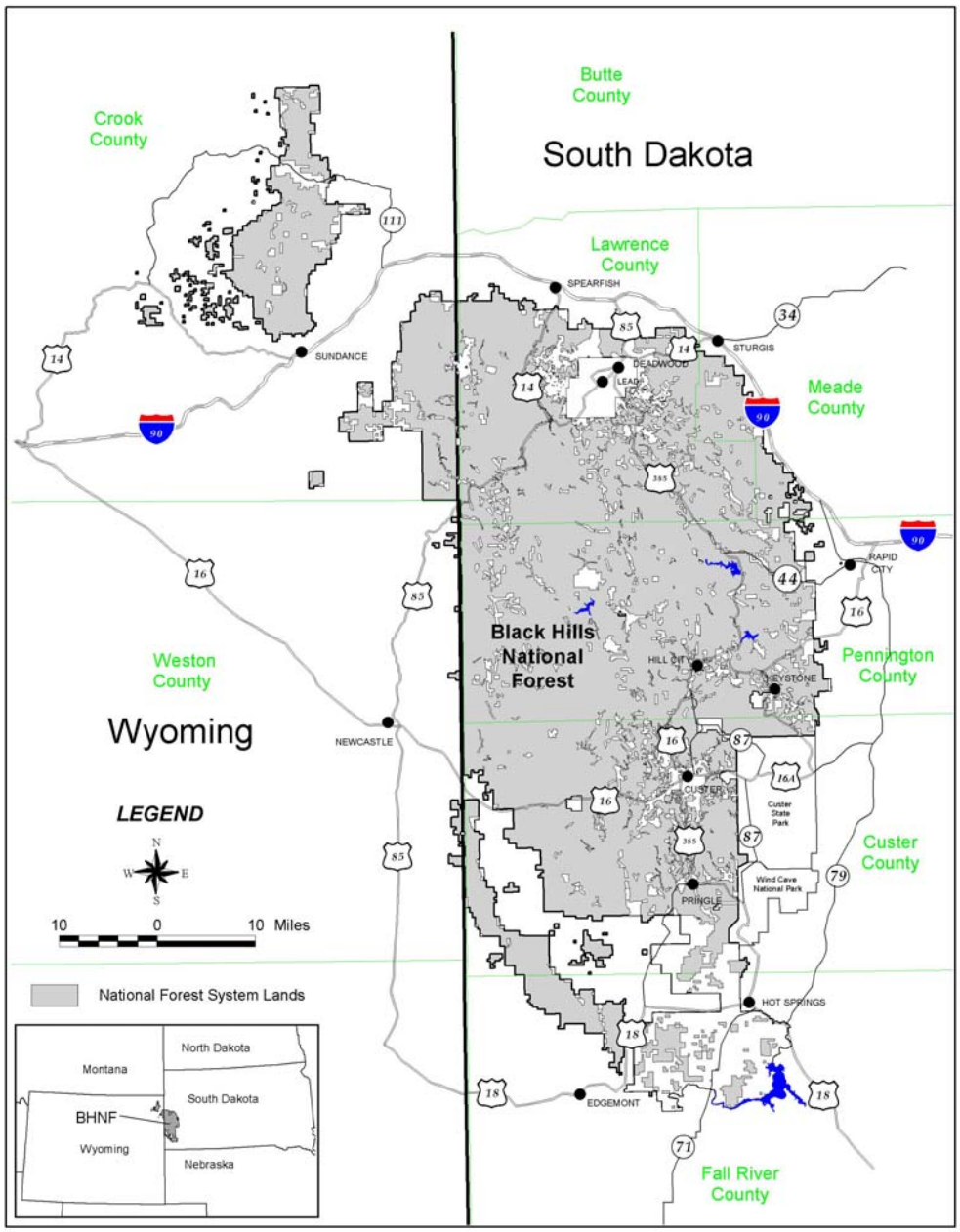
BLACK HILLS NATIONAL FOREST

FOREST-WIDE ROADS ANALYSIS REPORT



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ACRONYM/ABBREVIATIONS

%	Percent
AQ	Aquatics
AU	Administrative Use
BHNF	Black Hills National Forest
CCC	Civilian Conservation Corps
CDA	Connected Disturbed Area
CH	Cultural/Historical Issues
CR	Civil Rights and Environmental Justice
EC	Economics
EF	Ecosystem Functions
FHWA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act
GIS	Geographic Information System
GT	General Public Transportation
HUC	Hydrologic Unit Code
IDT	Interdisciplinary team
INFRA	Infrastructure Database
LRMP	Land and Resource Management Plan
MA	Management Area
ML	Maintenance Level
MM	Minerals Management
MOU	Memorandum of Understanding
NFMA	National Forest Management Act
NFSR	National Forest System Roads
PT	Protection
PV	Passive Use
R-2 Supplement	Region 2 Roads Analysis Supplement
RAP	Roads Analysis Process
RIS	Vegetative Cover
RM	Range Management
RNA	Research Natural Area
ROS	Recreation Opportunity Spectrum
RR	Motorized Recreation
RVD	Recreation visitor day
SDDOT	South Dakota Department of Transportation
SI	Social Issues
SP	Special Products
SUP	Special Use Permit
TES	Terrestrial Ecosystem Survey
TM	Timber Management
TW	Terrestrial Wildlife
UR	Non-Motorized Recreation
USDA	United States Department of Agriculture
WP	Water Projects

BACKGROUND

In August 1999, the Washington Office of the United States Department of Agriculture (USDA) Forest Service published Miscellaneous Report FS-643 titled *Roads Analysis: Informing Decisions about Managing the National Forest Transportation System* (USDA-Forest Service 1999a). 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, and have minimal negative ecological effects.

In January 2001, the Forest Service published the *Transportation Final Rule and Administrative Policy* authorizing units to use, as appropriate, the road analysis procedure embodied in FS-643 to assist land managers making major road management decisions.

In July 2004, the Rocky Mountain Region 2 published the latest update to the *R2 Roads Analysis Supplement to FS-643*. This supplement ties to Appendix 1 of Misc. Report FS-643 to be used in conjunction with that document. The R2 supplement is intended to provide guidance concerning the appropriate scale for addressing each question and the analysis needed. It has been and will continue to be updated.

PROCESS

