level roads analysis needs to determine whether the access will change in the proposed actions.

New road cuts and road prisms visible from within wilderness areas may affect the opportunities for a primitive recreation experience although located several miles away from the actual wilderness boundary. Roads that parallel, cherry stem or are near wilderness boundaries, can affect a wilderness experience due to noise and visibility of the motorized activity. These roads tend to lead to places where motorized or mechanized violations into wilderness areas occur. While policy is not to create buffers around wilderness areas, opportunities may be analyzed to reduce the impacts within the viewsheds from the wilderness areas.

Social Issues (SI)

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

The direct users of the roads system range from government agency personnel, recreationists, commercial entrepreneurs, scientists, students, hobbyists, collectors, or just about anyone who enjoys the atmosphere of a forest setting. People who use the SJNF come from all around the world, across the country, and locally.

Administrative activities include: construction and maintenance of forest facilities; management of forest land including fire management, wildlife habitat improvement, watershed and fisheries improvement; scientific study; private land improvements; law enforcement; contract administration including special uses, outfitter-guides, mineral extraction, timber harvest, and grazing.

Recreation activities include: pleasure driving, jeeping, all-terrain-vehicle riding, motorcycling, bicycling, hiking*, cross-country skiing*, snowmobiling*, horseback riding*, dog-sledding, pack animal hiking, (destination recreation - [including *]) picnicking, birding, collecting, camping, hunting, fishing, site-seeing, rafting, kayaking, boating, and general all around fun.

All of these activities require access to the Forest. The greatest use occurs via the arterial and collector road system.

The destination activities can occur anywhere on the forest (with snowmobiling limited to motorized winter areas). The others uses occur on the travel system.

The Forest Plan includes management area prescriptions with specific standards and guidelines for particular areas. There are also Infrastructure standards and guidelines for most prescriptions. Some limit certain modes of travel, while others allow all modes of travel. Summer motorized and mechanized forms of travel are restricted to designated routes in some areas, while other areas are open to cross-country travel. The SJNF is in the process of developing a Travel Management Plan and Motor Vehicle Use Map that will limit motorized travel to designated roads, trails, and areas.

SI (2): Why do people value their specific access to national forest and grasslands - - what opportunities does access provide?

Access is predominately a social issue; it means more than a road or trail. People can value existing opportunities for access, whether thy exercise them or not - - while others can value areas that have limited or no opportunities for access, seeing access as negative. This question specifically addresses those people and activities identified in SI-1 and asks 'Why do these people value their access?'

Almost all of the varied types of public recreational uses of National Forests depend in one way or another on roads for access. Whether, when, and where various recreational uses occur depend on the availability of access to – and the extent and location of – the road system. Altering this system is likely to have widespread and differing effects across different types of uses. (Forest Roads: A Synthesis of Scientific Information, USDA Forest Service, pp. 60)

For some, the value of access to the Forest is directly related to personal income and jobs. Timber and non-timber production, grazing, outfitter-guide services, special-use permits for ski areas, are all ways people make money by utilizing the national forest. Many local businesses rely on tourists

coming to the area to recreate on the national forest. This indirect effect is significant to some communities surrounding the San Juan National Forest.

Of high value to people is the ability to recreate on the Forest. To participate in most activities, people have to be able to get to certain places on the Forest. Most recreation activities require road access in order to get to trails, access points, or places to recreate. Some forms of recreation require roads in order to actually partake in the activity (4x4 driving, driving for pleasure). While some people value motorized/roaded access, others also value roadless and Wilderness areas for the opportunities they offer to recreate away from roads and vehicles.

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

Many communities and individuals have social and economic dependencies on forest roads and the resources provided by access to them. Changes to a road system or in road management may affect (positively or negatively) local commuting patterns, lifestyles, forest resource-related businesses, the collection of special forest products; firefighting access needs; and access to municipal water supplies, power lines, and other local infrastructure.

The benefits provided to communities around national forests extend beyond those who directly access or use forest resources. For example, people owning or working in businesses in 'gateway' communities often benefit from tourism associated with people visiting their national forest. Local businesses also benefit through resource activities including timber harvest, grazing, road development and maintenance, water projects, and other special uses in terms of potential economic activity.

Communities may benefit from infrastructure development that enhances their local quality of life, but at the same time, may negatively impact surrounding resources other people value for their quality of life. These externalities may include impact to resources such as soil, water, habitat, visuals, or damage to values people hold for an area, such as unroaded character, limited accessibility, or solitude.

Some ethnic groups, subcultures, tribes, national interest groups, as well as local residents of the area can hold cultural, spiritual, sacred, traditional, symbolic, or religious values associated with access to specific places, opportunities, or resources on the national forest. These passive uses or indirect use values need to be identified and considered along with the more direct use values.

These values nationally and locally need to be considered over time in terms of incremental changes that have occurred. As roads are constructed or closed mile by mile in individual projects, the impact does note seem great at such a small scale, but we must consider the roading or closures that may occur in an area over time, and that change may be significant. It is important to be aware of these larger changes and understand that often Forest Service projects are a balance between local and national values.

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

"Sense of place" embodies both the physical character of a location and the values that humans attach to a piece of geography due to our direct experiences with it. A "sense of place" includes such factors as the biophysical setting, psychological influences (memory, choice, perception, imagination, emotion), and socio-cultural influences. The built environment, including roads, influences the visitor experience. The identity of the Forest Service as a high-quality provider of outdoor recreation, and impressions about the Forest Service's ability to fulfill its mission of stewardship may influence "sense of place." Changes in road management can, and often do, directly affect a "sense of place," or in

other words, affect how these special places are experienced. Road management decisions may influence both the physical and psychological factors that contribute to the experience of a "sense of place."

People's sense of place is directly tied to the often intangible and inexpressible characteristics of an area. This may include a road corridor that invokes a special feeling or attachment to the landscape. Factors influencing this feeling could be the area's vegetation, fish and wildlife resources, amount of sunlight available, views, solitude, opportunities that make it a destination, and the overall familiarity to an individual or group. 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. Any changes in this management will likely change people's sense of place and impact current uses.

Some people that are seeking some degree of solitude and privacy may value those places with a lower level of development. These individuals tend to desire that roads not be highly improved or maintained. Places on the SJNF that tend to attract these types of individuals include Kennebec Pass, Echo Basin, Bolum Pass, and Endlich Basin.

Other visitors value places that are easy and quick to access. These individuals tend to desire an improved and highly maintained road system. Places on the Forest that tend to attract these types of individuals include areas such as Upper Hermosa Park, McPhee Reservoir, Cabin Canyon Campground, Andrews Lake, Haviland Lake, and the Vallecito Reservoir area.

Some places are significant enough to individuals, groups, or communities that if the opportunity to use a specific site is lost, the continuation of those activities no longer takes place – there is no substitute site for the activities because the site itself is the reason people participate. The presence or absence of substitute sites and the potential displacement of people from their 'chosen' site should be considered carefully before making modifications to roads.

This is especially true of Traditional Cultural Properties of the aboriginal inhabitants of the SJNF, the Ute and Mountain Ute people. Traditional cultural practices tied to certain special locations for thousands of years cannot be mitigated when that tie to the land is severed by relocation as happened to the Ute and Mountain Ute who were forcibly removed from their homeland.

Lastly, one consideration that is rarely if ever mentioned when dealing with "sense of place" can be thought of in terms of "value of place," which essentially has to do with cultural perspective. An area may be held special, even sacred, to the Ute and Mountain Ute people without anyone outside tribal membership ever knowing. The knowledge that a special place holds becomes the intellectual property of the Ute People. The "value" of that Traditional Cultural Property is irreplaceable to the Ute and Mountain Ute. After WWII, the jeep made "4-wheeling" a recreational pastime. Two-tracks punched into otherwise roadless areas either became system roads or not. Users nonetheless feel that it is their "right" to use many roads that lead nowhere, simply because they have used them for years…they value those places they are able to access. A clash of cultural values results when those roads impact Ute and Mountain Ute Traditional Cultural Properties, many of which forest managers are unaware of until identified by Ute and Mountain Ute Traditional Elders.

"Value of place" applies to most people who visit the Forest. The areas they visit and the activities they perform there gain a special meaning to them. Many of these meanings are unknown to anyone except themselves. It is important for the Forest to disclose activities that change an areas condition. Sometimes these activities can enhance the "sense or value" of a place, sometimes it may take it away. It is important to know if anyone in the public has a concern and if the concern can be mitigated.

Forest-wide Characteristics

Any location on the forest that is accessed by people is likely to have some degree of a "sense of place" associated with it. These places hold characteristics that people value not only for in a physical sense but also in how they are used. All project-level work and travel management decisions need to involve the public, tribal community, and archeological and scenic resources staffs to ensure that these values are recognized and preserved, as appropriate. An entire Scenery Management System has been developed to manage the "sense of place" on the Forest, along with associated GIS layers which include constituent information. (U.S. Department of Agriculture, Forest Service, 1995. *Landscape Aesthetics: a handbook for Scenery Management. Agricultural Handbook 701.* Washington, D.C.).

Information Needs

Assessment of people's sense of place and how roads and access affect people's sense of place has yet to be undertaken on a Forest-wide basis and should be incorporated into project-specific studies at the appropriate time, when such projects are first proposed.

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

"Almost all of the varied types of public recreational uses of National Forests depend in one way or another on roads for access. Whether, when, and where various recreational uses occur depend on the availability of access to—and the extent and location of –the road system. Altering this system is likely to have widespread and differing effects across different types of uses." –Forest Roads: A Synthesis of Scientific Information, USDA Forest Service, pp. 60.

For some, the value of access on the Forest is directly related to personal income--jobs. Timber and non-timber production, grazing, outfitter-guide services, and special-use permits for ski areas, are all ways people make money by utilizing the National Forest. Many local businesses rely on tourists coming to the area to recreate on the National Forest. This indirect effect is important in many communities throughout Colorado. The ability to access and recreate on National Forests is a major reason why people come to Colorado to vacation and why many decide to stay and make their living here.

Of high value to people is the availability to recreate on the Forest. In order to participate in most activities people have to be able to get to certain places on the Forest. Most recreation activities require road access to get to trails, access points, or places to recreate. Some forms of recreation require roads in order to actually partake in the activity (e.g. four-wheel-driving, driving for pleasure).

Roads provide the access; however, once people reach their destination, they expect to have a certain experience. Some want to use motorized equipment, some want to use mechanized equipment, some seek a non-motorized experience, and some prefer solitude, while others like the group or club setting. These differences have become apparent through comments made by the public during the Forest Plan Revision process. Many users requested some sort of separation of uses. Many people want to be able to exclusively do their activity without conflict from other activities. The Forest Plan Revision, through management area prescriptions and Recreation Opportunity Spectrum allocations, will set the stage for some separation, namely areas where motorized, mechanized, and non-motorized experiences can be expected, and in some areas allowed or restricted. Total separation is unlikely as there is a limited resource and, in some cases, a combination of activities is what the user wants.

Another value expressed was the opportunity for loop experiences. A core loop network helps to provide for this opportunity, especially for driving. For example, the ability to go from one community to another and return another way for a pleasurable day, or have a loop system where the arterial or collector serves as access to the loop experience, or is the link that completes the loop.

While roaded access is valued, so are roadless and wilderness areas. "…a strong value is doubtless attached to the continued existence of wilderness and roadless areas" *– Forest Roads: A Synthesis of Scientific Information, USDA Forest Service, pp. 79.*

Civil Rights and Environmental Justice (CR)

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

The SJNF does not discriminate against any group or persons based on color, creed, abilities, nationality, or background. All persons are treated equally in policy and management of the National Forest. Travel management is no exception. The rules, standards, and laws that govern how the travel system is developed and used apply equally to all that use it.

The policy holds true for persons with a disability according to direction set forth in 'Section 504 of the *Rehabilitation Act of 1973 which reads:*

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

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

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

It should be noted that the term "reasonable accommodation" is only used in reference to employment; there is no such requirement for program access.

OHV access by persons with disabilities:

There is no legal requirement to permit a person with a disability to utilize an OHV in any area that restricts or prohibits OHV use under the Forest Plan or the Forest Travel Plan/Transportation Plan. The SJNF does allow wheelchairs to go anywhere on the Forest, unrestricted.

Cultural and Heritage (CH)

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

Background

Access to paleontological, archaeological, and historical sites provides opportunities for studying, learning about, and enjoying our natural history and cultural heritage. Access to these sites may also increase risks of unintended physical damage and vandalism. There are creative ways of allowing users access to these sites without building new roads or maintaining existing roads by keeping the site setting and sense of place intact through maintaining the primitive and/or undeveloped nature of these sites.

Forest-wide Characteristics

Because of its rich history, there exist many historic, archeological, and sacred sites scattered across the entire San Juan Public Lands (SJPL). The SJPL archeological staff works closely with historians and tribal communities in inventorying and assessing archeological and historical sites. When a project is proposed for road construction, relocation, or decommissioning an archeological clearance and assessment by the SJPL archeological staff is mandatory.

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

Background

According to the Brunot Treaty of 1873, the Ute Tribes have certain rights associated with hunting on lands within the SJPL. This was confirmed in 2003 when the Office of General Council determined that the Ute tribes have treaty rights to hunt in the area ceded by the Brunot Agreement. The road system and road management does not affect these treaty rights.

Forest-wide characteristics

Much of the area that currently comprises the SJPL was included within the boundaries of the Brunot Treaty.

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

Some roads constitute historic sites under the National Historic Preservation Act (1966). Management opportunities being developed for these roads must address compliance with this Act. The SJPL archeological department maintains a catalog of these roads and how to maintain compliance with the Act. Over the years some of these roads may have been altered in such a way that the original roadbed is no longer present. It is not only the routes themselves that represent historic value, but the condition they are in that display the past. For example, a wagon route has more meaning historically if it is kept as a two-rail line, as it was, rather than made into a road which people can travel. Road development and maintenance has the potential to adversely affect historic roads.

Winter Use (WU)

WU(1): What are the potential effects of using the road system during winter, including authorizing snow removal?

There is a trend toward increased demand for year-around access to private inholdings and recreation areas within the National Forest. NFS roads are generally not constructed for winter, all-weather use. Therefore, this trend places demands on roads that were never intended for such use.

The Forest Service does not plow roads for snow removal. In some locations, NFS roads are also designated as county roads, and some of these roads are plowed by counties. Private landowners and special-use permittees may apply for a permit to plow NFS roads where winter access is needed.

Wet road conditions are common in the fall and spring, and also often occur at some locations during the winter months, or following snow removal. Traffic on a road in wet weather generally causes ruts. If the depth of the rut goes through the gravel surface (which on many of our roads is only two-to-four inches deep), the subgrade, material which is generally not good for use in roadway surfacing, (such as clay, silt and organic soils) seeps up into the gravel layer, destroying the structural integrity of the road. This problem spreads when subsequent drivers avoid the rut, but creates yet another rut. Continued use during these conditions will result in surface deterioration for the entire width of the road.

Winter use of NFS roads may have negative consequences for wildlife habitat, hydrology, fisheries, and the road condition. Improper snowplowing can causes significant, irreparable resource damage to water and fisheries and the road condition because it increases erosion and surface gravel loss. A road which is plowed too narrowly diverts water from snowmelt down the middle of the road surface, causing erosion.

Step 5 Describing Opportunities and Setting Priorities

Problems and Risks Posed by the Current Road System

The tables in Appendix C illustrate the results of the route-by-route analysis performed by the core IDT and district recreation representatives. The route-by-route analysis did not include evaluation of roads associated with campgrounds or roads ½-mile or less in length. The team identified the following values and risks for use in the matrix analysis:

Table 5.1
Road Values and Road Risks Used in Matrix Analysis

Road Values	Road Risks
• Recreation • Timber • Fire/Fuels • Range • Energy and Minerals • Private Access • Permittee Access • Administrative (Forest Service) Site Access	• Road Condition • Mixed Use • Water Resources • Terrestrial Wildlife • Riparian Habitat and Wetlands • Heritage Resource • Soil/Geologic Hazards • Jurisdiction • Annual Maintenance • Deferred Maintenance

The team evaluated each road for each of these values and risks and assigned a numerical value for each matrix category. High values and risks were assigned a numerical value of two (2), low values and risks were assigned a numerical value of one (1), and if a specific value or risk did not apply to a specific road, no value was assigned. An average was then calculated for each road that is represented by the "value priority ranking" and the "risk priority ranking" Those rankings with a value of 1.5 or greater were assessed as "High" and those rankings less than 1.5 were assessed as "Low." This resulted in four possible risk/value pair categories: High Value/High Risk, High Value/Low Risk, Low Value/Low Risk, and Low Value/High Risk.

Assignment of a High (2), Low (1), or <blank> (not applicable) rating for each value and risk matrix item generally followed the guidelines presented below.

Table 5.2
Value and Risk Rating Guidelines

Matrix Value/Risk	Rating	Criteria Guidelines
Road Values		
Recreation	High	• Access to developed recreation site, major trail or trail system, or large areas of the Forest that have no alternate access
	Low	• No developed recreation, no or only minor trails
Timber	High	• Accesses suitable land for timber harvest
	Low	• Access to areas where timber harvest may occur, but not an objective
	<blank>	• No timber use identified
Fire/Fuels	High	• Access to wildland-urban interface
	Low	• Non-wildland-urban interface

Matrix Value/Risk	Rating	Criteria Guidelines
Range	High	• Access to range allotment, infrastructure (fencing, etc.) on allotment, or needed for control of noxious weeds
	Low	• Road not needed for range purposes.
Energy/Minerals	High	• Road accesses mining claim(s) or area with moderate to high coalbed methane (CBM) potential
	Low	• Does not access mining claim or CBM area
	<blank>	• No potential for mining claim or CBM
Private Access	High	• Provides access to large inholding tract(s) or multiple residential tract with no alternative route available
	Low	• Provides access to minor inholding or single residence, or alternate route available
	<blank>	• No private land accessed or needed
Administrative Site Access	High	• Access to administrative site essential for forest management (repeater tower, lookout tower, maintenance facilities, high-use bunkhouse)
	Low	• Access to administrative sites not essential for forest management (e.g. recreation cabins, low-use bunkhouse).
	<blank>	• No administrative sites accessed
Road Risks		
Road Condition	High	• Existing road damage or poor road condition consisting of two or more of the following conditions: washboarding, surface deterioration, landslides, roadbed slumping, slope raveling, drainage problems, poor condition structures or culverts, and design deficiencies.
	Low	• No existing road damage and road condition fair or better
Mixed Use	High	• OHV use moderate to high
	Low	• OHV use low to non-existent
Water Resources	High	• Close proximity to surface water, history of landslides, slumping or drainage problems
	Low	• Distant from surface water, minimal history of landslides, slumping or drainage problems
Riparian Habitat and Wetlands	High	• Riparian habitat/wetlands immediately adjacent to road
	Low	• Riparian habitat/wetlands in vicinity of road
	<blank>	• No riparian habitat/wetlands in vicinity of road
Heritage Resources	High	• Known or surveyed sites within road prism or in vicinity of road corridor
	Low	• No known or located sites within road prism or vicinity or road corridor
Soils/Geologic Hazard	High	• Forest Service record of road damage from landslides, slumps, mudflows, rockfall, retaining wall failure, soils that are unstable or extremely susceptible to erosion. Records reviewed for years 1979, 1980, 1981, 1983, 1985, 1989, 1993, 2005.
	Low	• No record of road damage
Right-of-way Needed	High	• Multiple right-of-way easements needed
	Low	• Single right-of-way easement needed
	<blank>	• No right-of-way needed
Jurisdiction	High	• Access to large private development(s)
	Low	• Minor access to private development or inholding
	<blank>	• No private access
Annual Maintenance	High	• Annual maintenance cost >= $5,000 per mile
	Low	• Annual maintenance cost < $5,000 per mile
Deferred Maintenance	High	• Deferred maintenance cost >= $55,000 per mile
	Low	• Deferred maintenance cost < $55,000 per mile

Opportunities for Addressing Important Problems and Risks

The matrix analysis identified several risk categories where the average rating was high for all the roads on one or more Ranger District. These risk categories represent the greatest risks associated with the NFS road system. The high risk categories are water resources, soils/geologic hazards deferred maintenance and mixed use.

Water Resources

Road construction and maintenance is recognized as a major source of sediment in forested watersheds (Megahan and Kidd, 1972; Reid and Dunne, 1984). Roads can alter the historical runoff patterns by increasing the area impervious to surface water infiltration, and concentrating surface water flow and intercepting shallow subsurface flow, resulting in increased water with sediments being routed directly into streams (MacDonald and Stednick, 2003). Sediment not only directly affects water quality, which can directly impact aquatic life, but it can also alter channel morphology and impact aquatic habitat (Colorado Department of Public Health and Environment, 2002).

A sub-Forest scale roads analysis should be conducted for those roads for which water resource risks were assessed as high to better define the problem areas, to determine where CIP funds should be allocated, and to develop mitigation measures. The *Watershed Conservation Practices Handbook* (FSH 2509.25) may be used as a tool in developing mitigation strategies. This handbook describes seventeen management measures designed to aid in reducing water resource impacts related to activities such as road construction, road maintenance, and land management.

Soils/Geologic Hazards

Roads constructed in areas with poor soil characteristics and/or geologic hazard areas present potential safety hazards for the traveling public and may result in adverse impacts to down-gradient water resources. Roads in high soil/geologic risk areas that are assessed as low value should be considered for decommissioning. Roads in high soil/geologic risk areas that are assessed as high value should receive priority for CIP funding and, where appropriate, application for Emergency Relief for Federally Owned Roads (ERFO) funding should be made with the Federal Highway Administration (FHWA). Road condition surveys should include evaluation of cut and fill slope stability, retaining wall condition, potential landslide/rockfall areas, drainage issues that may contribute to landslides or roadbed slumping, and any other conditions that may result in hazards to the traveling public or roadway damage.

There are numerous reference documents available to provide guidance for transportation system management, from project planning to construction and maintenance. Relevant Forest Service handbooks and guidance manuals include the following:

- Transportation Planning Handbook (FSH 7709.55)
- Road Preconstruction Handbook (FSH 7709.56)
- Drainage Structures Handbook (FSH 7709.56b)
- Road Construction Handbook (FSH 7709.57)
- Transportation System Maintenance Handbook (FSH 7709.58)
- Slope Stability Reference Guide for National Forests in the United States (EM 7170-13)

Rights-of-Way Needed

The rights-of-way across private properties on which NFS roads are located may not be adequate for forest access as property ownership and land uses change in the future. In a number of cases, there is no documentation, or poor documentation of rights-of-ways for NFS roads that cross private land. The ability to acquire needed easements across these private properties may become increasingly more difficult if property values continue to increase and properties are subdivided. Landowners' willingness to grant an agreement easement may be affected by many factors including assessed value, terms of the proposed easement, location of the proposed easement, and an unwillingness to grant public access. Subdivision of large parcels can exacerbate these issues by also increasing the numbers of property owners from which easements must be obtained.

Currently, the Forest lacks adequate realty staff to pursue the needed right-of-way easements. Each Ranger District is staffed with one realty specialist and there are none at the Supervisor's Office. The realty specialists are currently focused on other competing land priorities. The right-of-way atlas, which is maintained at the PLC, needs to be updated with current information so that an accurate inventory of needed easements can be developed.

Road and trail right-of-way acquisition is funded through cost codes CMRD and CMTL, respectively. Therefore, the two staff groups, engineering and lands, need to coordinate priorities with respect to right-of-way acquisition.

Obtaining needed rights-of-way has become more critical with the finalizing of the Forest Service 2005 Travel Management Rule. Since the rule requires that the Forest Service designate a system of roads and trails for motorized use that the agency will be enforcing, the agency must have legal access for the routes for which designations will be made and enforcement will occur.

Although rarely used, the Department of Agriculture has the authority to condemn rights-of-way to maintain access corridors, with some exceptions. The Forest Service may only request the condemnation; the Secretary of Agriculture decides if condemnation will be used. Every effort should be made to acquire needed rights-of-way through voluntary means before considering condemnation.