Roads analysis is a six-step process. The steps are sequential, with the understanding that the process may require feedback 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 of progressing through the steps provides a set of possible issues and analysis questions the answers to which can inform choices about road system management. Decision makers and analysts determine the relevance of each question, incorporating public participation as deemed necessary.

Step 1. Setting up the Analysis

Step 2. Describing the Situation

Step 3. Identifying Issues

Step 4. Assessing Benefits, Problems and Risks

Step 5. Describing Opportunities and Setting Priorities

Step 6. Reporting

PRODUCTS

The products of this roads analysis are:

- A report for decision makers and the public that documents the information and analysis used to identify opportunities and set priorities for future national forest road systems.
- Road specific data that identifies estimated relative environmental concerns and relative public values associated with those roads.
- Identification of areas of special sensitivity or unique resource value.
- A summary of roads in nine categories that highlight groups of roads for future management needs based on the relative resource need and the relative value they provide to the public.
- Maps displaying the current road system with emphasis on the low clearance vehicle roads. Included are maps showing relative values for each low clearance vehicle road and priorities for future changes.

STEP 1: SETTING UP THE ANALYSIS

The purpose of Step 1 is to establish the level and type of decision making to be accomplished by the analysis. Specifically, this step identifies the objectives and scale for the analysis; develops a process plan for conducting the analysis; and clarifies the roles of technical specialists in the team.

1.1 OBJECTIVES OF THE ANALYSIS

This Roads Analysis Process (RAP) addresses the transportation system within the boundaries of the Black Hills National Forest, evaluating the existing condition of the system and identifying management opportunities. Recommendations for action apply only to those lands that fall within the boundary of the BHNF. This analysis considers social, cultural, economic, and ecosystem components that may overlap jurisdictional boundaries, but that could be affected by the actions taken on National Forest System lands.

Specifically, the objectives of the Roads Analysis Process are to:

- Provide basic road information to support project and Forest-level decision making.
- Identify prioritized opportunities that address watershed health and ecological need.
- Identify road maintenance issues.