Opportunities to address right-of-way issues should be pursued during:

- Sub-forest scale travel analysis planning processes.
- Permit negotiations.
- Projects that involve private lands where right-of-way easements are also needed.

Proactive measures that could be taken include:

- Frequent communications with local and county governments to keep abreast of proposed subdivisions and other land use changes.
- Early communication with lands and engineering staff on projects where rights-of-way may be needed, or could be acquired as an ancillary part of the project.
- Assign lands personnel to update the right-of-way atlas and right-of-way needs inventory.
- Improve lands and engineering staff coordination on identifying and pursuing needed easements.
- Work with counties to have them pursue needed easements from private property owners.

Mixed Use

The Forest Service 2005 Travel Management Rule requires that each forest develop a system of roads and trails designated for motorized use by vehicle class, and if appropriate, by time of year. While the rule does not define what vehicle classes should be used, the agency has given direction that vehicle class should be based on two criteria, the ability to license a vehicle for use on a public road and vehicle width. Mixed use is defined as allowing street-legal vehicles and non-street-legal vehicles to share travel routes. The rule requires that the designation process consider public safety and seek to minimize conflicts among different classes of vehicles.

An analysis should be conducted for each road where allowing mixed use is being considered in the planning process for the implementation of the travel management rule. *Guidelines for Engineering Analysis for Motorized Mixed Use on National Forest System Roads* (EM-7700-30, December 2005) and the Transportation Systems Operations Handbook (FSH 7709.59) provide guidance for evaluating whether mixed use should be allowed on a specific road.

Deferred Maintenance

As described in Step 2, historical funding allocation for annual and deferred maintenance has not kept pace with the funding needs. Over time, this will result in the condition of some roads deteriorating to a maintenance level that is below the maintenance objective level. The core IDT developed strategies based on the four possible Value/Risk combinations that may be used to control the way in which this shift occurs. The underlying premise of the strategies is to direct available funding toward maintaining and addressing risks for those roads with the highest value.

High Value/Low Risk – Ideal Condition

Roads in this category represent the ideal situation. The focus for roads in this category should be on preserving the maintenance level through focusing on annual maintenance. The SJNF should verify that appropriate maintenance procedures are followed, and take any necessary corrective actions for roads in this category for which the SJNF currently has maintenance agreements with county governments. Roads in this category that have high value for private access should be considered for transfer to county jurisdiction.

High Value/ High Risk – Priority Roads for Maintenance and CIP Funding

High Value/High Risk roads should receive first priority for investment and maintenance funding to restore these roads to the appropriate maintenance level and reduce resource risks. A sub-Forest-scale roads analysis should be conducted for roads in this category to better define the risks and needed improvements. Roads in this category that have high value for private access should be considered for transfer to county jurisdiction.

Low Value/High Risk – Priority Roads for Risk Analysis and Reducing Maintenance Level

Low Value/High Risk roads should receive priority for a sub-Forest-scale roads analysis to confirm the value and risk rating. The roads analysis should include a risk analysis that specifically describes the risks and identifies opportunities to reduce those risks. Roads confirmed to this category should receive highest priority for reducing maintenance levels and may be considered for conversion to trails. These roads may be considered for decommissioning if it can be done with a minimal investment.

Low Value/Low Risk – Priority Roads for Reducing Maintenance Level

Low Value/Low Risk Roads should receive lowest priority for maintenance funding. Consideration should be given to converting these roads to trails. These roads may be considered for decommissioning or reduction in maintenance level when this can be done with minimal investment.

Table 5.3
Value/Risk Category Summary

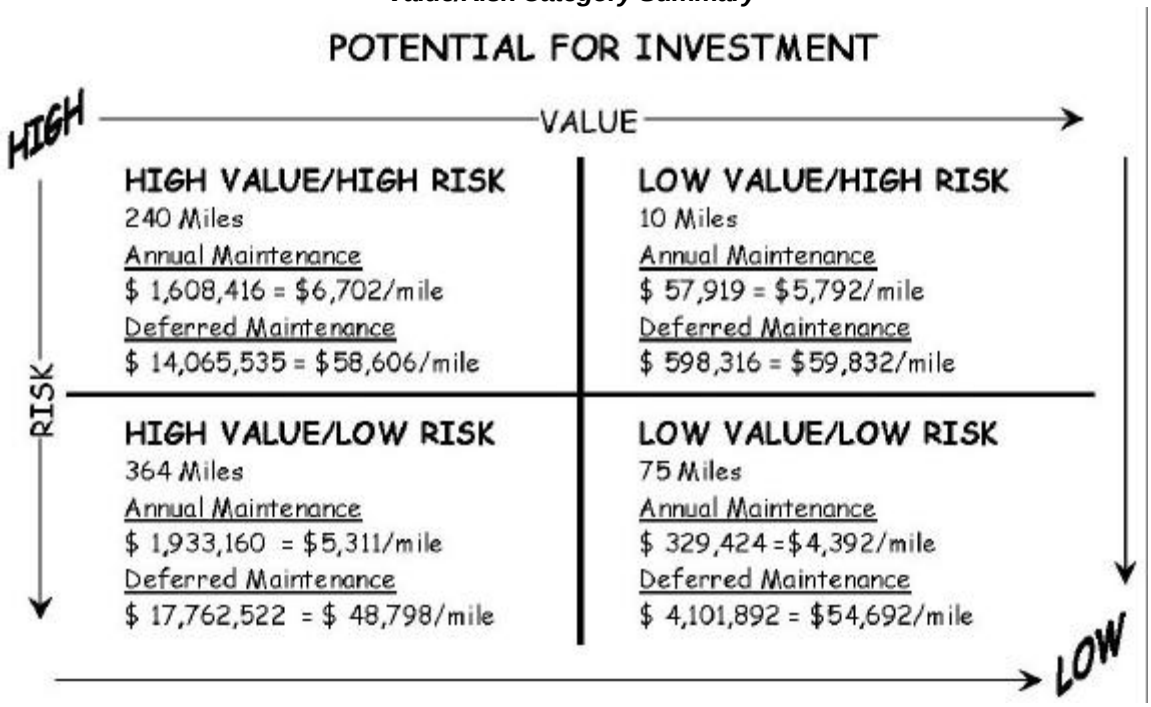

Table 5.4
Annual and Deferred Maintenance Costs by Ranking Category for Maintenance Level 3, 4 and 5 Roads

Ranger District	Maintenance Cost	High Value/ Low Risk	High Value/ High Risk	Low Value/ Low Risk	Low Value/ High Risk	Annual/Deferred Cost by Ranger District
Columbine	Annual	$ 400,640	$ 189,555	$ 2,193	$ 19,769	$ 612,157
	Deferred	$ 5,594,054	$ 1,010,366	$ 0	$ 149,699	$ 6,754,119
Dolores	Annual	$ 483,877	$ 1,007,393	$ 241,316	$ 19,682	$ 1,752,268
	Deferred	$ 5,224,675	$ 7,851,845	$ 2,890,899	$ 257,698	$ 16,225,117
Pagosa	Annual	$ 1,048,644	$ 411,468	$ 85,915	$ 18,468	$ 1,564,495
	Deferred	$ 6,943,794	$ 5,203,323	$ 1,210,993	$ 190,919	$ 13,549,029
	Total Annual	$ 1,933,160	$ 1,608,416	$ 329,424	$ 57,919	$ 3,928,919
	Total Deferred	$17,762,522	$ 14,065,535	$ 4,101,892	$ 598,316	$ 36,528,265
	Total Cost by Category	$19,695,682	$15,673,951	$ 4,431,316	$ 656,235	$ 40,457,184

Minimum Road System

The minimum road system should consist of those roads rated as high value and, although excluded from this analysis, roads that are associated with open campgrounds, trailheads, or other recreation facilities. Roads ranked as high value and recreation facility roads serve the Forest Service mission by providing access for Forest management activities, recreational opportunities, and utilization of Forest resources. Roads ranked as low value generally serve few Forest mission purposes, and in some cases, these roads service private interest needs more than Forest needs.

Assessment of Building Roads in a Currently Unroaded Area

Approximately 415,356 acres of the roadless area is congressionally designated Wilderness, and approximately 62,550 acres is within the Piedra Area, which is managed for its wilderness character. Road construction is prohibited in these areas and roads would not be consistent with the management intent.

The SJNF conducted a roadless inventory in 2005-2006 in accordance with the Forest Service Directives. The inventory identified 23 areas containing approximately 529,392 acres on the SJNF that have roadless character. These roadless areas lie outside of designated Wilderness and the Piedra Area. The roadless inventory is comprised of National Forest System lands greater than 5,000 acres or lands contiguous with other roadless/wilderness areas that do not contain:

1) authorized roads,

2) significant alterations to the landscape, or

3) permanent improvements

A Roadless Area Review and Evaluation (RARE II, 1979) inventoried 529,102 acres of roadless area. The San Juan National Forest Amended Land and Resource Management Plan (April 1992) identified 14,970 acres (3%) that was planned for timber removal. Comparison of the two inventories indicates that construction of roads for timber harvest has not occurred significantly during the last 13 years.

One of the Forest's desired future conditions favors maintaining the character of these roadless areas to preserve large expanses of undeveloped country. The areas would be managed for wildlife habitat, scenic quality, and as quiet places for recreationists to experience. Approximately one-half of the San Juan National Forest consists of Wilderness, the Piedra Area, or inventoried roadless areas. The other half of the Forest has an adequate system of level 3, 4 and 5 roads to provide access for a variety of activities.

Many of the lands within the inventoried roadless areas are not conducive to road construction. The topography tends to be steep and the soils and geology poor for road construction. Public comments received during the forest plan revision effort and the Northern San Juan Basin EIS process indicate that the public is generally opposed to constructing new roads within these areas, even if the roads are temporary. Environmental impacts typical with any new road construction include increased mass wasting and stream sedimentation, degradation of water quality, habitat loss and segregation, spread of noxious weeds, and noise impacts. Before any new road construction, either permanent or temporary, a project-specific roads analysis and the appropriate level of environmental analysis should be completed. Impact mitigation measures should be incorporated into the construction plan

package and provisions should be made for mitigation monitoring, and improvements, if the monitoring determines the mitigation plan implementation is deficient.

The primary cases under which roads, either temporary or permanent, may be considered in inventoried roadless areas are to provide access for private inholdings, valid existing mineral rights, insect or disease control projects, and fire/fuel reduction projects.

The Forest Service must provide access to private inholdings, as mandated under ANILCA (Alaska National Interest Lands Conservation Act of December 2, 1980). ANILICA provides for ingress and egress for landowners, but does not include rights-of-way for powerlines or other utilities. A special-use authorization is required to construct and/or use access facilities on NFS lands to access non-federal lands. Appropriate environmental clearances must be completed before issuance of the special-use permit.

Temporary roads may be constructed if there is a need for land management purposes such as insect and disease control or hazardous fuels reduction projects. Temporary roads may also be constructed to provide access to valid existing mineral rights that may include hard-rock mining and oil and gas leases on leasable federal lands. These roads are for administrative and permittee use only, and are closed to use by the general public. The maintenance level of these roads may vary from native surface (maintenance level 2) to two-lane gravel surface roads (maintenance level 4). These roads are intended for use only for the specific project's duration and should be decommissioned upon project completion.

The NSJB EIS is evaluating a proposal by a group of companies that hold federal oil and gas leases to produce natural gas from coal beds on federal, state, and privately owned lands in La Plata and Archuleta Counties, Colorado, collectively referred to as the Northern San Juan Basin. The proposal would allow the leaseholders to exercise their existing rights to drill for, extract, remove, and market natural gas products following the appropriate level of environmental analysis. The leaseholders proposed to drill a total of 285 natural gas wells and construct ancillary facilities needed to support those wells within the Northern San Juan Basin, which includes a roadless area known as the HD Mountains. The roadless area comprises approximately 28,000 acres of the proposed development area. The NSJB EIS preferred alternative would result in the construction of 26 gas production facilities and 14 road miles in the HD Mountains roadless area, which would result in 85 acres of roadless area disturbance. The roads would be gated and closed to public motorized use. Following project completion, which is estimated to last approximately 40 years, the well pads and roads will be obliterated and the area of disturbance restored to its original contours and revegetated.

NEPA Analysis Needs

This Forest-scale roads analysis is not intended to be, nor should it be considered sufficient environmental analysis to satisfy NEPA requirements. Furthermore, this document does not result in any decisions. This roads analysis is intended as one resource forest managers may use in informing future decisions. Project proposals may follow the recommendations presented herein through completion of sub-forest-scale roads analyses. Any proposal must undergo an appropriate level of environmental analysis, as required under NEPA, before a decision can be made and implemented. Some examples of projects that would require environmental analysis under the NEPA framework include changing a road maintenance level, adding a road to the NFS road system, decommissioning a road, changing the allowed use on a road, and making road improvements.

Step 6 Report Summary

Key Findings

Funding

Current funding is not adequate to maintain NFS roads to the standards that correspond to each maintenance level. The deferred maintenance backlog of $36.5 million is high and will continue to increase if funding levels remain flat or decrease, if there are no changes made to the road maintenance levels, and the SJNF maintains the current jurisdiction and maintenance responsibilities.

Right-of-Way Easements

The 2005 Travel Management Rule has made it critical that the Forest Service resolve the issue of outstanding right-of-way easements since implementation of the rule will result in designation of routes for public forest access, but many of these routes will cross private lands. An update of the legal right-of-way easements across private lands is needed so that an accurate assessment of the right-of-way easement needs can be made. Once this update is completed, a creative strategy will be needed to successfully pursue needed easements. With the current lands workload, additional staff may be necessary to complete the acquisition of the needed easements within a timely manner.

Jurisdiction

Increased development of private land inholdings accessed by NFS roads has resulted in pressure from private developers and landowners and county governments for year-round access. As a result, the number of snow-plowing permit requests is increasing. In some cases, roads are plowed for winter access without a permit. Many of these roads are not designed or constructed as all-weather roads and road damage is occurring from both authorized and unauthorized plowing and winter use.

OHV Demand

The use of OHVs on both NFS trails and NFS roads, where allowed, is increasing across Forests nationally as well as on the SJNF. The SJNF currently allows OHV use on most NFS roads. With this increased use, there is a need to evaluate safety and reduce conflicts where motorized mixed use of both highway-legal vehicles and OHVs is occurring. Motorized mixed use will be evaluated during the travel planning process for the implementation of the 2005 Travel Management Rule.

Access

The current maintenance level 3, 4 and 5 road system generally meets the current and anticipated access needs for recreation, fire and fuels reduction projects, timber harvest, and range.

There is current and future anticipated need to provide access for private inholdings. Requests for inholding access consist of both requests for new road construction and winter access. New access requests are expected to increase as land values increase, making development of inholdings more profitable. Winter access requests are expected to increase as inholding development increases and as property owners seek to inhabit inholding located residences year-round.

There is a current and future anticipated need to provide access for oil and gas development. The preferred alternative for the NSJB EIS would result in the development of an additional 92 miles of roads, including approximately 14 miles of new road construction in the HD Mountains roadless area. As oil and natural gas reserves become depleted, there will be an increased demand for the development of existing oil and gas leases, such as the Northern San Juan Basin.

Upcoming Events

The SJNF has pledged to implement the 2005 Travel Management Rule by September 2009. The travel planning process will require numerous activities before implementation can be completed. Those activities include:

- Public Involvement – Meetings and workshops will be held for each of the ranger districts to educate the public on the new rule and to gather input needed for designating routes.

- A travel analysis will be completed that builds upon this roads analysis, but includes Level 2 roads and motorized trails. This travel analysis will be comprised of several sub-Forest scale analyses.

- A mixed-use engineering analysis will be performed for those routes where motorized mixed use is proposed.

- Work toward resolving the need for right-of-way easements across private lands for NFS routes will continue. This effort may require direction from the Office of General Council (OGC) on the legal status of historic routes that currently cross private lands.

- An environmental analysis as required under NEPA will be performed for those routes where changes to the current travel management direction are proposed.

- Implementation of the rule will coincide with the publication of a Motor Vehicle Use Map (MVUM). The MVUM will be used by the public and by law enforcement to identify the routes that are open to motor vehicle use, by vehicle class, and by time of year, if appropriate.

- The MVUM will be updated annually and will be based upon ongoing monitoring, updates to the motorized route inventory, and non-static conditions which may affect the MVUM content.

APPENDIX A

DEFINITIONS AND ABBREVIATIONS

Definitions

Administrative unit - A National Forest, a National Grassland, a purchase unit, a land utilization project, Columbia River Gorge National Scenic Area, Land Between the Lakes, Lake Tahoe Basin Management Unit, Midewin National Tallgrass Prairie or other comparable unit of the National Forest System.

Area - A discrete, specifically delineated space that is smaller, and in most cases much smaller, than a Ranger District.

Best Management Practices – Known as BMPs, they are methods, measures, or Practices selected by an agency to meet its nonpoint pollution source control needs. Such practices include, but are not limited to, structural and nonstructural control, standard operating procedures, and required maintenance procedures. They can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants to a waterway.

Bridge – A road or trail structure, including supports, erected over and depression or an obstruction, such as water, a road, a trail, or railway, and having a deck for carrying traffic or other loads.

Cost Share – Federal Grants and Cooperative Agreements Act of 1977 **(31 U.S.C. 6301-6308, Pub. L. 95-224).**

Cooperative Forest Road Agreements – Procedures for all existing and new Cooperative Forest Road Agreements executed under authority of **16 U.S.C**. 532-538 may continue. (**FSM 7730, FSM 1582**, and **FSH 1509.11**, ch. 20. This limited exception does not cover emergency relief program activities under **23 U.S.C. 125**.

Cooperative Road Maintenance Agreement – The National Forest Products Association Cost Share/Access Policy Committee and the Forest Service jointly developed and approved a Cooperative Road Maintenance Agreement (ex. 01). Use this agreement to accomplish road maintenance for roads included under cost share agreements **(FSH 7709.58, sec. 13.22)**. **5467.3** – Cost Sharing Basis. The cooperative road development program allocates the share of costs to the respective parties in proportion to their anticipated use of the road. See **FSH 5409.17**, ch. 60, for direction on the process of determining shares of the construction cost.

Debris Flow – A mass movement involving rapid flowage of debris of various kinds under various conditions; specifically, a high density mudflow containing abundant coarse-grained materials and resulting almost invariably from an unusual heavy rain.

Designated road, trail, or area - A National Forest System road, a National Forest System trail or an area on National Forest System lands that is designated for motor vehicle use pursuant to **§ 212.51** on a motor vehicle use map.

Easement – A right held by one person to make use of another's land for a limited purpose, such as a special-use authorization for a right-of-way that conveys a limited interest in National Forest System land and is compensable according to its terms.

Facility – Structures needed to support the management, protection, and utilization of the national forests and national grasslands, including building, utility systems, and other construction features. There are three categories of facilities: recreation, administrative, and permitted.

Forest road or trail - A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System for the use and development of its resources.

Forest transportation atlas - A display of the system of roads, trails, and airfields of an administrative unit.

Forest transportation facility - A forest road or trail or an airfield that is displayed in a forest transportation atlas, including bridges, culverts, parking lots, marine access facilities, safety devices, and other improvements appurtenant to the forest transportation system.

Forest transportation system - The system of National Forest System roads, National Forest System trails and airfields on National Forest System lands.

Legal Definitions

1). RS 2477 – Section 8 of the Act of July 26, 1866, 14 Stat.253, Revised Statutes 2477, 43 U.S.C. 932, repealed October 21, 1976, 90 Stat.2793, (RS 2477), provided: "The right of way for the construction of highways over public lands, not reserved for public uses, is hereby granted."

RS 2477 (Revised Statute 2477) remained in effect until negated by Congress with the passage of the **Federal Land Policy and Management Act of 1976.**

The Government's servient estate is still subject to NEPA. Timber on the Right of Way still belongs to the Government. The General Mining Act of May 10, 1872, also included a free access clause; "[A]ll valuable mineral deposits in lands belonging to the United States… shall be free and open to exploration and purchase, and the lands in which they are found to occupation and purchase."

RS 2477 applied only to lands in the public domain, not reserved for other public uses. The statute created a permanent easement in the name of the State or Local Agency investing in road construction.

Note: The establishment of the White River Plateau Timberland Reserve on October 16, 1891, removed the lands from the Public Domain. The further creation of National Forest and expansion of the lands beyond the timber reservations(s) removed more land from the public domain; Holy Cross National Forest, Battlement National Forest and establishment of the White River as a National Forest (1911).
2). Prescriptive Rights – Public prescriptive easements involve the public use, not possession of the land. An Easement conveys a property right, is compensable if taken away or restricted, and is terminable by the terms specified in the grant of easement; an easement can be restricted to a specified purpose.

3). FRTA easements [Forest Road and Trail Act] – An Act of October 13, 1964 (P.L. 88- 657, 78 Stat. 1089,as amended; 16 U.S.C. 532-538.

Section 1. – The Congress hereby finds and declares … of an adequate system of roads and trails is essential**. (16 U.S.C. 532)**

Section 2. – The Secretary is authorized, …, to grant permanent or temporary easements for specified periods or otherwise for road rights-of-way (1) over national Forest lands administered by the Forest Service, and (2) over any other related lands with respect to which the Department of Agriculture has rights under the terms of the grant to it. **(16 U.S.C. 533)**

4). DOT easements – Federal Highway Act of 1958 and 1966 provide for appropriation and transfer of lands of the United States by the Secretary of Transportation for the benefit of the State or its nominees (counties, road districts, etc.) for rights-of-way for Interstate and other Federal Aid Highways (emphasis added).

5). ANILCA [Alaska National Interest Lands Conservation Act of December 2, 1980] – ANILCA applies nationwide to NFS lands. An annual fee applies as per other FLPMA authorizations. A special use authorization is required to construct and/or use access facilities on NFS lands to access non-federal lands. Provides for ingress and egress for landowners; does not include rights-of-way for power lines or other utilities.

6). FLPMA easements [Federal Land Policy and Management Act of 1976] – Grants all road rights-of-way except:
a). Federal Aid Highways (DOT);
b). Rights-of-way granted to cooperators and public road agencies under FRTA;
c). Rights-of-way in Wilderness;
d). Rights-of-way on Conservation System lands in Alaska;
e). Roads on valid mining claims or mineral lease areas.

- The Secretary (ies) are authorized to grant, issue, or renew rights-of-way over, upon, under or through such lands for:
a). reservoirs, canals, ditches, …, or distribution of water;
b). pipelines and other systems for the transportation of liquids and gases, other than water and other than oil, natural gas, …, and for storage and terminal facilities in connection therewith;
c). pipelines, slurry and emulsion systems, … ;
d). systems for generation, transmission, and distribution of electric energy, except…;
e). systems for transmissions or reception of radio, television, telephone, … ;
f). roads, trails, highways, railroads, canals, tunnels, tramways, airways, livestock driveways, or other means of transportation except where … commercial recreation facilities on lands in the National Forest System;
g). such other necessary transportation or other systems or facilities which are in the public interest and which require rights-of-way over, upon, or through such lands.

Memorandum of Understanding (MOU) – A legal agreement between the Forest Service, other agencies, private parties, or individuals resulting from consultation between them that states specific measures they will follow to accomplish a project. A memorandum of understanding is not a fund-obligating document.

Motor vehicle - Any vehicle which is self-propelled, other than: (1) A vehicle operated on rails; and (2) Any wheelchair or mobility device, including one that is battery-powered, that is designed solely for use by a mobility-impaired person for locomotion and that is suitable for use in an indoor pedestrian area.

Motor vehicle use map - A map reflecting designated roads, trails, and areas on an administrative unit or a Ranger District of the National Forest System.

National Forest System – The term used to include the National Forests, National Grasslands, and other related lands that the Forest Service has administers responsibility.

National Forest System road - A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county or other local public road authority.

National Forest System trail - A forest trail other than a trail which has been authorized by a legally documented right-of-way held by a State, county or other local public road authority.

Off-highway vehicle - Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland or other natural terrain.

Over-snow vehicle - A motor vehicle that is designed for use over snow and that runs on a track or tracks and/or a ski or skis, while in use over snow.

Private Road - A road under private ownership authorized by an easement to a private party or a road that provides access pursuant to a reserved or private right (unchanged from **FS-643**).

Public Road - Any road or street under the jurisdiction of, and maintained by, a public authority and open to public travel **(23 U.S.C. 101(a))**.

Right-of-Way

1). Land authorized to be used or occupied for the construction, operations, maintenance, and termination of a project or facility passing over, upon, under, or through such land **(36 CFR 251.51)**.

2). The privilege that one person or persons particularly described may have of passing over the land of another in some particular line.

Road - A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Road Classifications

A). Functional Class

1. Arterial – Provides service to large land areas. Connects with other arterials or public highways.

2. Collector – Serves smaller land areas than arterials. Connects arterials to local roads or terminal facilities.

3. Local – Single purpose road. Connects terminal facilities with collectors or arterials.

B). Maintenance Levels – Maintenance levels define the level of service provided by, and maintenance required for, a specific road **FSH 7709.58**

1). Level 1 – Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Roads receiving maintenance level 1 may be of any type, class, or construction standard, and may be managed at any other maintenance level while they are open for traffic. While being maintained at level 1, they are closed to vehicular traffic, but may be open and suitable for non-motorized uses.

2). Level 2 – Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or specialized uses. Log haul may occur at this level.

3). Level 3 – Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surface with either native or processed material.

4). Level 4 – Assigned to roads that provide a moderate degree of user comfort and convenience at moderate traffic speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated.

5). Level 5 – Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.

Road construction or reconstruction - Supervising, inspecting, actual building, and incurrence of all costs incidental to the construction or reconstruction of a road.

Road Decommissioning - Activities that result in the stabilization and restoration of unneeded roads to a more natural state **(36 CFR 212.1)**, **(FSM 7703).**

Roadless Areas – Undeveloped areas that meet eligibility criteria for wilderness consideration under the Wilderness Act**. (36CFR 219.17)**

Road Maintenance - The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective **(FSM 7712.3)**.

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

Rockfall – The relatively free falling or precipitous movement of a newly detached segment of bedrock (usually massive, homogeneous, or jointed) of any size from a cliff or other very steep slope.

Rockslide – A landslide involving a downward and usually sudden and rapid movement of newly detached segments of bedrock; sliding or slipping over an inclined surface of weakness as a surface of bedding, jointing, or faulting.

Sinkholes – Described as a “collapse” associated with fresh water dissolving evaporate minerals.

Slump – A landslide characterized by a shearing and rotary movement of a generally independent mass of rock or earth along a curved slip surface (concave upward) and about an axis parallel to the slope from which it descends.

Temporary road or trail - A road or trail necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or trail and that is not included in a forest transportation atlas.

Trail - A route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail.

Transportation Facility Jurisdiction - The legal right to control or regulate use of a transportation facility derived from fee title, an easement, an agreement, or other similar method. While jurisdiction requires authority, it does not necessarily reflect ownership.

Travel management atlas - An atlas that consists of a forest transportation atlas and a motor vehicle use map or maps.

Unauthorized road or trail - A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas.

Abbreviations

ATV – All Terrain Vehicles

BLM - Bureau of Land Management

C.R. - County Road

DEIS – Draft Environmental Impact Statement

EIS - Environmental Impact Statement

GIS – Geographic Information Systems

HUB – Hydrologic Unit Boundary

IDT – Interdisciplinary Team

NEPA – National Environmental Policy Act

NFS - National Forest System

OGC – Office of General Council

OHV – Off – Highway Vehicle

RNA – Research Natural Area

SJNF - San Juan National Forest

SJPL - San Juan Public Lands

T&E Species – Threatened and Endangered Species

APPENDIX B

AQUATIC ASSESSEMENT FOR THE SAN JUAN NATIONAL FOREST JULY 2006 DRAFT TRANSPORTATION SECTION

Chapter 3
Transportation Category

Transportation- Key Findings

1. Within the Forest there are 81 watersheds no system roads located in the valley bottoms (0.1 miles of road or less). There are 72 HUBs with roads (= 0.1 mile of road) located within valley bottoms. For watersheds, located entirely on forest paved road densities (mi/sq. mi. valley bottom) range from 2.4 to 0.1. For watersheds located entirely on the forest, with greater than on-tenth of a mile unpaved road/valley floor densities range from 46.9 to 1.8.
2. There are 14 watersheds located entirely on the forest that have no non-system roads. For watersheds located entirely on the forest, with greater than on-tenth of a mile non-system road/valley floor densities range from 5.9 to 0.1.
3. Forest Service system roads, which include both paved and unpaved roads, average 1.0 miles of road per square mile. When non-system road mileage is included in calculating a road density the average doubles to 2.0 miles of road per square mile of forest land. This includes wilderness and private land within the forest boundary.
4. Foot trails are found through out the forest, except for its western most portions. Those HUBs defined with the highest potential for effects on aquatic, riparian, and wetland resources are found in the west-central, north central, and northeastern most portions of the Forest.
5. Approximately 79% of the Forest is open to OHV use.
6. Railroads are found in eight of the Forests 153 watersheds. Only two watersheds were found to have high potential for railroad related effects on aquatic, riparian, and wetlands. In these two watersheds the ratio of miles of rail road per square mile of valley bottom ranged from 7.16 to 3.54. One watershed is located completely on the Forest. The other has only a very small percentage of the watershed located off-forest.
7. The additive effects analysis revealed only very minor portions of six 6th level HUBs that are not influenced by activities in the transportation category with the San Juan National Forest
8. The 6th level HUBs with the highest influence of transportation appears to be in the very northern and central portion of the SJNF, with the remainder of the Forest exhibiting fewer influences.
9. Of a possible cumulative ranking value of 30 (meaning that each of the 10 parameters measured would have to have the highest rank of 3), more than 45 of the 74 the 6th level HUBs had values of half of the potential ranking value.

Management Scale

At present there are approximately 3191 miles of Forest Service system road, including paved and unpaved, covering a total of 3273 square miles within the San Juan National Forest boundary. As a result, system road density averages approximately 1.0 miles of road per square mile of Forest land, including wilderness and private land within the Forest boundary. As displayed in Figure 3.1 roads are found through out the forest except within the Lizard Head, Weminuche, and San Juan Wilderness areas.

System roads are defined as roads within, partially within, or adjacent to a national forest boundary and necessary for protecting, administering, and using national forest lands.

The Forest Service authorizes and maintains jurisdiction over these roads. There are approximately 309 miles of paved road, 2883 miles of unpaved road.

Non-system roads are defined as roads which are no longer required for management purposes, or which have been created by off road vehicle use, but a road foot print still exists. Data analysis indicates that there is an approximate total of 3,549 miles of non-system road on the forest, with approximately 868 of those miles in valley bottoms (Table 3.1).

It should be noted though that several data quality issues were not resolved due to time constraints prior to analysis. As a result, it appears that the non-system road numbers may be higher than what is on the ground (See Information Needs section). However, forest staff felt the existing data was of sufficient quality that analysis could still be conducted.

Table 3.1 Summary of Road Mileage, by Type, management scale, San Juan National Forest

Road Surface Type	Total Miles On Forest*	% of Total Road Miles on Forest
Paved	309	4
Unpaved	2883	43
Non-system roads	3,549	53
Total	6,740	100%

Mileage determined using ArcGIS. Numbers have been rounded to the nearest whole mile

Evaluating road densities at the 6th HUB level is an effective tool for defining areas that may have potential elevated levels of road related effects on aquatic resources. Calculated road densities do not include un-authorized or non-system road mileages.
System road densities for the San Juan N.F. are displayed and summarized in Figure 3.2 and Table 3.2. Calculated road densities include both paved and unpaved roads. At this time complete road data beyond forest boundaries is unavailable.

Approximately 27 HUB's are ranked within the 80-100 percentile range, which are summarized in Table 3.2. This percentile range defines those watersheds which have the most potential for road related effects on aquatic health. Road densities vary from a high of 5.6 mi/sq. mi for the East Fork of Mud Creek watershed (HUB#140801070105) to a low of 1.9 mi/sq. mi in the beaver Creek-Trail Canyon watershed (HUB 140300020305).

For those watersheds, such as the East Fork of Mud Creek (HUB#140801070105), which are not located completely within forest boundaries, road density values may be skewed. This is due to the amount of watershed area within the forest boundary and/or the amount of stream length within of the portion of the watershed within forest boundaries. Examination of GIS data indicates that this combination of factors explains the elevated road densities within the East Fork of Mud Creek watershed.

However, for watersheds such as the East Fork Hermosa Creek, which are located completely within the forest boundary, other explanations are needed for elevated road densities. High road densities in the East Fork of Hermosa Creek are most likely associated with the mining and logging activity within this watershed, although recreational use is common in this watershed.

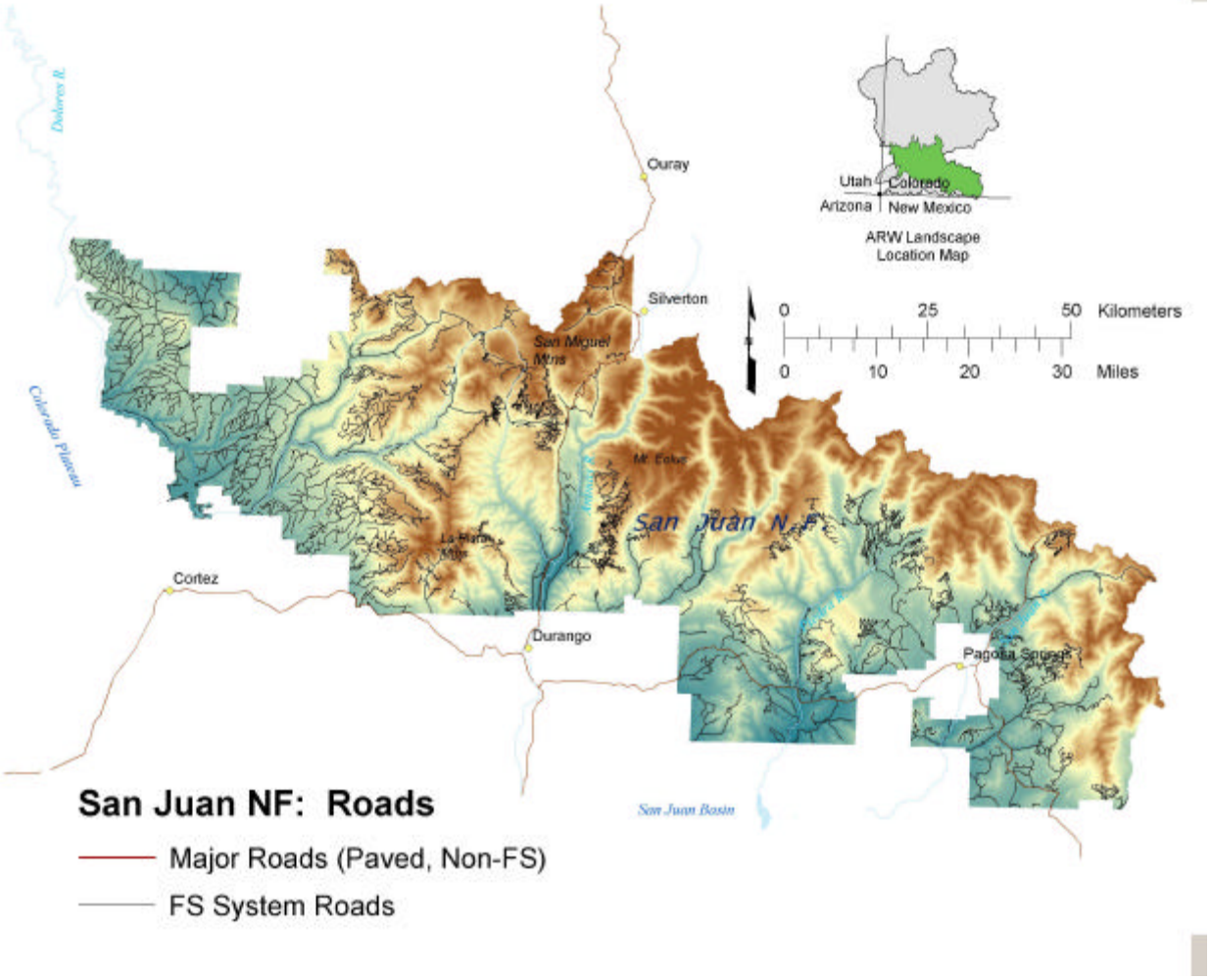

Figure 3.1 Locations of Paved and Unpaved System Roads within the San Juan National Forest

Although evaluating road densities at the 6th level, or management scale, defines watersheds of interest, it does not take into account other important factors that influence how roads affect resources aquatic and riparian resources. The position of the road within the landscape (e.g., within the valley bottom versus uplands), structural associations (e.g., culverts, stream crossings) and road surface composition (paved vs. unpaved) are better factors for evaluating the scale and magnitude of road related effects on these resources.

For these reasons, analysis for this report focused on two more specific types of measurements. These measurements are more indicative of the relationship between roads and aquatic and riparian resources.

Ratios were calculated to determine the number of miles of road (paved or unpaved) per stream mile as well as the number of road crossings per stream mile.

Ratio's help avoid bias in interpretation when comparing low and high density drainage watersheds to each other.

Road densities, within the area defined as the "valley floor", were analyzed to provide a focused assessment of road related effects on aquatic and riparian habitat.

The valley floor has been defined as a stable environment containing dynamic components such as perennial and intermittent streams, primary and secondary stream channels, and active terraces and floodplains (Bighorn ARWEA, 2004). As this area includes riparian zones separate calculations, involving riparian areas, were not conducted. The ratio's for miles of paved road and unpaved road per stream mile located within the valley floor, for each 6th level HUB were calculated for all watersheds intersected by the San Juan National Forest boundary. These results define areas of varying potential effects and the calculated values provide a means of relative comparison between HUBs.

The densities of paved and unpaved roads located in valley bottoms were also measured to further evaluate road related impacts on aquatic and riparian resources. Unpaved roads are either naturally surfaced or are topped with aggregate. Both of these surface types have a higher potential for contributing sediment via surface runoff than paved roads. Surfaced roads are paved with asphalt.

Figures 3.3 and 3.4, and Tables 3.3 and 3.4, display calculated road densities and HUB ranking for paved and unpaved system roads, located within the valley floor areas within the San Juan National Forest boundary.

Analysis of paved system roads displayed in Figure 3.3 and Table 3.3 indicate that there are 13 watersheds within the 80-100 percentile range. Ranking these HUB's determines which watersheds have the highest potential for road related impacts. Those HUB's ranked within the 80-100 percentile range are those most susceptible to road related influences and are listed in Table 3.3. For watersheds located completely within the Forest boundary, the highest density of paved roads located in a valley floor area occurs in the Rico Valley watershed (HUB 140300020203), with a density of 2.4 miles per square mile. The high density in the Rico Valley is a function of a high total of paved road miles (U.S. Highway 145) relative to the amount of valley bottom. The lowest density is 0.8 miles per square mile of valley floor area, in the Lower Cascade Creek watershed (HUB 140801040303).

The rest of the watersheds listed in the table contain only portions of the watershed within the Forest boundary. As a result, the road densities are not reflective of paved road densities for the entire individual watershed. Most of the paved roads located on the Forest are highways passing through NFS lands.

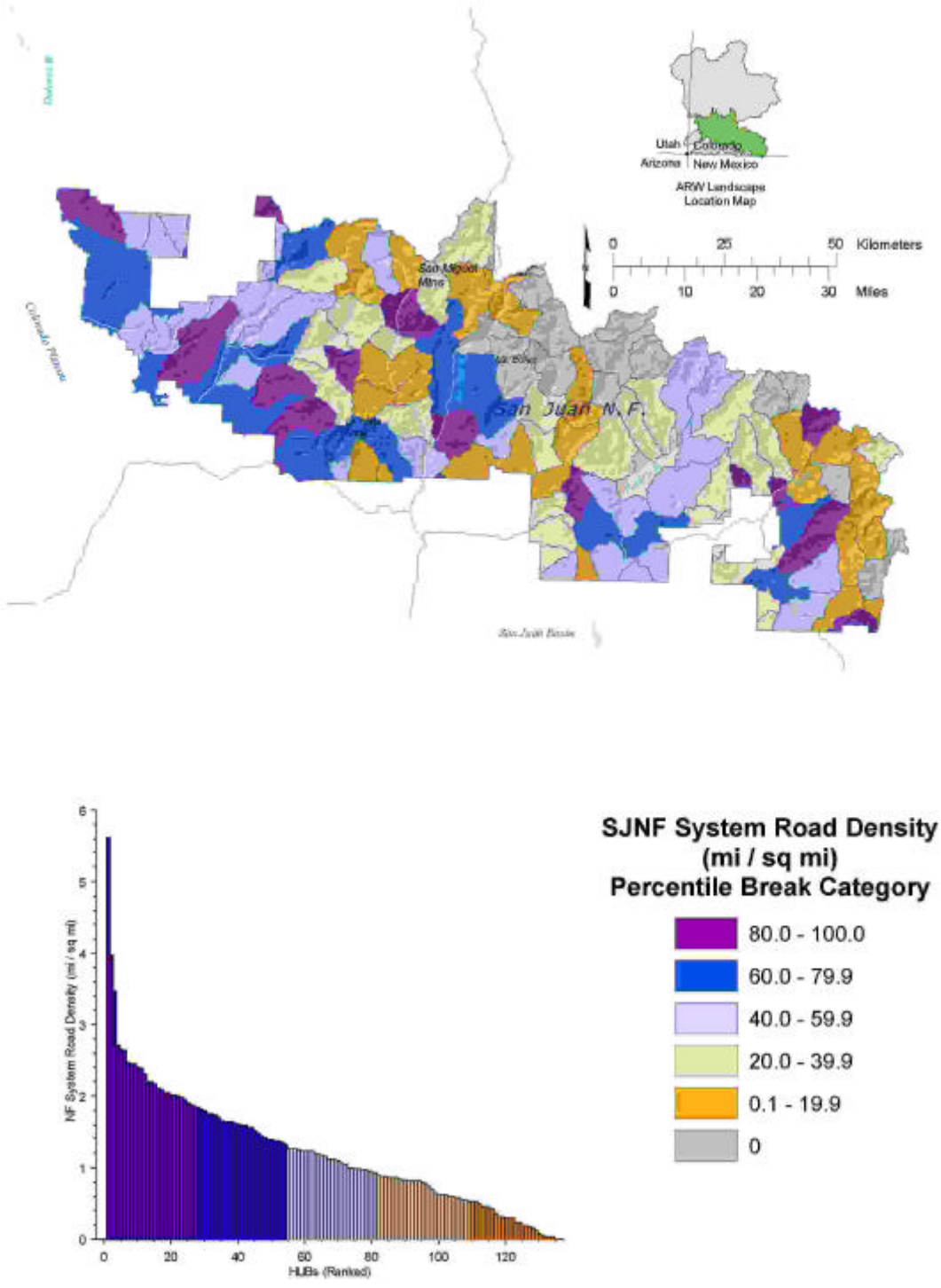

Figure 3.2 Rank and distribution of total (paved and unpaved) system road densities, management level, San Juan National Forest.

Table 3.2 HUB Numbers and Calculated Road Densities (mi/sq.mi) for System Roads Within the 80-100 Percentile, San Juan National Forest*. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	NF System Road Density (mi / sq mi)
140801070105	East Fork of Mud Creek	5.6
140801040402	East Fork Hermosa Creek	4.0
140802020103	Hartman Canyon	3.5
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	2.7
140801040401	Hermosa Creek headwaters	2.7
140801010304	Upper Pagosa Springs	2.6
140801070103	Upper Mancos Valley	2.5
140300020509	Pine Arroyo	2.5
140300020511	Disappointment Valley-Wild Horse Reservoir	2.5
140300020401	Upper Lost Canyon	2.4
140801040503	Upper Animas Valley-Stevens Creek	2.4
140300020605	Dolores Canyon-Joe Davis Hill	2.3
140300020302	Upper Plateau Creek	2.2
140300020407	House Creek	2.2
140300036101	Naturita Creek	2.2
140300020507	Dawson Draw	2.1
140801010203	Wolf Creek	2.1
140801010504	Navajo River-Weisel Flat	2.1
140801010405	Rito Blanco	2.0
140300020510	Upper Disappointment Valley	2.0
140300020205	Roaring Forks Creek	2.0
140801040604	Animas River-Spring Creek	2.0
140801070102	West Mancos River	2.0
140801011601	Upper Beaver Creek	1.9
140801010305	McCabe Creek	1.9
140300020502	Disappointment Creek Headwaters	1.9
140300020305	Beaver Creek-Trail Canyon	1.9

* All acreage data was generated using Arcview GIS and associated spreadsheets. All numbers rounded to nearest tenth of a mile.

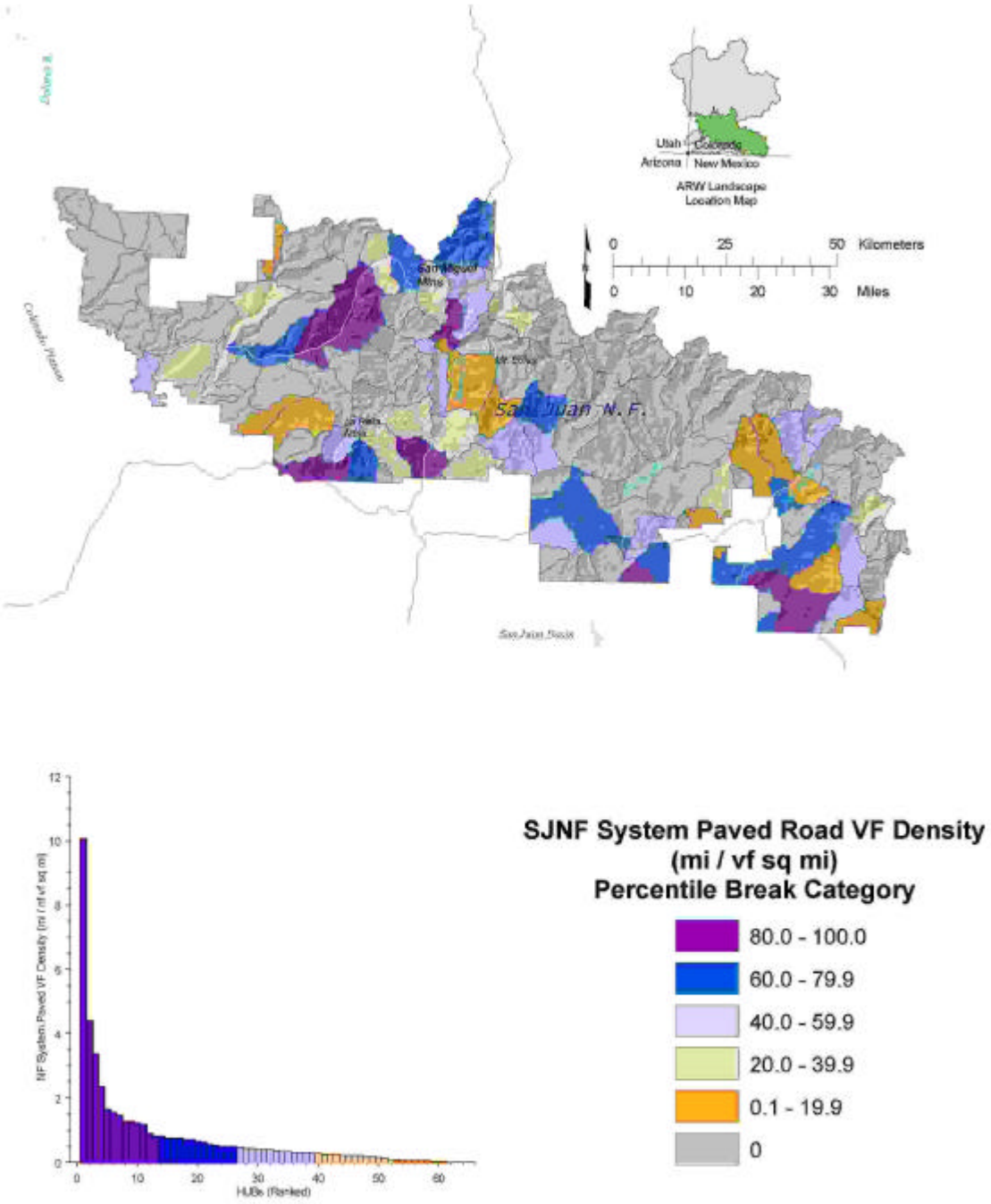

Figure 3.3 Rank and distribution of system paved road densities in valley floor areas.

Table 3.3 Summary Table of Valley Floor Paved System Roads within the 80-100 Percentile Range, San Juan National Forest. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	NF System Paved VF Density (mi / sq mile of valley floor)
140802020103	Hartman Canyon	10.1
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	4.4
140801070103	Upper Mancos Valley	3.4
140300020203	Rico Valley	2.4
140801050102	Mayday Valley	1.7
140801010406	Lower Rio Blanco-San Juan River	1.5
140801020405	Lower Stollsteimer Creek	1.5
140801050105	Upper Cherry Creek	1.3
140300020207	Dolores River-Priest Gulch	1.3
140801040504	Upper Animas Valley-Trimble	1.2
140300020204	Upper Dolores River-Scotch Creek	1.2
140801010507	Coyote Creek	0.9
140801040303	Lower Cascade Creek	0.8

Figure 3.4 and Table 3.4, which follow below, summarize data analysis of unpaved system roads within the Forest boundary. 27 out of 153 HUBS' were in the 80-100 percentile range. Of these 27 watersheds only 13 were located completely within the Forest boundary. The Hermosa Creek headwaters watershed (HUB 140801040401) had the highest unpaved valley floor road density at 46.9 mi/sq. mi. valley floor, while the Upper Hermosa Creek watershed had the lowest unpaved valley floor road density at 14.3 mi/sq. mi. valley floor. The high unpaved road valley floor densities are associated with municipal development in the Hermosa Creek headwaters may be related to mining.

The Lower Florida-Ticalotte (HUB #140801040901), the Upper Disappointment Valley (#HUB 140300020510), and the East Fork of Mud Creek (HUB # 140801070105) all have extremely high road densities and have only a small portion of the entire watershed located on the National Forest. The portions within the forest boundary though contain high amounts of unpaved road miles.

Determining which watersheds fall within the 80-100 percentile range defines those watersheds with the greatest potential for aquatic and riparian resources to be impacted by the unpaved road system located in valley bottom areas. It is important to remember that road systems provide the means for generating increased surface runoff, disruption of hydrology and erosion. This potential is highest where road ditches connect to stream channels and infiltration rates are reduced. Roads commonly result in increased sediment delivery to streams, as well as higher peak flows, and accelerated timing of peak flow (Nelson, 2002).

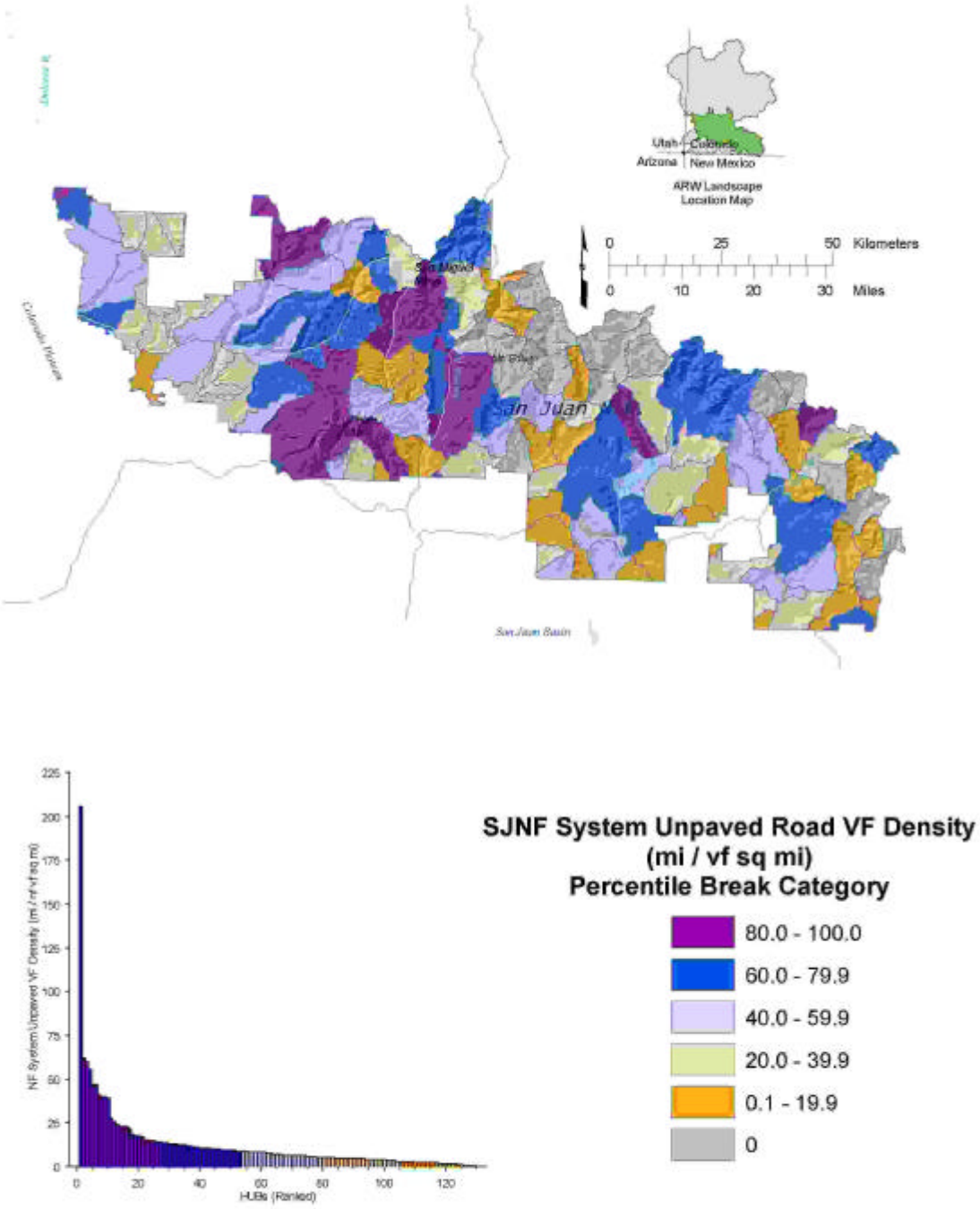

Figure 3.4 Rank and distribution of system unpaved road densities in valley floor areas at the management level

Table 3.4 Summary of Unpaved Roads in the 80-100 Percentile Category for Unpaved System Roads Located in the Valley Floor. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	NF System Unpaved VF Density (mi / national forest valley floor sq. mi)
140801040901	Lower Florida River-Ticalotte	205.4
140300020510	Upper Disappointment Valley	62.3
140801070105	East Fork of Mud Creek	59.9
140801040604	Animas River-Spring Creek	55.6
140801040401	Hermosa Creek headwaters	46.9
140300036101	Naturita Creek	46.7
140300020205	Roaring Forks Creek	41.0
140801050101	La Plata River headwaters	40.0
140300020405	Lower Lost Canyon	39.8
140801040402	East Fork Hermosa Creek	39.4
140801010604	Upper Cat Creek	27.4
140801040503	Upper Animas Valley-Stevens Creek	25.9
140801010203	Wolf Creek	24.1
140300020511	Disappointment Valley-Wild Horse Reservoir	22.8
140300020102	Fish Creek	22.8
140801011503	Los Pinos River-Bayfield	22.6
140801040601	Junction Creek	21.9
140801020203	Sand Creek	18.0
140300020502	Disappointment Creek Headwaters	17.7
140300020206	Bear Creek	17.3
140801070102	West Mancos River	16.8
140801040301	Upper Cascade Creek	15.4
140801070101	East Mancos River-Middle Mancos River	15.0
140300020104	Groundhog Creek	14.5
140801040501	Upper Animas Valley-Canyon Creek	14.4
140801040403	Upper Hermosa Creek	14.3
140801050105	Upper Cherry Creek	13.8

While paved or unpaved road density values are not a direct measure of road related impacts, they can be utilized to help identify areas at risk. This type of data could be used to help screen areas in which road construction is proposed in valley bottoms; identify areas for future inventories and monitoring; and to define possible watershed improvement needs.

To provide an even more focused evaluation of potential road related impacts two additional ratios were calculated; the number of road miles per stream mile and the number of stream crossings per stream mile. These ratios were calculated for both paved and unpaved system roads. The number of stream crossings per stream mile is important as all road crossings have the potential for impacting water quality and quantity.

Roads modify runoff and groundwater through interception (USDA Forest Service, 1996). Surface runoff from roads can not only contribute sediment to streams but additional flow volume as well (MacDonald, 1991, USDA Forest Service, 2003).

Culverts that become plugged and fail can contribute high volumes of sediment to streams (http://www.srs.fs.usda.gov/pubs/; Steven E. Taylor).

Other types of road associated influences on aquatic systems include erosion of fill associated with culverts, perching of culverts with associated erosion and scouring, including bank erosion, and channel modification related to increased sediment input (USDA Forest Service, 2003). Increased sediment contribution and modified flow can impact water quality, degrade aquatic habitat, reduce stream productivity, and in some cases, modify channel morphology. Havlick, 2002, documents stream crossings as a significant source of sediment delivery to many streams.

Figure 3.5 displays the ratio for system road miles per stream mile. 27 watersheds are with the 80-100 percentile range for this metric. The vast majority of these watersheds are found in the western half of the forest, along both the northern, western, and southern forest boundaries. However, only six of these watersheds are located entirely on forest (Table 3.5). As a result, most of the potential for road related effects on aquatic, riparian and wetland resources are located off-forest. However, for those six watersheds located entirely within the forest boundary there is the potential for on-forest effects.

Forest Service paved system road ratios and rankings are displayed in Figure 3.6 and Table 3.6. 15 out of 153 HUBS' are found within the 80-100 percentile range. Only four of these watersheds occur completely within the Forest and are highlighted in light green. These watersheds are found in the western half of the forest and in the eastern most part of the forest.

Paved road crossing ratios vary from a high of 4.8 in the Harman Canyon watershed (HUB # 140802020103) to a low of 0.1 crossings per stream mile in the Lower Rio Blanco-San Juan River watershed (HUB # 1408010406). The Hartman Canyon, Upper Mancos Valley, and Lower Alkali Canyon-Narraguinnep Canyon watersheds are all located almost entirely outside of the forest boundary. Their very high ratios of paved stream crossings are reflective of the small amount of watershed within the forest boundary. However, the Upper Animas Valley-Trimble watershed is mostly within the forest boundary and the density of 0.3 paved road stream crossings is a more accurate reflection of conditions within this watershed.

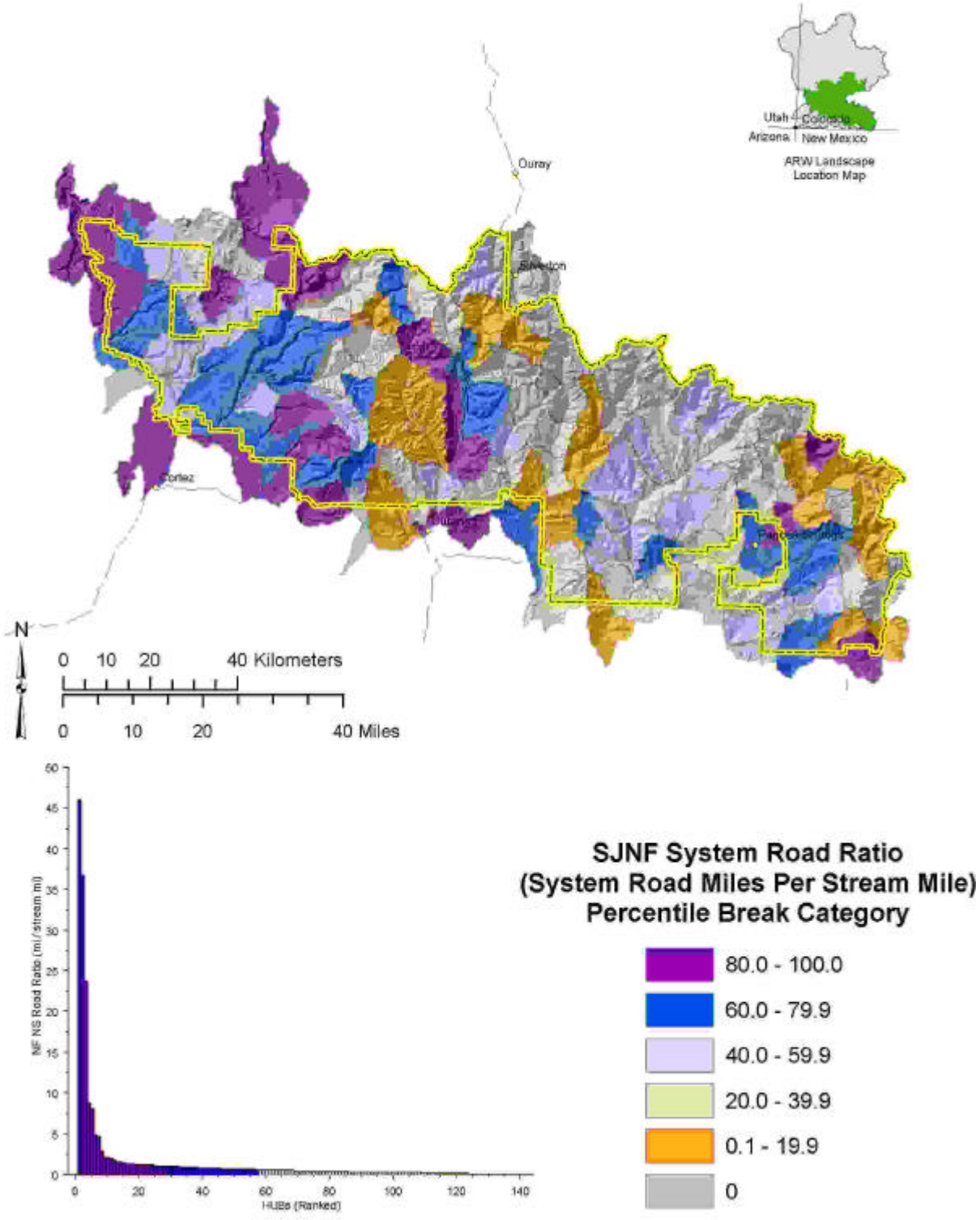

Figure 3.5 Ranks and Distribution of System Road Ratios by HUB, San Juan National Forest

Table 3.5 Rank and Distribution of System Road Ratios by HUB, San Juan National Forest, Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	NF System Road Ratio (mi / stream mi)
140801040901	Lower Florida River-Ticalotte	122.9
140300020510	Upper Disappointment Valley	35.7
140801070105	East Fork of Mud Creek	27.0
140802020103	Hartman Canyon	4.8
140801040604	Animas River-Spring Creek	4.2
140300020605	Dolores Canyon-Joe Davis Hill	3.3
140300020511	Disappointment Valley-Wild Horse Reservoir	2.8
140300036101	Naturita Creek	2.7
140801070103	Upper Mancos Valley	2.6
140801040402	East Fork Hermosa Creek	1.7
140300020405	Lower Lost Canyon	1.7
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	1.3
140801010203	Wolf Creek	1.2
140801010504	Navajo River-Weisel Flat	1.1
140801040503	Upper Animas Valley-Stevens Creek	1.1
140300020509	Pine Arroyo	1.1
140300020502	Disappointment Creek Headwaters	1.1
140300020401	Upper Lost Canyon	1.0
140300020102	Fish Creek	1.0
140801040401	Hermosa Creek headwaters	1.0
140801070102	West Mancos River	1.0
140801050105	Upper Cherry Creek	0.9
140300020604	Dolores Canyon-Lake Canyon	0.9
140300020104	Groundhog Creek	0.9
140300020302	Upper Plateau Creek	0.9
140801010304	Upper Pagosa Springs	0.9
140801040502	Elbert Creek	0.9

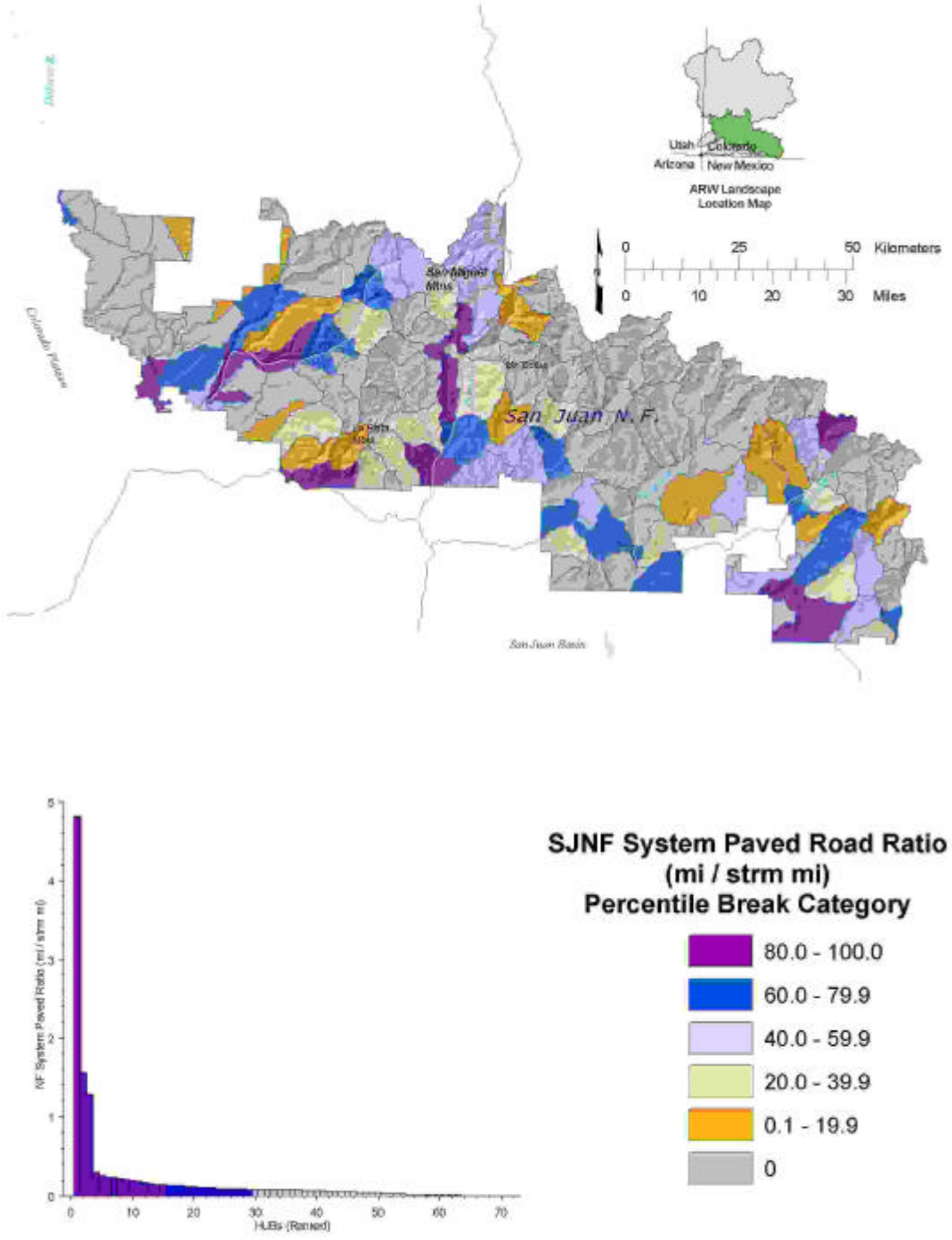

Figure 3.6 Rank and distribution Paved System Road Ratios within the San Juan National Forest, management scale.

Table 3.6 Summary of Paved System Road Crossing Ratios within the 80-100 percentile range, management scale, San Juan National Forest. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	NF System Paved Ratio (mi / stream mi)
140802020103	Hartman Canyon	4.8
140801070103	Upper Mancos Valley	1.6
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	1.3
140801040504	Upper Animas Valley-Trimble	0.3
140801010203	Wolf Creek	0.3
140801010602	Montezuma Creek	0.2
140801040502	Elbert Creek	0.2
140801050105	Upper Cherry Creek	0.2
140801050102	Mayday Valley	0.2
140300020408	McPhee Reservoir-Dolores River	0.2
140801040303	Lower Cascade Creek	0.2
140300020404	Stapleton Valley	0.2
140801010507	Coyote Creek	0.2
140300020209	Upper Dolores River-Taylor Creek	0.1
140801010406	Lower Rio Blanco-San Juan River	0.1

Although all road crossings have the potential to impact water quality and affect channel morphology, the risk of impact is greater with unpaved crossings. Unpaved roads can either be naturally surfaced or surfaced with aggregate. Both are more susceptible to surface erosion and runoff than paved roads (Clinton and Vose, 2003).

Unpaved system road ratios are displayed in Figures 3.7 and Table 3.7. 26 out of 153 HUBS' are within the 80-100 percentile range. Eight of the 26 HUB's are located completely within the Forest boundary. These eight HUB's are highlighted in light green in Table 3.7. Unpaved road ratios, for watersheds located entirely within the Forest, range from a high of 1.7 crossings per stream mile in the East Fork Hermosa Creek watershed (HUB 140801040402) to a low of 0.9 crossings per stream mile in the Roaring Fork Creek watershed (HUB 140300020205). Watersheds within this group are at higher risk of road-related watershed impacts.

The Lower Florida-Ticalotte, Upper Disappointment Valley, and East Fork of Mud Creek watersheds have especially high number of unpaved road ratios. These three watersheds have only very small portions of their watershed area within the forest boundary with a high number of road miles in these areas. To more fully asses the potential for road related impacts additional data outside of the forest would have to be obtained.

Results of this data analysis would be useful for identifying watershed improvement needs, habitat restoration projects, or for fisheries stocking projects.

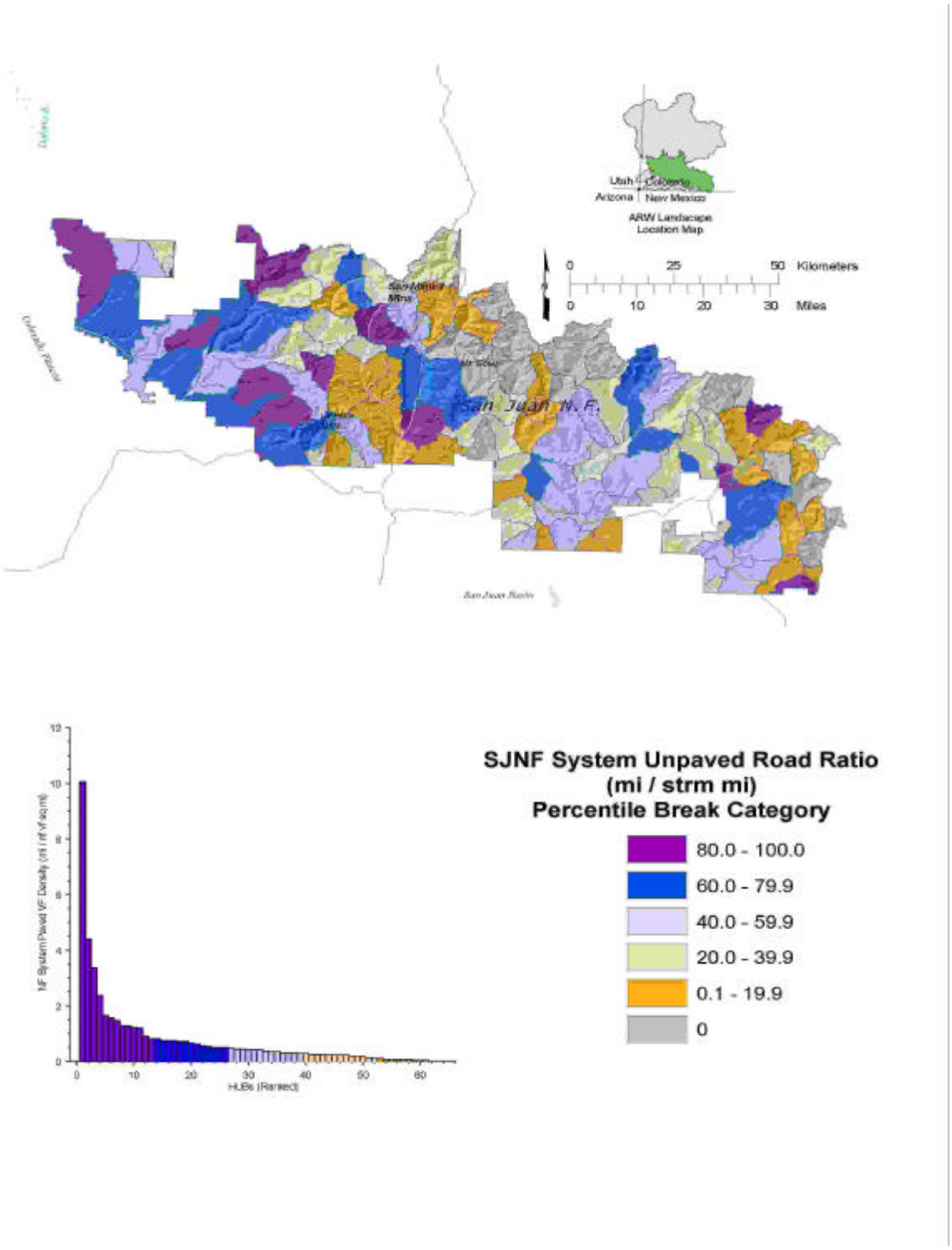

Figure 3.7 Rank and distribution of Unpaved System Road Ratios within the San Juan National Forest, management scale.

Table 3.7 Summary of Unpaved System Road Ratios within the 80-100 Percentile Range, management scale, San Juan National Forest. Watersheds highlighted in green are located entirely on the national forest

6th Level HUB	6th Level HUB Name	NF System Unpaved Ratio (mi / stream mile)*
140801040901	Lower Florida River-Ticalotte	122.9
140300020510	Upper Disappointment Valley	35.7
140801070105	East Fork of Mud Creek	27.0
140801040604	Animas River-Spring Creek	4.2
140300020605	Dolores Canyon-Joe Davis Hill	3.2
140300020511	Disappointment Valley-Wild Horse Reservoir	2.8
140300036101	Naturita Creek	2.7
140801040402	East Fork Hermosa Creek	1.7
140300020405	Lower Lost Canyon	1.7
140300020509	Pine Arroyo	1.1
140801010504	Navajo River-Weisel Flat	1.1
140300020502	Disappointment Creek Headwaters	1.1
140300020401	Upper Lost Canyon	1.0
140300020102	Fish Creek	1.0
140801070103	Upper Mancos Valley	1.0
140801040401	Hermosa Creek headwaters	1.0
140801010203	Wolf Creek	1.0
140801040503	Upper Animas Valley-Stevens Creek	1.0
140801070102	West Mancos River	0.9
140300020604	Dolores Canyon-Lake Canyon	0.9
140300020104	Groundhog Creek	0.9
140300020302	Upper Plateau Creek	0.9
140300020305	Beaver Creek-Trail Canyon	0.9
140300020507	Dawson Draw	0.9
140300020205	Roaring Forks Creek	0.9
140801010304	Upper Pagosa Springs	0.8

* All ratios calculated using ArcGIS. Numbers may not be statistically significant. All numbers rounded to the nearest 10th of a unit.

Roads related impacts to streams are not restricted to where roads parallel streams. Roads can also impact streams where crossings exist. Road crossings were also analyzed as road use, construction, and maintenance can degrade channel morphology and integrity, especially at stream crossings (Waters, 1995), Hagans, et al, and Heede 1980). Alterations may include modification of channel geometry at the road/stream intersection, compaction of the substrate, and/or changing substrate size distribution. Other channel morphological features may also be affected such as pool depth, modification of change longitudinal profile, and modification or loss of spawning habitat (USDA Forest Service, 2003).

The number of paved road stream crossings per stream mile is displayed in Figure 3.8 and Table 3.8.

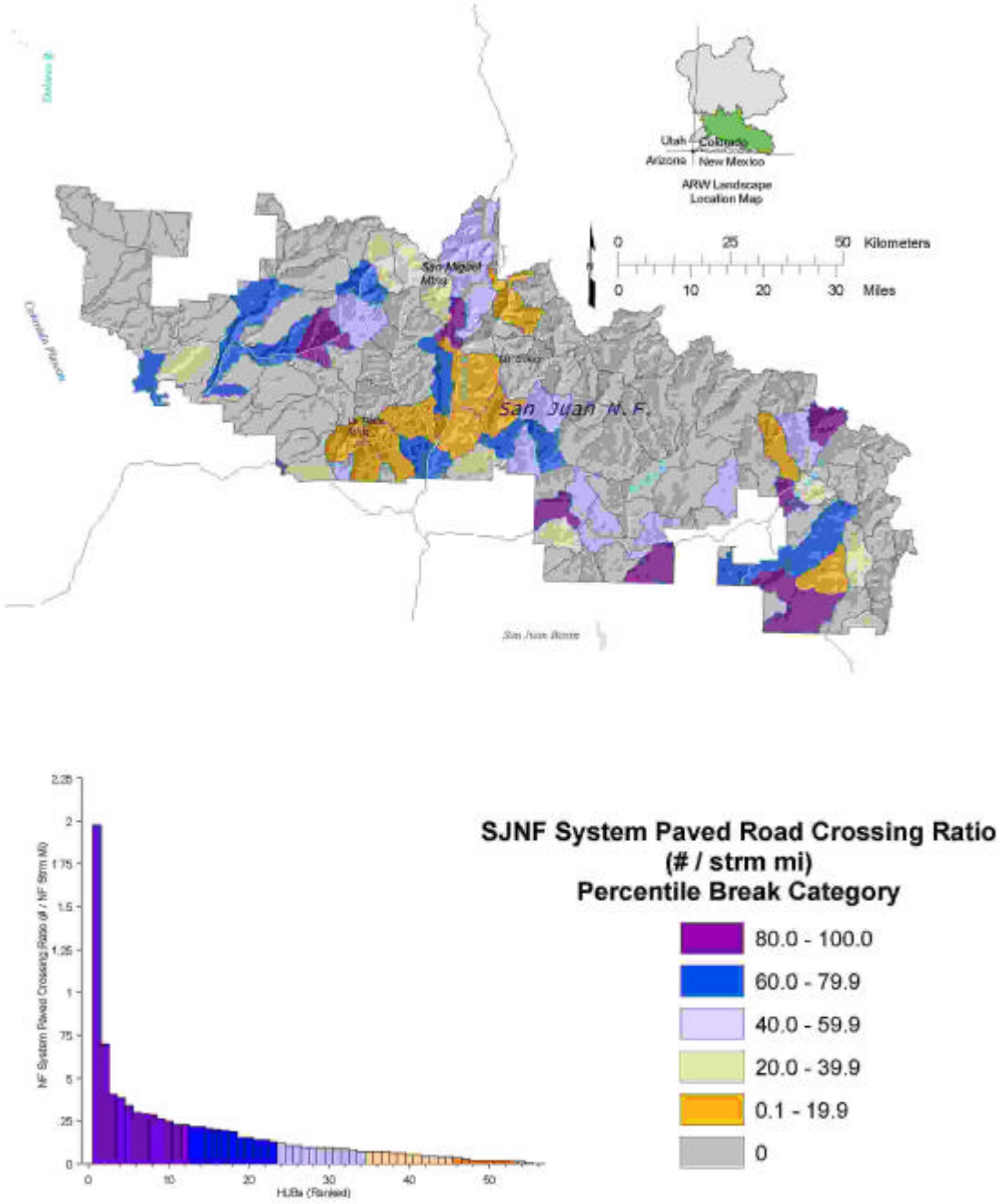

Figure 3.8 Rank and distribution of paved system road stream crossings, management scale, San Juan National Forest.

Table 3.8 Summary of paved system road stream crossing ratios within the 80-100 percentile range, management scale, San Juan National Forest. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	NF System Paved Crossing Ratio (# / NF Stream Mi)	HUB Drainage Density (mi/sq.mile)
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	2.0	3.3
140801070103	Upper Mancos Valley	0.7	2.6
140801010203	Wolf Creek	0.4	1.7
140801010406	Lower Rio Blanco-San Juan River	0.4	2.8
140801040303	Lower Cascade Creek	0.3	2.7
140801010507	Coyote Creek	0.3	2.0
140801020405	Lower Stollsteimer Creek	0.3	3.3
140801011602	Middle Beaver Creek	0.3	3.3
140300020207	Dolores River-Priest Gulch	0.3	2.4
140801010602	Montezuma Creek	0.2	2.0
140801010304	Upper Pagosa Springs	0.2	2.8
140801020404	Middle Stollsteimer Creek	0.2	3.5

*All ratios calculated using ArcGIS. Numbers may not be statistically significant. Numbers are rounded to the nearest tenth of a unit.

Twelve HUBs were found to have paved system road crossing ratios within the 80-100 percentile range (Table 3.8). Ratio values range from a high of 2.0 in the Lower Alkali Canyon-Narraguinepp Canyon watershed (HUB # 140802020106) to a low of 0.2 in the Middle Stollsteimer Creek watershed (HUB# 140801020404). As in the other tables of this report, watersheds highlighted in green are within forest boundaries. Watersheds which are not highlighted only have a portion of their area within the forest boundary.

Lower Alkali Canyon-Narraguinepp Canyon watershed has only a very small portion of its area within the forest boundary. In addition, the watershed has a relatively high drainage density. The combination of these two factors results in the artificially high number of stream crossings.

Figure 3.8 displays the watershed rankings and the location where the watersheds occur. Most of the watersheds within the 80-100 percentile range are found in the southeastern most portion of the forest. Drainage densities within the 80-100 percentile groups vary from a high of 3.5 in the Middle Stollsteimer Creek watershed (HUB 140801020404) to a low of 2.0 in the Montezuma Creek watershed (HUB 140801010602) and in Coyote Creek (HUB 140801010507).

Unpaved road ratio crossings were also calculated. Unpaved roads produce higher amounts of sediment compared to paved roads, especially if they are not constructed or maintained properly (Clinton and Vose, 2003). The results of this metric analysis are displayed in Figure 3.9 and Table 3.9. Those watersheds located entirely on the forest are highlighted in light green.

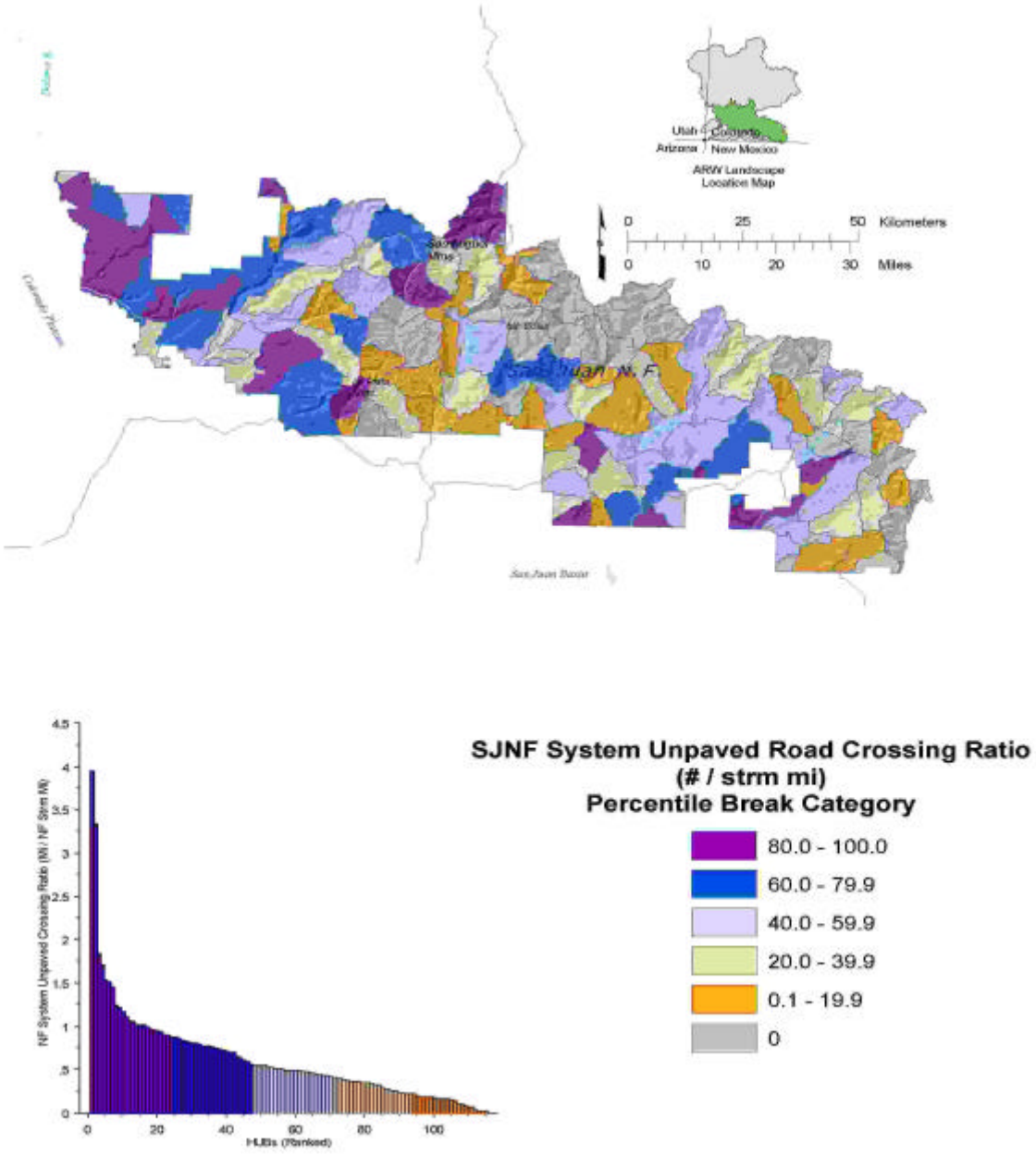

Figure 3.9 Rank and distribution of unpaved system road stream crossings, management scale, San Juan National Forest.

Table 3.9 Summary of unpaved system road stream crossing ratios within the 80-100 percentile range, management scale, San Juan National Forest. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	Unpaved System Road Crossing Ratio (# / Stream mile)	HUB Drainage Density (mi/sq.mile)
140802020106	Lower Alkali Canyon-Narraguinepp Canyon	3.9	3.3
140300020405	Lower Lost Canyon	3.3	3.0
140300020605	Dolores Canyon-Joe Davis Hill	1.8	1.8
140801040402	East Fork Hermosa Creek	1.7	2.3
140300020401	Upper Lost Canyon	1.5	2.3
140801020403	Stollsteimer Creek-Dyke Valley	1.5	2.7
140801040401	Hermosa Creek headwaters	1.5	2.7
140300020604	Dolores Canyon-Lake Canyon	1.2	2.2
140801010308	San Juan River-Eightmile Mesa	1.2	2.9
140801020405	Lower Stollsteimer Creek	1.2	3.3
140300020509	Pine Arroyo	1.1	2.5
140801011704	Upper Spring Creek	1.1	2.8
140801040103	Mineral Creek	1.1	2.2
140801010306	Mill Creek	1.0	3.1
140300020504	Ryman Creek	1.0	3.2
140300020502	Disappointment Creek Headwaters	1.0	2.1
140300020602	Narraguinepp Canyon Natural Area	1.0	2.2
140801011601	Upper Beaver Creek	1.0	2.7
140300020306	McPhee Reservoir-Beaver Creek Inlet	1.0	2.3
140801070104	Chicken Creek	0.9	2.6
140300020603	Dolores Canyon-Cabin Creek	0.9	2.0
140300036101	Naturita Creek	0.9	1.8
140801050101	La Plata River headwaters	0.9	2.3
140300020305	Beaver Creek-Trail Canyon	0.9	2.1

*All ratios calculated using ArcGIS. Numbers are rounded to the nearest tenth of a unit.

24 HUBs were found to be within the 80-100 percentile range for unpaved system road crossings. This is twice the number of paved road crossings within the same percentile range. Unpaved road crossing ratios vary from a high of 3.9 in the Lower Alkali Canyon-Narraguinepp Canyon watershed (HUB #140802020106) to a low of 0.9 in the Beaver Creek-Trail Canyon watershed (HUB# 140300020305). However, Lower Alkali Canyon-Narraguinepp Canyon and Lower Lost Creek Canyon watersheds have only 0.4% and 2% of their respective areas within forest boundaries. As a result, it is likely there are minimal effects related to unpaved road crossings on forest aquatic resources in these watersheds. For the other un-highlighted watersheds the potential for on-forest influence is a function of what percent of the watershed is located on the forest.

Watersheds located entirely within the forest include the East Fork Hermosa Creek, Upper Lost Canyon, Upper Beaver Creek, McPhee Reservoir-Beaver Creek Inlet, La Plata River headwaters, and Beaver Creek-Trail Canyon (Table 3.9). For these watersheds the unpaved road ratios vary from 1.7 in the East Fork Hermosa Creek watershed to a low of 0.9 in the Beaver Creek-Trail Canyon watersheds.

As these watersheds are within the 80-100 percentile range there is the potential for aquatic resources to be influenced by unpaved road stream crossings.

However, the East Fork Hermosa Creek and Beaver Creek-Trail Canyon watersheds appear to have the most potential for influence as their ratios are 50-70% higher than the other four watersheds. The higher drainage densities and increased number of stream crossings may reflect the influence of the HUBs bedrock geology.

As mentioned earlier non-system roads are either roads which are no longer required for management purposes or they are roads which have been created by off road vehicle use (ORV's). Roads no longer used for management purposes are typically "put to bed" using best management practices to help stabilize the road bed, reducing or preventing erosion and sedimentation. However indiscriminant ORV use is known to be a major source for creating new non-system roads. These ORV created roads have been shown to cause extensive environmental impacts.

Initial disturbance is generated when an ORV trail is first generated. However, with proper placement and the implementation of Best Management Practices, or BMP's, effects to aquatic resources may be prevented or limited to acceptable levels. However, when ORV's are ridden indiscriminately across the landscape, including riparian areas and streams, unrestricted ORV use contributes to a wide range of adverse impacts due to soil, hydrologic, and vegetation disturbance.

Disturbance can result in reduced species diversity as well as trophic interaction. Impacts may occur throughout the year depending on habitat uses. Channel morphology is degraded as vehicles drive across streams, increasing erosion and sedimentation, as well as physically altering channel bed morphology and aquatic habitat. With increased erosion and sedimentation both water quality and aquatic habitat can be affected. As streams are crossed riparian and wetland vegetation is disturbed and function disrupted. Soils are also affected due to loss of vegetation, erosion and/or compaction. ORV use is also known to affect wildlife as well as air pollution (http://www.sdafs.org/tcafs/content/orvpol.htm).

Because the impacts of ORV use can be so considerable, metrics were also calculated on available non-system road data. Available data indicates that there is approximately 3,549 miles of non-system road on the forest with 868 of those miles occurring in valley bottoms. These totals may be high due to some data quality concerns (see information needs section). However, as the total non-system road number is an order of magnitude higher than what is shown for paved roads it is assumed that non-system roads represent a substantial watershed and aquatic resources health concern.

Due to the data quality concerns regarding non-system roads it is recommended that the following metric results be treated as estimates.

Table 3.10 summarizes non-system road density by HUB and their rank and distribution is shown in Figure 3.10. These watersheds occur mainly in the western half and south central portions of the forest, in association with nearby towns, reservoirs, or recreational areas.

29 watersheds occur within the 80-100 percentile range. Watersheds highlighted in light green in Table 3.9 are within forest boundaries. Road data is not available at this time beyond the forest boundary. As a result non-system road densities in un-highlighted watersheds are a function of the amount of non-system road relative to the portion of the watershed within the forest boundary. For example, Naturita Creek (HUB 140300036101) and Dolores Canyon-Joe Davis Hill (HUB 140300020605), which have the highest road densities in Table 3.9, have 3% and 7% of their watersheds, respectively, within the forest's boundary. Calf Creek, which has the lowest density, has 40% of its area within the forest with approximately 18.4 miles of non-system road within the watershed.

Table 3.10 Summary of Non-system road density by HUB, management scale, San Juan National Forest. Watersheds highlighted in green are located entirely on the national forest

6th Level HUB	6th Level HUB Name	Non-system Road Density (mi / sq mi)
140300036101	Naturita Creek	6.4
140300020605	Dolores Canyon-Joe Davis Hill	6.1
140801070105	East Fork of Mud Creek	4.9
140300020511	Disappointment Valley-Wild Horse Reservoir	4.2
140300020604	Dolores Canyon-Lake Canyon	4.0
140300020401	Upper Lost Canyon	3.8
140802020201	Upper Yellowjacket Canyon	3.8
140801011503	Los Pinos River-Bayfield	3.7
140300020402	Spruce Water Canyon	3.7
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	3.4
140300020407	House Creek	3.2
140300020406	Upper Dolores River-Italian Creek	3.2
140300020509	Pine Arroyo	3.1
140300020507	Dawson Draw	2.8
140801070101	East Mancos River-Middle Mancos River	2.8
140300020603	Dolores Canyon-Cabin Creek	2.7
140300020304	Lower Plateau Creek	2.7
140801010503	Navajo Peak	2.6
140300020510	Upper Disappointment Valley	2.6
140801020402	Upper Stollsteimer Creek	2.6
140300020405	Lower Lost Canyon	2.6
140801011501	Middle Los Pinos River-Red Creek	2.6
140801020104	Piedra River-O'Neal Creek	2.6
140801011601	Upper Beaver Creek	2.6
140801020401	Martinez Creek-Dutton Creek	2.5
140801010307	Echo Canyon Reservoir	2.4
140300020205	Roaring Forks Creek	2.3
140801040402	East Fork Hermosa Creek	2.2
140300020303	Calf Creek	2.2

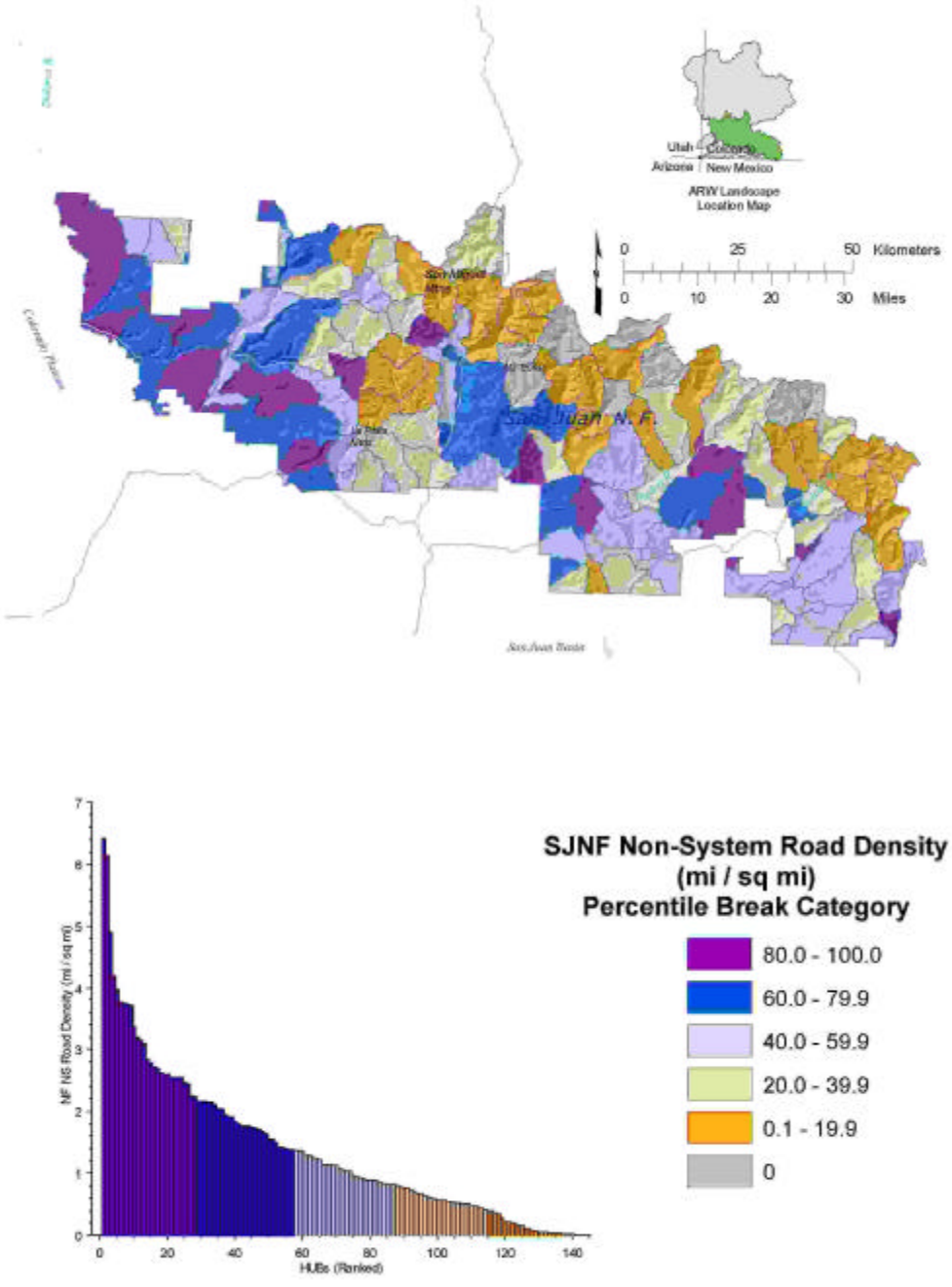

Figure 3.10 The rank and distribution of non-system road densities, management scale, San Juan National Forest.

The ratio of miles of non-system road per stream mile was also calculated to help evaluate the overall potential influences of non-system roads. 29 HUBs were found to be within the 80-100 percentile range for this metric Table 3.11. Watersheds shown in highlighted in light green are located entirely within forest boundaries. The majority of these HUBS are located within western most quarter of the forest (Figure 3.11).

According to the San Juan National Forest maps travel management designations the majority of these HUBs are designated as travel areas "F", or open to year round to passenger car, 4 wheel drive, all terrain vehicles, motorcycles or snowmobile use. Minor components of lands involved in Area "A" and B are also involved. Area "A" means closed year round to all types of traffic for erosion control and due to conflicts of interest. Areas included under designation "B" have the same travel restrictions except for snowmobiles and for the same reason. Watersheds falling within this 80-100% range can approximately be related to the following areas in a west to east direction: Glade Canyon south to Lone Dome State Recreation and Wildlife area, Hinchman Reservoir south to House Creek recreation area, Lost Canyon and Hay Camp Mesa areas, Little Fish Creek and Fish Creek Trail, and Taylor Mesa and the area immediately to the northwest. Upper Disappointment Valley (HUB 140300020510), lower Florida River-Ticalotte (HUB 140801040901), East Fork of Mud Creek (HUB 1401070105), Dolores Canyon-Joe David Hill (HUB 140300036101), Naturita Creek (14030036101) have ratios that are almost two to six times higher than all the other watersheds in Table 3.11. These high ratios are due to amount of non-system road relative to the amount of watershed within forest boundaries. These watersheds only have 1-7% of their area within the forests boundary.

Ratios for watersheds located entirely on forest range from a high of 1.6 for Upper Lost Canyon (HUB 140300020401) to a low of 1.0 for Stoner Creek (HUB 140300020602) and Piedra River-O'Neal Creek (HUB 140801020104).

As with system roads, the densities of non-system roads in valley floor areas were also analyzed. This metric provides a more focused evaluation of which watersheds have the highest risk potential for non-system road impacts on aquatic and riparian resources. Figure 3.12 and Table 3.12 summarizes the analysis results for this metric. Watersheds within the 80-100 percentile range for this metric are found primarily in the western and southern portions of the forest. They appear to be correlated to the Glade Canyon to Lone Dome State Recreation and Wildlife area, House Creek recreation area, Lost Canyon and Hay Camp Mesa areas, Fish Creek and Taylor Mesa areas, Lemon Creek Reservoir and south of Vallecito Reservoir areas, Hatcher Reservoir and Eightmile Mesa areas.

Lower Lost Canyon (HUB 140300020405), Naturita Creek (14030036101), Dolores Canyon-Joe David Hill (HUB 140300036101), have the highest non-system road densities as they only have 2-7% of their watershed area within the forest (Table 3.12). As a result, on-forest effects related to non-system roads are minimal in these watersheds. Watersheds located entirely on-forest have valley floor densities ranging from 5.9-3.1. All six watersheds have the potential for on-forest effects as they fall within the 80-100 percentile range. However, Upper Lost Canyon, Spruce Water Canyon, and Upper Beaver Creek watersheds have the highest potential for contributing effects to downstream aquatic and riparian resources, as they are nearest to the southern border of the forest.

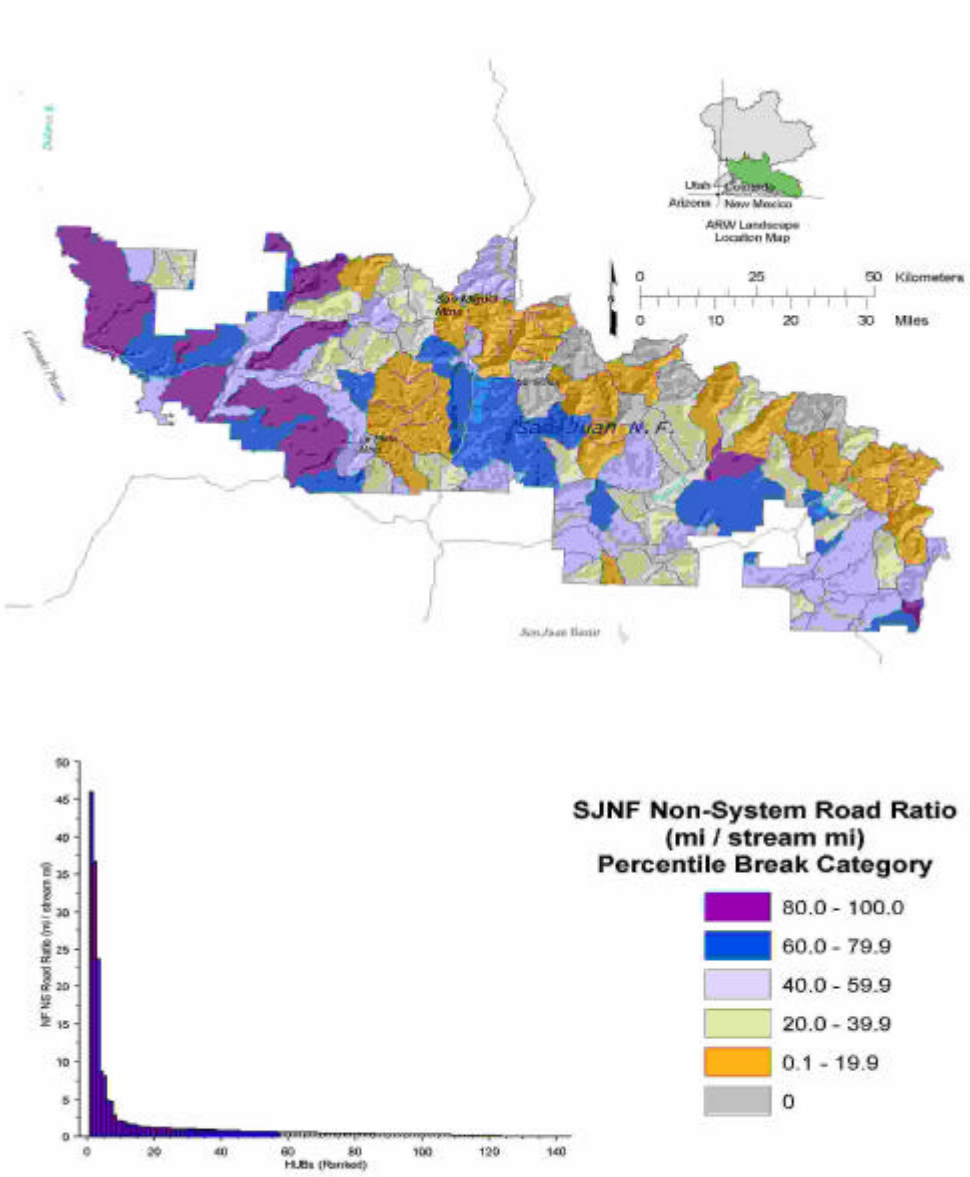

Figure 3.11 Rank and distribution of non-system road ratios within the San Juan National Forest, management scale.

Table 3.11 Summary of watersheds within the 80-100 percentile range of non-system road ratios. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	NF NS Road Ratio (mi / stream mi)
140300020510	Upper Disappointment Valley	46.0
140801040901	Lower Florida River-Ticalotte	36.7
140801070105	East Fork of Mud Creek	23.6
140300020605	Dolores Canyon-Joe Davis Hill	8.8
140300036101	Naturita Creek	8.0
140300020511	Disappointment Valley-Wild Horse Reservoir	4.8
140801011503	Los Pinos River-Bayfield	4.7
140300020405	Lower Lost Canyon	2.9
140802020201	Upper Yellowjacket Canyon	2.1
140300020604	Dolores Canyon-Lake Canyon	2.1
140802020103	Hartman Canyon	1.9
140300020401	Upper Lost Canyon	1.6
140802020106	Lower Alkali Canyon-Narraguinepp Canyon	1.6
140300020402	Spruce Water Canyon	1.5
140300020509	Pine Arroyo	1.4
140300020407	House Creek	1.3
140300020102	Fish Creek	1.3
140801010503	Navajo Peak	1.3
140300020304	Lower Plateau Creek	1.2
140300020603	Dolores Canyon-Cabin Creek	1.2
140300020406	Upper Dolores River-Italian Creek	1.2
140801070103	Upper Mancos Valley	1.2
140300020502	Disappointment Creek Headwaters	1.2
140300020507	Dawson Draw	1.2
140801070102	West Mancos River	1.1
140801070101	East Mancos River-Middle Mancos River	1.0
140300020208	Stoner Creek	1.0
140300020602	Narraguinnep Canyon Natural Area	1.0
140801020104	Piedra River-O'Neal Creek	1.0

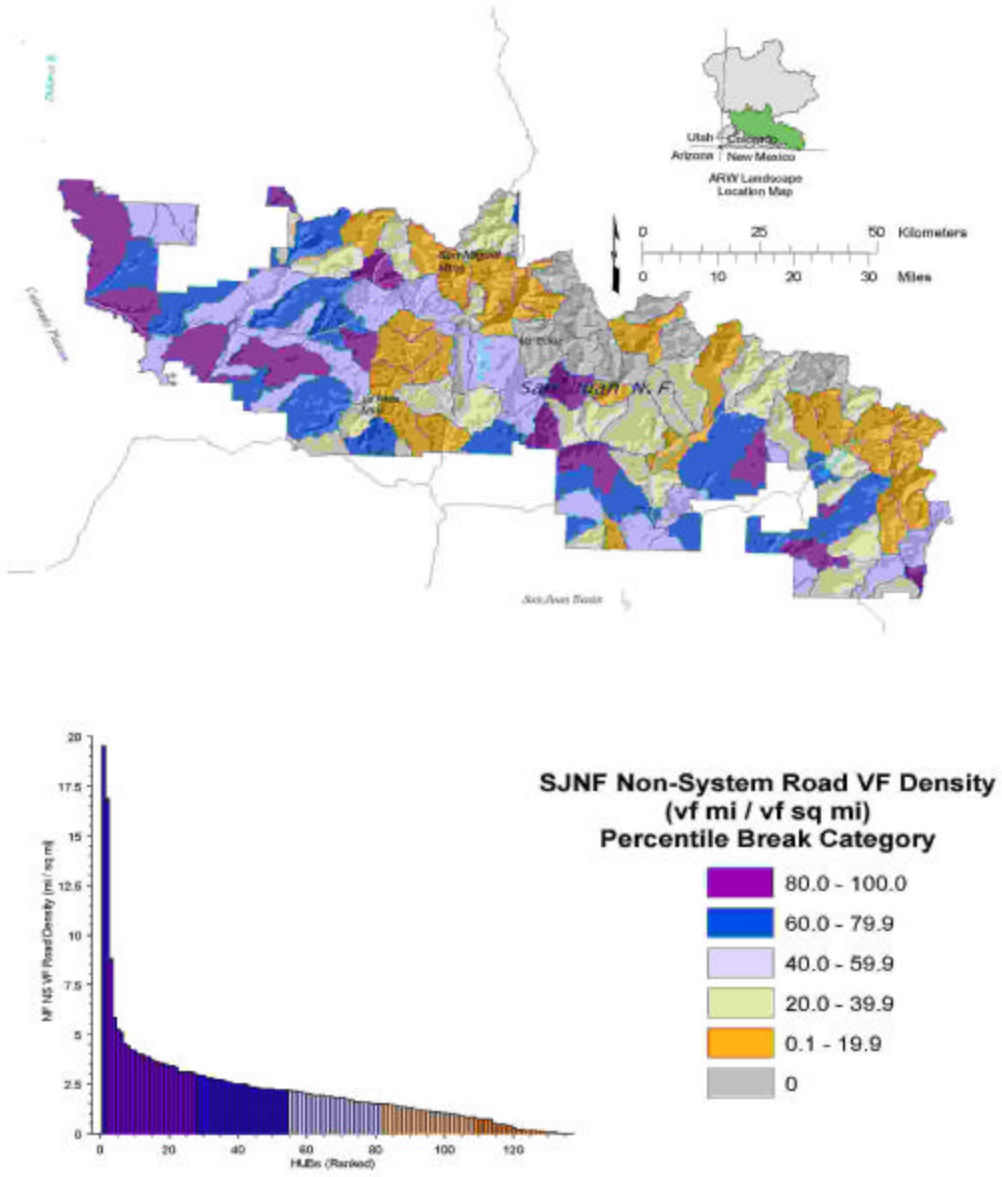

Figure 3.12 The rank and distribution of non-system valley floor road densities, management scale, San Juan National Forest.

Table 3.12 Summary of HUBs within the 80-100 percentile range for non-system road valley floor densities, management scale, San Juan National Forest. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	NF NS VF Road Density (mi / sq mi)
140300020405	Lower Lost Canyon	19.5
140300036101	Naturita Creek	16.9
140300020605	Dolores Canyon-Joe Davis Hill	8.8
140801011403	Lower Vallecito Creek	5.9
140801011501	Middle Los Pinos River-Red Creek	5.3
140300020604	Dolores Canyon-Lake Canyon	5.1
140300020509	Pine Arroyo	4.5
140801010307	Echo Canyon Reservoir	4.4
140300020511	Disappointment Valley-Wild Horse Reservoir	4.2
140300020401	Upper Lost Canyon	4.2
140802020103	Hartman Canyon	4.0
140801010406	Lower Rio Blanco-San Juan River	4.0
140300020402	Spruce Water Canyon	3.9
140300020601	Dolores River-Salter Canyon	3.8
140801020401	Martinez Creek-Dutton Creek	3.7
140801070105	East Fork of Mud Creek	3.6
140300020603	Dolores Canyon-Cabin Creek	3.6
140300020507	Dawson Draw	3.5
140300020407	House Creek	3.5
140300020502	Disappointment Creek Headwaters	3.4
140300020205	Roaring Forks Creek	3.4
140300020406	Upper Dolores River-Italian Creek	3.3
140801011601	Upper Beaver Creek	3.1
140300020203	Rico Valley	3.1
140801010503	Navajo Peak	3.1
140802020201	Upper Yellowjacket Canyon	3.1
140801011502	Bear Creek	3.1

25 HUBs were found to have the most potential for stream crossing related effects. As mentioned earlier, Naturita Creek, Lower Lost Canyon, and Dolores Canyon-Joe Davis Hill watersheds have only a small percentage of their area within the forest. As a result, the number of calculated stream crossings in the watershed is disproportionate to watershed size. The four watersheds, highlighted in light green in Table 3.13, are all found within the forest boundary. As all four watersheds are within the 80-100 percentile range there is a high potential that non-system road crossings are influencing aquatic and riparian health on the forest. However, Lemon Reservoir watershed (HUB 140801040803) is the most likely to influence downstream conditions, as it is the closest to the forests border.

These 25 watersheds are found mainly in the western, south-central, and south east portions of the forest.

They appear to be related to the following areas: Glade Canyon south to Lone Dome State Recreation and Wildlife area, the Ferris Canyon north to Crooked Reservoir, House Creek Recreation Area, and area of old rail grade, Spruce Lake, Lost Canyon, Hay Camp Mesa, Durango Mountain Resort in the East Fork Hermosa Creek Drainage, Lemon Reservoir and south of Vallecito Reservoir, Hatcher Reservoir, and Eightmile Mesa.

Although the majority of these areas have a travel designation of "F", there are areas where travel designations of "A", "E", and "B" appear to be involved. This indicates that travel closures are not being enforced or observed.

Table 3.13 Summary of non-system road crossings by HUB within the 80-100 percentile range, management scale, San Juan National Forest. Watersheds highlighted in green are located entirely on the national forest.

6th Level HUB	6th Level HUB Name	Non-System Road Crossing Ratio (# / stream mi)
140300036101	Naturita Creek	8.6
140300020405	Lower Lost Canyon	3.3
140300020605	Dolores Canyon-Joe Davis Hill	3.3
140300020604	Dolores Canyon-Lake Canyon	2.0
140801010307	Echo Canyon Reservoir	2.0
140801011501	Middle Los Pinos River-Red Creek	1.8
140801040803	Lemon Reservoir	1.5
140801040102	Cement Creek	1.5
140801010406	Lower Rio Blanco-San Juan River	1.4
140300020507	Dawson Draw	1.4
140300020407	House Creek	1.3
140300020601	Dolores River-Salter Canyon	1.3
140300020509	Pine Arroyo	1.3
140801020401	Martinez Creek-Dutton Creek	1.2
140300020502	Disappointment Creek Headwaters	1.2
140300020304	Lower Plateau Creek	1.2
140801011601	Upper Beaver Creek	1.2
140801040402	East Fork Hermosa Creek	1.2
140801011502	Bear Creek	1.2
140300020406	Upper Dolores River-Italian Creek	1.1
140801011403	Lower Vallecito Creek	1.1
140300020303	Calf Creek	1.0
140801070101	East Mancos River-Middle Mancos River	1.0
140801011602	Middle Beaver Creek	1.0
140300020401	Upper Lost Canyon	1.0

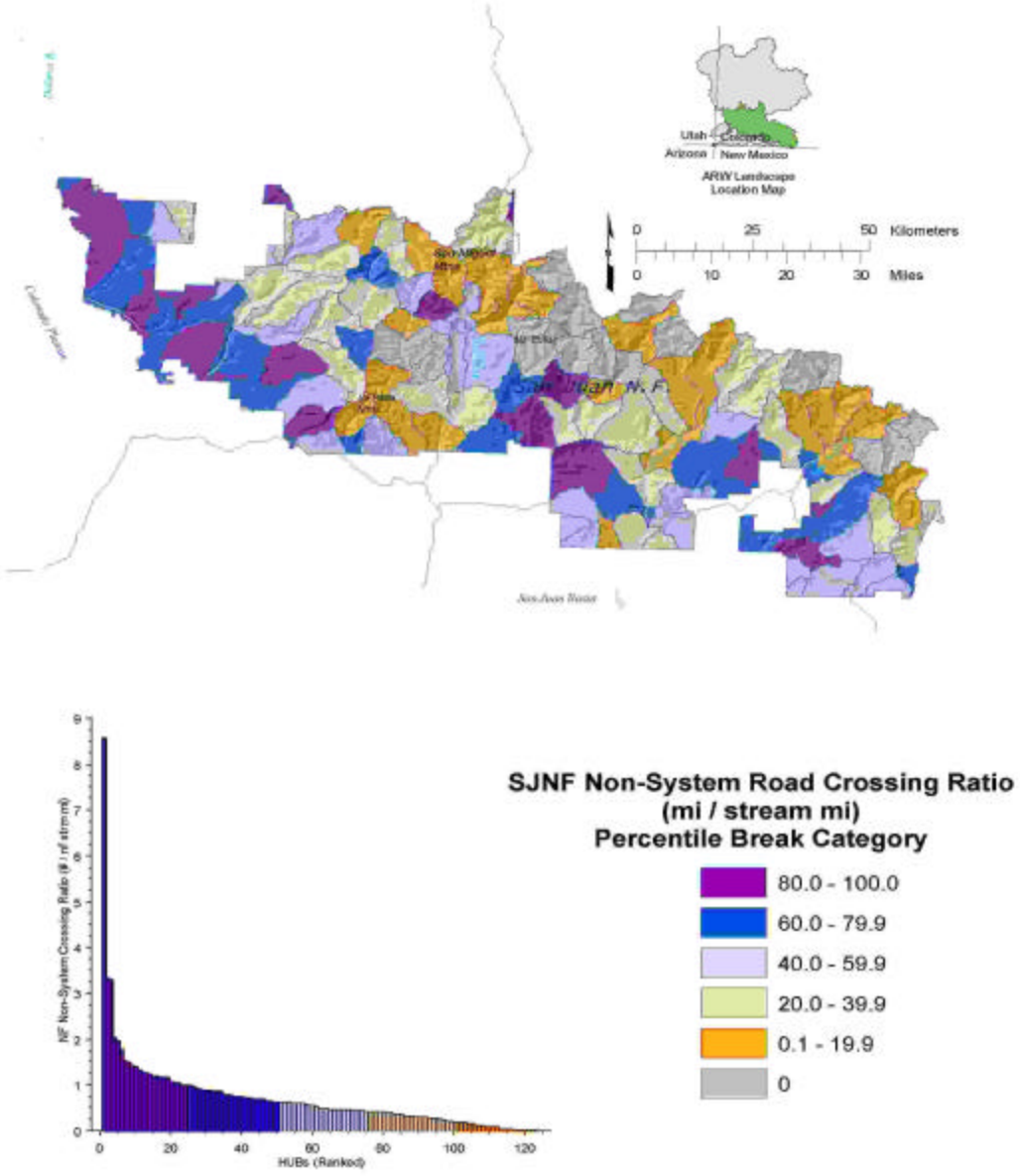

Figure 3.13 Rank and distribution of non-system stream crossings, management scale, San Juan National Forest.

6th Level HUB Information Needs

At present, there is no interdisciplinary comprehensive forest roads analysis report. Completion of such a report would help identify areas where roads are contributing sediment and water to streams, help identify potential watershed improvement projects. It would also help identify areas to survey for aquatic impacts from roads.

In addition it would be helpful to collect and create an accurate GIS coverage for non-system roads beyond the forest boundary

Current forest plan road density standards are only related to wildlife, not watershed concerns. Hydrological and hydrologically related resources would be better protected if aquatic based standards and guidelines for watershed road densities and stream crossings were developed. It is recommended that these be developed during the current forest plan revision process.

Management Implications at the 6th HUB Level

Table 3.8 summarizes the cumulative road class score for all watersheds. However, it should be noted that these existing road densities will be modified when an alternative is selected and implemented for the Northern San Juan Basin Coalbed Methane Development project and other large development proposals. It is recommended that road densities be re-evaluated in the watersheds involved prior to planning additional land management activities.

The information and recommendations presented in subsequent paragraphs are taken from the Ecological Driver Analysis (Report 1 of 3) and the Synthesis (Report 3 of 3), in the 2006 San Juan Aquatic, Riparian, and Wetland Ecosystem Assessment. To obtain detailed information on the sensitivity of fisheries, riparian vegetation, aquatic productivity, and benthic macroinvertebrate responses changes in hydrology, sediment, thermal regime, nutrients, and biota for a proposed site specific or area specific project these reports should be referred to for more detailed data and interpretations.

27 watersheds, or 18% of the watersheds found on the San Juan National Forest, scored a cumulative road class score of "5", the highest possible rating. 20 of these watersheds are not located entirely on-forest while seven of the watersheds are found entirely within the Forest's boundary (Table 3.28). The Upper Cherry Creek (HUB# 140801050105), Upper Animas Valley-Canyon Creek (HUB# 140801040501), Lower Lost Canyon (HUB# 140300020405), and the Upper Dolores River-Taylor Creek (HUB# 140300020209) watersheds all have the highest total transportation score of 12, out of a possible 15. All 27 watersheds have a high potential for exhibiting effects on aquatic, riparian, and wetland health due to roads, while the Upper Cherry Creek, Upper Animas Valley-Canyon Creek, Lower Lost Canyon, and the Upper Dolores River-Taylor Creek watersheds are even more likely to have impacts due to their cumulative transportation rank scores.

Riparian Clusters 1r, 2r, 4r, 5r, and 6r and wetland Clusters 1w, 2w, 3w, 4w, and 7w were associated with the watersheds receiving a score of "5", which is equated with the 100-80 percentile range. Riparian Clusters 4r and wetlands Cluster 3w were the most common clusters to occur in association with these watersheds.

Fisheries and riparian resources in riparian Clusters 1r, 2r, 4r, 5r, 6r, and 7r have a moderate to high sensitivity to fluctuations in both hydrology and sediment, however riparian vegetation is low in its sensitivity to changes in sediment compared to the other clusters. Fish, aquatic productivity, and benthic macroinvertebrates have variable sensitivity to thermal regime changes depending on which cluster is under consideration. Cluster 1r is among the most sensitive to changes in thermal regime aquatic productivity and benthic macroinvertebrates, as is Cluster 2r. The other clusters, 4r, 5r, 6r, and 7r which have low to moderate sensitivity to changes in thermal regime for aquatic productivity and macroinvertebrates. Sensitivities appear to be related to hydrologic/climatic regimes (San Juan Aquatics Reports 1 of 1 and 3 of 3).

Although wetlands Cluster 3w was the most common in its occurrence, 1w and 4w were also prevalent. Clusters 2w and 7w are each only associated with one watershed in the 100-80 percentile range. Clusters 1w, 3w, and 4w are all very sensitive to fluctuations in hydrology.

However, Cluster 1w is moderately sensitive to sediment load alterations compared to Clusters 3w and 4w have been evaluated to be low in sediment sensitivity. Sensitivity to changes in hydrology are high for wetlands Cluster 2w and 7w, with sediment load changes having a high influence in wetlands Cluster 7w. Sediment load variations are categorized as having a moderate response in wetland Cluster 2w.

Specific recommendations are discussed below and are based upon the results of additive analysis and the ecological driver's analysis (San Juan Aquatics Reports 1 of 1 and 3 of 3) which has defined the characteristics of riparian and wetland clusters. Recommendations include:

- Out of the three activity categories under transportation, roads have the highest potential for influencing aquatic, riparian, and wetland health, due to alterations in sediment loads, water quality, and water quantity. With 27 watersheds within the 100-80 percentile range, site specific project planning needs to consider the percentile ranking for roads within that area, confirm what types of road activity is within the project area and if it is located in valley floor areas. In addition, the level of activity of other activity categories must be considered, especially those that influence hydrologic and sedimentologic modifications, such as vegetation management or developed recreation.
- Within the 27 watersheds in the 100-80 percentile range, riparian Clusters 4r and 5r were the most common, with Clusters 1r, 2r, and 6r being much less common. Lower Lost Canyon is the only watershed that scored a total transportation category score of 12 and did not have another activity category ranked within the 100-80 percentile range.
- The Upper Animas Valley-Canyon Creek also was ranked as within the 100-80 percentile range for vegetation management. The Upper Cherry Creek watershed was also ranked as within the 100-80 percentile range for urbanization. The Upper Dolores River-Taylor Creek watershed was also ranked as within the 100-80 percentile range for water uses. Vegetation management, urbanization, and water uses can alter hydrologic and sedimentologic regimes. Any future projects in these proposed watersheds must evaluate the potential for further impacts, or improvements to both sedimentologic and hydrologic regimes.
- With the very high potential for anthropogenic influences in the Upper Animas Valley-Canyon Creek watershed, mitigation efforts are recommended for any low gradient reaches within the watershed, as the importance of low gradient reaches for riparian vegetation and aquatic plans and animals is magnified. Wetland Cluster 2w has been rated as one of the highest for strategic wetland protection and management, as all watersheds containing this wetland are within the top 12 rankings for cumulative effects related to anthropogenic activities.
- As a result, proactive management to maintain the integrity of these wetlands should be emphasized when considering any future projects that may influence hydrologic and sedimentologic regimes relating to wetlands Cluster 3w, as should the high potential of these wetlands for restoration.
- Both the Upper Cherry Creek and Upper Dolores River-Taylor Creek watersheds are categorized as containing riparian Cluster 5r. This riparian cluster is dominated by calcareous geology, making it one of the most productive for aquatic and riparian systems. As the overall potential for anthropogenic influence is high, these two watersheds should be considered candidates for mitigation measures.
- Upper Cherry Creek contains wetlands which are designated as 4w, which are mostly isolated and smaller in extent. Mitigation measures are recommended for a project by project basis to ensure the integrity of these wetlands, are maintained.
- The wetlands in Lower Lost Canyon and the Upper Dolores River-Taylor Creek watersheds are both classified as 3w. These wetlands are expected to be of less importance than those in other clusters. However, due to the relative rarity of these wetlands, and the high potential for influence by roading and water uses, restoration of individual wetlands should be considered important for improving the health and function of these wetlands.

- For any watershed receiving a cumulative road class score of "4" potential projects would verify the level of other activity categories, determine wetland and riparian class within the proposed project area, and discuss the potential for impacts in context of the wetland and riparian class's sensitivity to changes in hydrology, sediment, thermal regime, nutrients, and biota for fisheries, riparian vegetation, aquatic productivity, and benthic macroinvertebrates.

Direction for Reach/Site Scale Analysis

In order to identify specific influences from roads on aquatic, riparian, and wetland resources, analysis at the reach/site scale is critical.

It would be beneficial for aquatic, riparian, and wetland resource management if the San Juan National Forest continues its annual inspection of stream crossings and culverts. The information collected could be used to determine which crossings are performing as intended, and which are in need of remediation.

Tables 3.14 through 3.16 provide direction for prioritization of watersheds for analysis at the reach or site level. These HUB's have been identified to have the highest risk of road-related impacts.

Table 3.14 lists watersheds with the highest total (paved and unpaved) system road miles. Table 3.15 is those HUBs listed based on unpaved road stream crossing ratios. Table 3.16 lists those HUBs which are at risk due to the amount of non-system road mile totals. The watersheds listed in this table are recommended for receiving the highest priority for more detailed analysis. HUBs listed in light green are located entirely within the forest's boundaries.

The following questions should be considered for a reach/site scale analysis:

1. Are the crossings adequate to pass the design flow including associated debris?
2. Is the crossing appropriate for the expected traffic levels?
3. Is fish passage an issue? If so, is the crossing designed to allow unimpeded passage of aquatic organisms?
4. Are Best Management Practices adequate to prevent chronic inputs of sediment into the stream?
5. Are culverts being properly maintained on an annual basis?

Table 3.14 Watershed Prioritization List for Reach/Site scale analysis based on those watersheds within the 80-100 percentile ranges for total (paved and unpaved) forest system road densities by HUB.

6th Level HUB	6th Level HUB Name	NF System Road Density (mi / sq mi)
140801070105	East Fork of Mud Creek	5.6
140801040402	East Fork Hermosa Creek	4.0
140802020103	Hartman Canyon	3.5
140802020106	Lower Alkali Canyon-Narraguinnep Canyon	2.7
140801040401	Hermosa Creek headwaters	2.7
140801010304	Upper Pagosa Springs	2.6
140801070103	Upper Mancos Valley	2.5
140300020509	Pine Arroyo	2.5
140300020511	Disappointment Valley-Wild Horse Reservoir	2.5
140300020401	Upper Lost Canyon	2.4
140801040503	Upper Animas Valley-Stevens Creek	2.4
140300020605	Dolores Canyon-Joe Davis Hill	2.3
140300020302	Upper Plateau Creek	2.2
140300020407	House Creek	2.2
140300036101	Naturita Creek	2.2
140300020507	Dawson Draw	2.1
140801010203	Wolf Creek	2.1
140801010504	Navajo River-Weisel Flat	2.1
140801010405	Rito Blanco	2.0
140300020510	Upper Disappointment Valley	2.0
140300020205	Roaring Forks Creek	2.0
140801040604	Animas River-Spring Creek	2.0
140801070102	West Mancos River	2.0
140801011601	Upper Beaver Creek	1.9
140801010305	McCabe Creek	1.9
140300020502	Disappointment Creek Headwaters	1.9
140300020305	Beaver Creek-Trail Canyon	1.9

Table 3.15 Watershed Prioritization List for Reach/Site scale analysis based on those watersheds within the 80-100 percentile ranges for unpaved road stream crossing ratios by HUB.

6th Level HUB	6th Level HUB Name	Unpaved System Road Crossing Ratio (mi / Stream mile)	HUB Drainage Density (mi/sq.mile0
140802020106	Lower Alkali Canyon-Narraguinepp Canyon	3.9	3.3
140300020405	Lower Lost Canyon	3.3	3.0
140300020605	Dolores Canyon-Joe Davis Hill	1.8	1.8
140801040402	East Fork Hermosa Creek	1.7	2.3
140300020401	Upper Lost Canyon	1.5	2.3
140801020403	Stollsteimer Creek-Dyke Valley	1.5	2.7
140801040401	Hermosa Creek headwaters	1.5	2.7
140300020604	Dolores Canyon-Lake Canyon	1.2	2.2
140801010308	San Juan River-Eightmile Mesa	1.2	2.9
140801020405	Lower Stollsteimer Creek	1.2	3.3
140300020509	Pine Arroyo	1.1	2.5
140801011704	Upper Spring Creek	1.1	2.8
140801040103	Mineral Creek	1.1	2.2
140801010306	Mill Creek	1.0	3.1
140300020504	Ryman Creek	1.0	3.2
140300020502	Disappointment Creek Headwaters	1.0	2.1
140300020602	Narraguinepp Canyon Natural Area	1.0	2.2
140801011601	Upper Beaver Creek	1.0	2.7
140300020306	McPhee Reservoir-Beaver Creek Inlet	1.0	2.3
140801070104	Chicken Creek	0.9	2.6
140300020603	Dolores Canyon-Cabin Creek	0.9	2.0
140300036101	Naturita Creek	0.9	1.8
140801050101	La Plata River headwaters	0.9	2.3
140300020305	Beaver Creek-Trail Canyon	0.9	2.1

Table 3.16 Watershed Prioritization List for Reach/Site scale analysis based on those watersheds within the 80-100 percentile ranges for non-system road densities by HUB.

6th Level HUB	6th Level HUB Name	Non-system Road Density (mi / sq mi)
140300036101	Naturita Creek	6.4
140300020605	Dolores Canyon-Joe Davis Hill	6.1
140801070105	East Fork of Mud Creek	4.9
140300020511	Disappointment Valley-Wild Horse Reservoir	4.2
140300020604	Dolores Canyon-Lake Canyon	4.0
140300020401	Upper Lost Canyon	3.8
140802020201	Upper Yellowjacket Canyon	3.8
140801011503	Los Pinos River-Bayfield	3.7
140300020402	Spruce Water Canyon	3.7
140802020106	Lower Alkali Canyon-Narraguinepp Canyon	3.4
140300020407	House Creek	3.2
140300020406	Upper Dolores River-Italian Creek	3.2
140300020509	Pine Arroyo	3.1
140300020507	Dawson Draw	2.8
140801070101	East Mancos River-Middle Mancos River	2.8
140300020603	Dolores Canyon-Cabin Creek	2.7
140300020304	Lower Plateau Creek	2.7
140801010503	Navajo Peak	2.6
140300020510	Upper Disappointment Valley	2.6
140801020402	Upper Stollsteimer Creek	2.6
140300020405	Lower Lost Canyon	2.6
140801011501	Middle Los Pinos River-Red Creek	2.6
140801020104	Piedra River-O'Neal Creek	2.6
140801011601	Upper Beaver Creek	2.6
140801020401	Martinez Creek-Dutton Creek	2.5
140801010307	Echo Canyon Reservoir	2.4
140300020205	Roaring Forks Creek	2.3
140801040402	East Fork Hermosa Creek	2.2
140300020303	Calf Creek	2.2

APPENDIX C

ROAD VALUES AND RISKS MATRIX

COLUMBINE DISTRICT ROADS
OBJECTIVE MAINTENANCE LEVEL: 3, 4 AND 5

		ROAD DATA									ROAD VALUES									ROAD RISKS																							
ID	NAME	SEG LENGTH	FUNCTIONAL CLASS	LANES	OBJECTIVE MAINTENANCE LEVEL	OPER MTC LEVEL	SURFACE	RECREATION	TIMBER	FIRE/FUELS	RANGE	ENERGY AND MINERAL USE	ACCESS TO PRIVATE DEVELOPMENT	ADMINISTRATIVE SITE ACCESS	VALUE PRIORITY	OVERALL VALUE ASSESSMENT	ROAD CONDITION	MIXED USE	WATER RESOURCES	RIPARIAN HABITAT AN D WETALNDS	HERITAGE RESOURCES	SOILS/GEOLOGIC HAZARD	RIGHT-OF-WAY NEEDED	JURISDICTION	ANNUAL MAINTENANCE	DEFERRED MAINTENANCE	ISSUES PRIORITY	OVERALL RISK ASSESSMENT	Annual Maintenance cost/mile	Deferred Maintenance cost/mile	COMMENTS
065	FALLS CREEK	2	1		3	3	AGG	1	1	2	2		2		1.60	H	1	1	1		2	1		2	1	1	1.25	L	$1,368.24	$ 9,571.00	NEGOTIATING W/COUNTY TO TRANSFER JURISDICTION
135	BEAVER MEADOWS	13.7	A	1	4	4	AGG	2	2	2	2	1	2	2	1.86	H	1	2	2		1	1	1	1	2	1	1.33	L	$5,255.98	$ 57,994.96	
171	JUNCTION CREEK(CR 204)	7.1	C	1	4	4	AGG	2	1	2	2	1	1		1.50	H	2	1	2		1	2		1	1	1	1.38	L	$3,763.75	$ 5,156.45	HEAVY TRAFFIC & MOUNTAIN BIKE USE, ADDN'L CULVERTS NEEDED
171	JUNCTION CREEK(CR 204)	11.5	C	1	3	3	AGG	2	2	2	2	1	1		1.67	H	2	2	2		1	2	2	1	1	1	1.56	H	$3,763.75	$ 5,156.45	
576	HERMOSA CREEK (CR 201)	2.24	C	2	4	4	AGG	2	1	2	2		1		1.60	H	1	1	2		1	2	1	1	2	1	1.33	L	$5,717.60	$ 53,675.00	
578	HERMOSA PARK	8.78	C	1	3	3	AGG	2	1	1	2		2		1.60	H	1	2	2	2	1	2	1	1	1	2	1.50	H	$ 3,068.07	$ 60,283.03	DMR USE
579	CASCADE DIVIDE	2.78	C	1	3	3	AGG	2	2	1	2			2	1.80	H	1	1	2		1	2		1	1	2	1.38	L	$1,508.71	$ 130,288.50	ADMIN SITE IS GRAVEL PIT, DISPERSED USE PRIMARILY CLOSED ROADS
580	RELAY CREEK	8.5	1	1	3	3	AGG	2	2	1	2				1.75	H	1	1	2		1	1		1	1	2	1.25	L	$2,767.30	$ 63,778.24	DISPERSED USE PRIMARILY ON CLOSED ROADS
582	COLUMBINE	0.95	1	1	5	5	AC	1	1	1	2		2		1.40	L	1	1	1		1	1		1	1	1	1.00	L	$2,308.77	$ -	CHECK IF IT NOW BELONGS TO DMR
585	SOUTH MINERAL	4.8	1	1	4	4	AGG	2		1	2		1		1.50	H	1	1	2	2	1	2		2	1	1	1.44	L	$2,344.19	$ 57,053.05	OUTWARD BOUND USE, SAN JUAN COUNTY ECONOMIC DEV
590	ANDREWS LAKE	1	1	1	3	3	AC	2		1	2				1.67	H	1	1	1		1	1		1	1	1	1.00	L	$3,280.39	$ -	FUTURE MAINTENANCE COSTS
595	BURNT TIMBER	3.532	1	1	3	3	AGG	1	2	1	2				1.50	H	1	1	1		1	1		1	1	2	1.13	L	$4,776.59	$ 60,361.21	
596	FLORIDA(CR 243)	2	C	1	3	3	AGG	2	1	2	2				1.75	H	1	1	2		1	2		1	1	2	1.38	L	$1,348.84	$ 60,361.21	DUST COMPLAINTS
602	PINE RIVER	3.9	C	2	4	4	AGG	2		2	2		2		2.00	H	1	1	2		1	2	2	2	2	1	1.56	H	$9,960.22	$ 56,160.90	FIRE ZONE , GUEST RANCHES
603	EAST VALLECITO	1	C	2	3	3	AC	2	1	2	2		2	2	1.83	H	2	1	2		1	1	1	2	1	1	1.33	L	$4,927.80	$ 52,767.04	PFSR NOMINEE, #1 PRIORITY IN R2, ACCESS TO 5 BRANCHES RESORT, WEIGHT RESTRICTED BRIDGE
603	EAST VALLECITO	3.5	C	2	3	3	AGG	2	1	2	2	1	2	1	1.57	H	1	1	2		1	2	1	2	1	1	1.33	L	$4,927.80	$ 52,767.04	PFSR NOMINEE, #1 PRIORITY IN R2, ACCESS TO 5 BRANCHES RESORT
604	BEAR CREEK	3.74	1	1	3	3	AGG	1	2	2	2	1			1.60	H	1	2	2		1	1		1	1	1	1.25	L	$5,073.52	$ 55,431.20	OHV TRAILS TO FOREST LAKES
608	SAULS CREEK(CR 527)	4	1	1	3	3	AGG	1	2	2	2	2	2		1.83	H	1	1	2		2	2	1	2	1	1	1.44	L	$4,440.05	$ 57,785.03	WINTER RANGE, HIGH VISIBILITY
613	FOSSETT GULCH	12.9	C	1	3	3	AGG	1	2	2	2	2	2		1.83	H	1	1	2		1	1	2	1	1	2	1.33	L	$4,725.33	$ 73,285.67	SOUTH HALF OF ROAD USED PRIMARILY FOR ENERGY ACCESS
620	FIRST NOTCH	7.2	1	1	3	3	AGG	1	2	2	2	2	2		1.83	H	1	1	2		1	2	1	1	1	2	1.33	L	$2,207.30	$ 62,597.45	H ISSUES MP 0-1, REST IS L ISSUES, SNOWMOBILE PARKING 1ST 1/2 MILE
621	LOWER PIEDRA	1.41	1	1	3	3	AGG	2	1	1	2		2		1.60	H	2	1	2	2	1	1	1	1	2	1	1.40	L	$5,389.54	$ 50,016.88	
671	HAVILAND LAKE CG	1.873	1	2	4	4	BST	2	2	1	2		2	1	1.67	H	1	1	1		1	1	1	1	2	2	1.22	L	$7,241.35	$ 90,704.42	FUTURE MTCE COST, PARKING ALONG ROAD
682	MISSIONARY RIDGE	16.8	C	1	3	3	AGG	2		1	2		2		1.75	H	2	2	2	1	1	2	2	1	1	1	1.50	H	$4,791.03	$ 12,068.74	LIME MESA WATERSHED, HAZARD TREES, PRIVATE CONFLICTS W/TIMBER, DUST COMPLAINTS, SLIDES/ROCK DEBRIS
724	MIDDLE MT	12.46	C	1	3	3	AGG	2	2	2	2		1		1.80	H	1	2	2		1	2	2	1	1	1	1.44	L	$4,982.08	$ 58,097.83	FIELD REVIEW, WILDERNESS TH & PARKING
743	RELAY STATION	2.09	1	1	3	3	AGG	1	2	1	2	2	1	1	1.43	L	1	1	2		1	2		1	2	2	1.50	H	$9,459.02	$ 71,626.44	ACCESS TO COMMUNICATION TOWERS BOTH FS & OTHERS
791	CHRIS PARK	1.4	1	1	4	4	AGG	2		1	2		1		1.50	H	1	1	1		1	1		1	1	1	1.00	L	$3,964.69	$ 53,675.00	USED BY HORSE OUTFITTERS

Value and Risk Assessments

Not Applicable = 0	Annual Maintenance cost < $5,245	= 1 (Low Cost < approx. 67th percentile)
Low Value or Risk = 1	Annual Maintnenance cost >= $5,245	= 2 (High Cost > approx. 67th percentile)
High Value or Risk = 2	Deferred Maintenance Cost < $59,407	= 1 (Low Cost < approx. 67th percentile)
	Deferred Maintenance Cost >= $59,407	= 2 (High Cost > approx. 67th percentile)

Overall value and risk assessment ratings:

H = High for priority ranking >= 1.5
L = Low for priority ranking < 1.5

DOLORES DISTRICT ROADS

OBJECTIVE MAINTENANCE LEVEL: 3, 4 AND 5

ROAD DATA								ROAD VALUES									ROAD RISKS														
ID	NAME	SEG LENGTH	FUNCTIONAL CLASS	LANES	OBJECTIVE MAINTENANCE LEVEL	OPER MTC LEVEL	SURFACE	RECREATION	TIMBER	FIRE/FUELS	RANGE	ENERGY AND MINERAL USE	ACCESS TO PRIVATE DEVELOPMENT	ADMINISTRATIVE SITE ACCESS	VALUE PRIORITY RANKING	OVERALL VALUE ASSESSMENT	ROAD CONDITION	MIXED USE	WATER RESOURCES	RIPARIAN HABITAT AN D WETALNDS	HERITAGE RESOURCES	SOILS/GEOLOGIC HAZARD	RIGHT-OF-WAY NEEDED	JURISDICTION	ANNUAL MAINTENANCE	DEFERRED MAINTENANCE	ISSUES PRIORITY RANKING	OVERALL RISK ASSESSMENT	Annual Maintenance cost/mile	Deferred Maintenance cost/mile	COMMENTS
258	LOWER BOGGY	1.05	L	1	3	3	AGG	2	2	2	1				1.75	H	1	2	1		1	1			1	1	1.14	L	$ 2,499.99	$ 53,675.24	POTENTIAL O&G DEVELOPMENT
271	MCPHEE MARINA	2.7	A	1	5	5	AC	2		1				2	1.67	H	1	1	2		2	2		1	1	1	1.38	L	$ 4,949.82	$ -	STATE LOOKING AT ACQUIRING
272	MCPHEE OVERLOOK	0.61	C	1	5	5	AC	2		1					1.50	H	1	1	1		2	1		1	1	1	1.13	L	$ 4,473.69	$ -	
316	MADDEN PEAK	4.8	L	1	3	3	AGG	2	2	1	2	1	1	1	1.43	L	1	2	1		1	1	1	1	1	2	1.22	L	$ 2,954.18	$ 64,121.85	ACCESS TO COMPRESSOR STATION AND RADIO TO
327	SPRING CREEK	1.8	L	1	3	3	AGG	1	1	1	2		1	1	1.17	L	1	2	1		1	1		1	1	2	1.25	L	$ 3,082.98	$ 73,987.38	PRIVATE WANT YEAR ROUND ACCESS
350	SPRUCE MILL	7.3	C	1	3	3	AGG	1	2	1	2			1	1.40	L	1	2	1		1	1		1	2	1	1.25	L	$ 7,852.88	$ 57,934.08	
385	CHICKEN CREEK	1.24	L	1	3	3	AGG	2	1	2	2			1	1.60	H	1	1	1		1	1	1	1	1	1	1.00	L	$ 2,836.70	$ 53,675.00	ALTERNATE ACCESS AVAILABLE
390	GROUSE POINT	2.4	L	1	3	3	AGG	1	2	2	2				1.75	H	1	1	1		1	1	1	1	1	1	1.00	L	$ 3,700.57	$ 56,266.94	
435	ROARING FORK	6.759	C	1	3	3	AGG	2	2	1	2				1.75	H	2	2	2		1	2	1	1	2	2	1.67	H	$ 6,249.71	$ 60,110.68	SH145 TO HIGHLINE TO US 550
436	HILLSIDE DRIVE	13	C	1	3	3	AGG	2	2	1	2				1.75	H	2	2	2		1	2		1	2	2	1.75	H	$ 5,302.51	$ 65,469.07	
471	EAGLE CREEK	7.2	C	1	3	3	AGG	2	1	2	1			1	1.40	L	1	2	2		1	1	1	1	2	1	1.33	L	$ 5,504.83	$ 55,828.28	
493	BENCH MARK MTN	1.3	L	1	3	3	AGG	1	1	2	1	1		2	1.33	L	1	2	1		2	1		1	1	1	1.25	L	$ 958.68	$ 53,675.00	MANNED FIRE TOWER
496	BARLOW	0.7	L	1	3	3	AGG	1	2	1	1				1.25	L	1	1	2	2	1	1		1	2	2	1.44	L	$ 7,610.24	$ 144,920.17	
504	LONE DOME	32.2	L	1	3	3	AGG	2	2	2	2	1	2	1	1.71	H	1	2	2		2	1	1	1	1	1	1.33	L	$ 3,219.46	$ 5,004.08	HYDROELECTRIC PLANT, STATE REC AREA
506	DOE SPRINGS	4.3	L	1	3	3	AGG	1	2	2	2	1			1.60	H	1	2	1		1	1		1	1	2	1.25	L	$ 2,372.73	$ 63,917.47	
510	DRY CANYON	7.82	C	1	3	3	AGG	2	2	2	2	1			1.80	H	1	2	1		2	1		1	1	1	1.25	L	$ 4,245.88	$ 57,618.95	
512	BLACK SNAG	2.1	C	1	3	3	AGG	1	1	1	2	1			1.20	L	1	2	2		1	1		1	1	1	1.25	L	$ 1,910.85	$ 55,032.50	
514	GLADE	24.1	A	2	4	4	AGG	2	2	2	2	1	2	2	1.86	H	1	2	1		2	1		1	2	2	1.50	H	$ 18,202.00	$ 87,838.16	
515	BIG BEND	0.19	L	1	3	3	AGG	2	2	1	2	1	2		1.67	H	1	1	2		1	1		2	2	1	1.38	L	$ 5,424.00	$ 53,673.68	COUNTY PLOWS WITHOUT PERMIT
519	FLAT IRON	3.36	L	1	3	3	AGG	1	2	1	1	1			1.20	L	1	2	1		1	1		1	1	1	1.13	L	$ 1,575.21	$ 55,604.00	
520	FERRIS	4.3	L	1	3	3	AGG	1	2	2	2	1	1		1.50	H	1	2	1		1	1	1	1	1	1	1.11	L	$ 3,827.02	$ 52,424.53	CONSIDER DOWNGRADE TO L2
521	ORMISTON POINT	11.2	A	2	4	4	AGG	2	2	1	2	1		2	1.67	H	1	1	1		1	1		1	1	1	1.00	L	$ 3,825.45	$ 57,046.23	GRAVEL PIT
523	TRIMBLE	5.8	L	1	3	3	AGG	1	2	1	2	1			1.40	L	1	2	2		1	1		1	1	1	1.25	L	$ 3,450.40	$ 49,755.93	
523.A	TRIMBLE A	2.2	L	1	3	3	AGG	1	2	1	2	1			1.40	L	1	2	1		1	1		1	1	1	1.13	L	$ 4,560.58	$ 53,675.00	
526	DOLORES NORWOOD	3	A	2	4	4	BST	2	2	1	2	1	2	1	1.57	H	1	2	2		1	2		2	1	1	1.50	H	$ 2,848.53	$ 56,114.92	
526	DOLORES NORWOOD	8.5	A	2	4	4	AGG	2	2	1	2	1	2	1	1.57	H	1	2	2		1	2		2	1	1	1.50	H	$ 2,848.53	$ 56,114.92	
526	DOLORES NORWOOD	4.6	A	2	5	5	AC	2	2	1	2	1	2	1	1.57	H	1	2	2		1	2		2	1	1	1.50	H	$ 2,848.53	$ 56,114.92	
527	BOGGY DRAW	13.1	L	1	3	3	AGG	2	2	1	2		2		1.80	H	1	2	1		1	1	1	1	1	1	1.11	L	$ 3,829.06	$ 57,458.84	ONLY ACCESS TO 2 1/2 PRIVATE SECTIONS
528	HOUSE CREEK	5.83	C	2	5	5	AC	2	2	2	2		2		2.00	H	1	2	2		2	2	1	1	2	1	1.56	H	$ 12,466.25	$ 58.15	PRIVATE LAND OWNERS WANT YEAR-ROUND ACCE
529	BEAVER RIM	1.71	L	1	3	3	AGG	1	2	1	2				1.50	H	1	2	1		1	1		1	1	1	1.13	L	$ 1,260.64	$ 54,851.11	
532	COTTONWOOD	7.6	C	1	3	3	AGG	2	2	1	2		2		1.80	H	1	1	2		2	1		1	2	2	1.50	H	$ 5,511.87	$ 66,397.73	LANDLOCKED RANCH & PRIVATE
533	GROUND HOG	4.7	C	1	4	4	AGG	1	2	2	2		1		1.60	H	2	1	2		1	1		1	2	2	1.50	H	$ 5,500.46	$ 64,277.90	
534	LONE CONE	0.7	C	1	3	3	NAT	1	2	1	2	1		1	1.33	L	1	1	1		1	1		1	2	1	1.13	L	$ 6,123.23	$ 59,199.09	
534	LONE CONE	5.6	C	1	3	3	AGG	1	2	1	2	1		1	1.33	L	1	2	1		1	1		1	2	1	1.25	L	$ 6,123.23	$ 59,199.09	
535	WEST DOLORES	11	A	1	4	4	AGG	2	2	1	2		2	1	1.67	H	2	1	2	2	1	2	1	1	2	2	1.60	H	$ 8,480.17	$ 67,391.67	CONNECTS SH145 WITH COUNTY ROAD
535.A	NAVAJO TRAILHEAD	0.5	L	1	3	3	AGG	2	1	1	1				1.25	L	1	1	1		1	1		1	1	1	1.00	L	$ 1,224.92	$ 19,324.00	
545	TAYLOR CREEK	12.6	C	1	3	3	AGG	2	2	1	2		2		1.80	H	2	2	2		1	2	1	1	1	2	1.56	H	$ 5,208.77	$ 66,301.40	
547	TAYLOR MESA	4.7	L	1	3	3	AGG	1	2	1	2		1		1.40	L	2	2	2		1	2		1	1	1	1.50	H	$ 4,187.57	$ 54,829.42	
548	PRIEST GULCH TRAILHEAD	0.5	L	1	3	3	AGG	2	1	1	1		1		1.20	L	1	1	1		1	1	1	1	1	1	1.00	L	$ 919.82	$ 23,222.00	
556	ROCK SPRINGS	18.8	A	1	3	3	AGG	2	2	2	2		2	1	1.83	H	1	2	2		1	2		1	1	1	1.38	L	$ 4,537.84	$ 59,226.98	
557	INDIAN RIDGE	3.4	L	1	3	3	AGG	1	2	1	2				1.50	H	1	2	1		1	1		1	1	1	1.13	L	$ 1,600.29	$ 52,254.12	
558	HAY CAMP	3.5	L	1	3	3	AGG	2	2	2	2				2.00	H	1	2	1		1	1		1	1	2	1.25	L	$ 1,543.86	$ 65,206.31	
559	MILLWOOD	5.4	C	1	3	3	AGG	2	2	2	2		2		2.00	H	1	1	2		1	1	1	1	1	1	1.11	L	$ 2,963.56	$ 53,675.00	PLOWING PERFORMED WITHOUT PERMIT
560	LOST CANYON	4	C	1	3	3	AGG	1	2	1	2		1		1.40	L	1	2	1		1	1		1	2	1	1.25	L	$ 5,428.58	$ 18,791.62	ACCESS TO SPRING CREEK SUBDIVISION VIA 327
561	WEST MANCOS	13.6	A	1	3	3	AGG	2	2	2	2	1	2	2	1.86	H	1	2	1	1	1	1	1	1	1	1	1.10	L	$ 2,711.70	$ 5,095.30	
565	TRANSFER	1.1	L	1	3	3	AGG	2	2	1	2		2	2	1.83	H	1	2	2	1	1	2		1	1	1	1.33	L	$ 1,102.75	$ 40,546.91	
566	ECHO BASIN	6.6	C	1	3	3	AGG	2	2	2	2	1	2		1.83	H	1	2	1		1	1		1	2	2	1.38	L	$ 6,326.03	$ 65,799.64	
578	HERMOSA PARK	2.61	C	1	4	4	AGG	2	1	1	1		1		1.20	L	1	1	2	1	1	1		1	1	2	1.22	L	$ 3,068.07	$ 60,283.03	CONSIDER DOWNGRADE TO L2
611	BLACK MESA	11.35	C	1	3	3	AGG	2	2	1	2		1	2	1.67	H	2	2	2		1	2		1	2	1	1.63	H	$ 5,545.91	$ 53,675.00	ACCESS TO DUNTON GS & 2 FS GRAVEL PITS
686	STONER MESA	8.6	C	1	3	3	AGG	2	2	1	2		1		1.60	H	1	2	2		1	2	1	1	2	2	1.56	H	$ 5,742.77	$ 67,547.59	MAJOR SLIDES, CHECK PRIVATE STATUS
692	POTHOLE	2.1	L	1	3	3	AGG	1	2	1	2		1		1.40	L	2	2	1		1	1		1	1	1	1.25	L	$ 4,443.05	$ 56,206.44	
727	WILLOW DIVIDE	2.2	L	1	3	3	AGG	1	2	1	2				1.50	H	1	2	1		1	1		1	1	1	1.13	L	$ 470.77	$ 791.00	CONSIDER DOWNGRADE TO L2

Value and Risk Assessments

Not Applicable = BLANK

Low Value or Risk = 1

High Value or Risk = 2

Annual Maintenance cost < $5,245 = 1 (Low Cost < approx. 67th percentile)

Annual Maintnenance cost >= $5,245 = 2 (High Cost > approx. 67th percentile)

Deferred Maintenance Cost < $59,407 = 1 (Low Cost < approx. 67th percentile)

Deferred Maintenance Cost >= $59,407 = 2 (High Cost > approx. 67th percentile)

Overall value and risk assessment ratings:

H = High for priority ranking >= 1.5

L = Low for priority ranking < 1.5

PAGOSA DISTRICT ROADS
OBJECTIVE MAINTENANCE LEVEL: 3, 4 AND 5

ROAD DATA															ROAD VALUES												ROAD RISKS					
ID	NAME	SEG LENGTH	FUNCTIONAL CLASS	LANES	OBJECTIVE MAINTENANCE LEVEL	OPER MTC LEVEL	SURFACE	RECREATION	TIMBER	FIRE/FUELS	RANGE	ENERGY AND MINERAL USE	ACCESS TO PRIVATE DEVELOPMENT	ADMINISTRATIVE SITE ACCESS	VALUE PRIORITY RANKING	OVERALL VALUE ASSESSMENT	ROAD CONDITION	MIXED USE	WATER RESOURCES	RIPARIAN HABITAT AN D WETALNDS	HERITAGE RESOURCES	SOILS/GEOLOGIC HAZARD	RIGHT-OF-WAY NEEDED	JURISDICTION	ANNUAL MAINTENANCE	DEFERRED MAINTENANCE	ISSUES PRIORITY RANKING	OVERALL RISK ASSESSMENT	Annual Maintenance cost/mile	Deferred Maintenance cost/mile	COMMENTS
006	KENNEY FLATS	0.63	C	1	3	3	AGG	1	2	2	2				1.75	H	1	1	1		1	1		1	2	1	1.13	L	$ 8,116.43	$ 51,657.14	ACCESSES LARGE AREA, PROVIDES ACCESS TO L2
023	OPAL LAKE	1.57	1	1	3	3	AGG	2	1	1	1			2	1.40	L	1	1	2		1	1		1	1	1	1.13	L	$ 4,463.14	$ 32,533.64	
024	PORCUPINE	5.6	1	1	3	3	AGG	1	2	2	2	2			1.80	H	1	1	2	2	1	2		1	1	1	1.33	L	$ 2,850.48	$ 56,444.51	
029	ECHO CANYON	3.6	1	1	3	3	AGG	1	2	2	2	2	2		1.83	H	1	1	1		1	1	1	1	1	1	1.00	L	$ 2,775.09	$ 55,135.21	WINTER/SPRING USE RESULTS IN ROAD DAMAGE
037	JACKSON MOUNTAIN	4.6	1	1	3	3	AGG	2	2	2	2	2	2		2.00	H	1	1	2		1	2		1	2	1	1.38	L	$ 5,768.65	$ 57,992.09	POTENTIAL FUTURE NEED FOR PLOWING & PERMITS
039	FALL CREEK	4.95	1	1	3	3	AGG	2	2	1	2	2			1.80	H	1	1	2		1	1		1	2	2	1.38	L	$ 110,399.10	$ 60,031.26	
617	CHIMNEY ROCK	3.2	1	2	3	3	AGG	2	1	2	1	2		2	1.67	H	1		1		2	1	1	1	1	2	1.25	L	$ 4,384.75	$ 61,718.83	CHIMNEY ROCK VISITOR'S CENTER ACCESS
622	FIRST FORK	12.3	1	1	3	3	AGG	2	2	1	2	2			1.80	H	1	1	2		2	2	2	2	2	2	1.78	H	$ 5,768.97	$ 59,409.39	1ST 1/2 MILE SHOULD BE COUNTY JURISDICTION
625	GORDON CREEK	2.3	C	1	3	3	AGG	1	2	1	2	1			1.40	L	1	1	1		1	1		1	2	1	1.13	L	$ 5,398.45	$ 55,354.06	
627	GAME FARM	1.5	1	1	3	3	NAT	1	1	2	2	2	2		1.67	H	1		2	2	1	1		1	2	2	1.50	H	$ 6,102.00	$ 74,265.44	DOW FACILITY, LOW USE
628	SNOW RANCH	3.65	1	1	3	3	AGG	1	2	2	2	1	2		1.67	H	1	1	2	2	1	1		1	2	1	1.33	L	$ 6,746.25	$ 58,363.48	LOW WATER CROSSING, PLOWING FOR PRIVATE ACCESS
629	TURKEY SPRINGS	4.7	C	1	3	3	AGG	1	2	2	2	1	2	2	1.71	H	1	2	2		1	1	1	2	1	1	1.33	L	$ 1,319.75	$ 53,675.00	JURISDION SHOULD BE COUNTY TO PRIVATE LAND
630.1	MONUMENT PARK-WEST	6.44	C	1	3	3	AGG	2	2	1	2	1			1.60	H	1	1	2		1	2		1	2	1	1.38	L	$ 5,831.08	$ 57,502.44	
630	MONUMENT PARK-EAST	7.8	C	1	3	3	AGG	2	2	2	2	1			1.80	H	1	1	2		1	2		1	1	1	1.25	L	$ 4,870.33	$ 3,485.04	
631	PIEDRA	16.73	A	2	4	4	AGG	2	2	2	2	1	2		1.83	H	1	2	2	2	1	2	2	2	2	2	1.80	H	$ 5,657.68	$ 64,502.94	GRAVEL HAULING
631	PIEDRA	17	1	1	3	3	AGG	2	2	2	2	1	1		1.67	H	1	1	2	2	1	2	2	1	2	2	1.60	H	$ 5,657.68	$ 64,502.94	
633	MC MANUS	6.63	C	1	3	3	AGG	1	1	2	2	1	2		1.50	H	1	1	2		1	1	2	2	1	1	1.33	L	$ 4,413.73	$ 54,536.98	SCHOOL BUS ROUTE
634	PLUMTAW	15.31	C	1	3	3	AGG	2	2	2	2	1	1		1.67	H	2	2	2		1	2		1	2	1	1.63	H	$ 5,947.24	$ 59,391.87	
635	PIEDRA ALTERNATE	3.2	1	1	3	3	AGG	1	1	1	1	1	2		1.17	L	1	1	2	2	1	1	1	2	1	1	1.30	L	$ 751.10	$ 55,878.50	COUNTY JURISDICTION
636	MIDDLE FORK	5.6	C	1	3	3	AGG	2	1	1	2	1	2		1.50	H	1	1	1	2	1	1	2	1	1	2	1.30	L	$ 5,175.40	$ 60,235.66	
637	EAST TONER	7.5	C	1	3	3	AGG	2	2	2	2	1			1.80	H	1	1	2	2	1	2		1	1	1	1.33	L	$ 1,064.61	$ 53,714.11	UPGRADING FROM L2 TO L3, MAJOR PLUGGED CULVERTS
638	PALISADE LAKE	3.31	1	1	3	3	NAT	1	2	1	1	1	1		1.17	L	1	1	2		1	1		1	2	2	1.38	L	$ 5,246.82	$ 60,980.66	CONSIDER DOWNGRADE TO L2
639	TRAIL RIDGE	2.31	1	1	3	3	AGG	1	2	2	2	1			1.60	H	1	1	2		1	2		1	1	2	1.38	L	$ 4,878.18	$ 84,556.18	ACCESS TO LARGE AREA
640	WILLIAMS CREEK	4.7	C	1	4	4	AGG	2	1	2	2	1	1		1.50	H	1	1	2	2	1	2		1	2	2	1.56	H	$ 5,380.24	$ 72,642.06	
642	SAND BENCH	2.4	1	1	3	3	AGG	1	2	1	2	1			1.40	L	1	1	2		1	1		1	1	1	1.13	L	$ 4,031.75	$ 53,675.00	
644	POISON PARK	3.02	C	1	3	3	AGG	2	1	1	2	1			1.40	L	1	1	2	2	1	2		1	2	2	1.56	H	$ 6,115.10	$ 63,218.10	
645	FOURMILE	5.5	C	1	3	3	AGG	2	2	2	2	1	1		1.67	H	1	1	2	2	1	2	2	2	1	2	1.60	H	$ 2,802.80	$ 116,940.82	COUNTY JURISDICTION
647	TURKEY CREEK	3	1	1	3	3	AGG	1	2	2	2	2	1		1.67	H	1	1	1		1	1		1	2	1	1.13	L	$ 5,366.75	$ 57,131.59	
648	WEST FORK	3.13	1	2	3	3	AGG	2	1	2	1	2	2	1	1.57	H	1	1	2	2	1	2	1	1	2	1	1.40	L	$ 4,616.39	$ 62,185.10	
649	BURNS CANYON	6.25	1	1	3	3	AGG	1	1	2	2	1	2	1	1.43	L	1	1	2		1	1	2	1	1	1	1.22	L	$ 3,924.91	$ 54,293.15	COMMUNICATION TOWER ACCESS
656	BLANCO RIVER	2.3	1	1	3	3	AGG	2	2	2	2	2	1		1.83	H	1	1	2	2	1	1		1	1	1	1.22	L	$ 5,238.78	$ 57,159.60	
660	CASTLE CREEK	6.8	1	1	3	3	AGG	2	2	2	2	2	1		1.83	H	1	1	2		1	2		1	2	1	1.38	L	$ 5,466.71	$ 57,488.99	HIGH CHARACTERISTICS MILE 0-1, REST IS LOW CHAR., PLOWED FOR PRIVATE ACCESS
662	MILL CREEK	3.04	C	1	4	3	AGG	2	2	2	2	2	2		2.00	H	1	1	2	2	1	1	2	2	1	1	1.40	L	$ 2,663.57	$ 5,027.01	COUNTY JURISDICTION DUE TO DEVELOPMENTS
663	BUCKLES LAKE	7.54	C	1	3	3	AGG	2	2	1	2	2			1.80	H	1	1	2		1	2		1	1	1	1.25	L	$ 4,337.61	$ 58,053.29	POTENTIAL O&G DEV. MAY INFLUENCE CHARACTERISTICS & ISSUES
665	NIPPLE MOUNTAIN	11.73	C	1	3	3	AGG	2	2	1	2	2	2		1.83	H	2	1	2		1	2		1	1	1	1.38	L	$ 2,875.55	$ 53,675.00	
666	FAWN GULCH	4.7	1	1	3	3	AGG	2	2	2	2	2	2		2.00	H	1	1	1		1	1	1	1	2	1	1.11	L	$ 5,926.01	$ 58,747.39	
667	EAST FORK	4.2	C	1	3	3	AGG	2	1	2	2	2	2	1	1.71	H	2	1	2		1	2	1	2	1	2	1.56	H	$ 2,087.61	$ 69,434.20	UNKNOWN JURISDICTION AT BEGINNING OF ROAD,O&G EXPLORATION
668	LECHE CREEK	0.83	1	1	3	3	AGG	1	1	1	2	2	2		1.50	H	1	1	1		1	1		1	1	1	1.00	L	$ 4,025.80	$ 59,400.46	
684	QUARTZ CREEK	3.5	C	1	3	3	AGG	2	1	1	2	2			1.60	H	1	1	2	2	1	1	2	1	1	2	1.40	L	$ 3,511.93	$ 75,075.12	WELL INACTIVE, CONSIDER FOR DOWNGRADE TO L2
731	PRICE LAKES	7.67	C	1	3	3	AGG	2	2	1	2	2	2		1.83	H	1	1	2	2	1	2		1	2	1	1.44	L	$ 5,834.90	$ 59,350.46	
907	WILLIAMS CR TRAILHEAD	4.78	1	1	3	3	AGG	2				1			1.50	H	1	1	1		1	1		1	1	1	1.00	L	$ 29.08	$ 53,674.90	
919	BROCKOVER	0.8	1	1	3	3	AGG	1	2	2	2	1			1.60	H	1	1	1		1	1		1	1	2	1.13	L	$ 465.74	$ 60,895.70	CONSIDER DOWNGRADE TO LEVEL 2
923	NEWT JACK	2.76	1	1	3	3	AGG	1	2	2	2				1.75	H	1	1	2		1	1		1	1	1	1.13	L	$ 1,308.97	$ 56,398.46	
987	LAKE BED	1.4	1	1	3	3	AGG	1	1	1	2	1			1.20	L	1	1	1		1	1		1	1	1	1.00	L	$ 4,681.43	$ 56,048.00	
997	CHUB DRAW	1.53	C	1	3	3	AGG	1	2	1	2			1	1.40	L	1	1	1		1	1		1	1	2	1.13	L	$ 3,895.65	$ 68,839.37	FS GRAVEL PIT

Value and Risk Assessments

Not Applicable = 0	Annual Maintenance cost < $5,245	= 1 (Low Cost < approx. 67th percentile)
Low Value or Risk = 1	Annual Maintnenance cost >= $5,245	= 2 (High Cost > approx. 67th percentile)
High Value or Risk = 2	Deferred Maintenance Cost < $59,407	= 1 (Low Cost < approx. 67th percentile)
	Deferred Maintenance Cost >= $59,407	= 2 (High Cost > approx. 67th percentile)

Overall value and risk assessment ratings:

H = High for priority ranking >= 1.5
L = Low for priority ranking < 1.5

APPENDIX D

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