1.2 SCALE OF THE ANALYSIS

This roads analysis will be conducted at a national forest scale. The analysis concentrates on Maintenance Level (ML) 3, 4, and 5 roads, though level 1 and 2 roads may be used for some specific resource analyses. Only existing information is used in the analysis; no new data has been collected.

1.3 INTERDISCIPLINARY TEAM MEMBERS AND PARTICIPANTS

Black Hills National Forest RAP Interdisciplinary Team (IDT) members (USFS) and/or participants:

Planner	Jeff Ulrich
Engineering	Craig Kjar
GIS Specialist	Ken Marchand
GIS Specialist	Lorrie Martinez
GIS Specialist	Todd Mills
Wildlife	Kerry Burns
Hydrologist	Monte Williams
Hydrologist	Les Gonyer
Timber	Blaine Cook
Recreation Specialist	Rick Hudson
Range	Craig Beckner
Botanist/Ecologist	Deanna Reyher

Fire/Fuels	Todd Pechota
Heritage	Dave McKee
Minerals	Rusty Wilder
Landscape Architect	Stephen Keegan
Fishery/Wildlife Biologist	Steve Hirtzel
Engineering / Transportation	Alan Anderson

Co-Authors: SAIC – Science Applications International Corp.

1.4 IDENTIFICATION OF INFORMATION SOURCES

The following sources of information were identified for use in the analysis:

- Geographic Information System (GIS) database information on the transportation system, recreation sites, suitable timber areas, heritage sites, right of ways, resource damage areas, fuels treatments areas, perennial streams, wildlife areas, and administrative and storage facilities.
- Budget information, (e.g., annual maintenance costs, deferred maintenance records, capital improvement costs).
- Data from the EIS (USDA-Forest Service 1996a) and Forest Plan (USDA-Forest Service 1997) concerning history, acres, management emphasis, current/future management directions, and location/status of landownership, rights-of-way, and easements and leased areas.
- Data from the EIS (USDA-Forest Service 1996a) and Forest Plan (USDA-Forest Service 1997) on wildlife, social and economic concerns, and cultural resources.
- Reports that describe the natural resources including climate, soils, geology, and water resources.
- Public comments relating to roads from Phase I amendment and Phase II scoping. Also, when available, public comments from past projects.
- Comments from county and state road management agencies that participate in the development and management of the road system in the Black Hills area.

1.5 ANALYSIS PLAN

The USFS IDT specialists, in cooperation with Science Applications International Corporation specialists, have conducted the analysis through a three stage process: the ranking of relative risk factors by road, the ranking of social and economic value considerations by road, and the consolidation of road risk and value rankings by road to identify opportunities for improvement or modification.

The first stage evaluates a set of individual maintenance level 3, 4, and 5 Forest Service System roads (passenger vehicle roads) based on the potential relative risk that the road presents to the selected resources. Forest Service System roads that are under the jurisdiction of the counties were also included in the analysis because they are heavily interconnected with roads under

Forest Service jurisdiction and the information could be useful if future projects are proposed that include major modifications. The road lengths were cropped at the Forest boundary. Small campground loop roads and short roads at administrative sites were not included. If a road had more than one jurisdiction or the functional classification it was divided into segments that allowed a unique identifier of road number, jurisdiction, and functional classification. There are 221 road segments or 959 miles of road in this category. Of these, 140 roads or 629 miles of roads have Forest Service jurisdiction and 81 roads or 330 miles of road have county jurisdiction. These numbers represent 13 percent of all Forest Service jurisdiction miles and 79 percent of all county jurisdiction miles.

The following resources have been identified for analysis:

1. **Hydrology** These risks are estimated by appropriate hydrology related parameters, such as road densities, soil types, slopes, proximity to streams, and number of stream crossings.
2. **Wildlife** These risks are estimated by appropriate wildlife related parameters such as road density and the road's proximity to Goshawk nests, Marten habitat, snail colonies, riparian areas, and American Dipper streams.
3. **Noxious Weeds**
4. **Resource Damage Area**
5. **Botanical Area**
6. **Heritage Area**
7. **Land Right of Way**
8. **Annual Maintenance and Deferred Maintenance Cost**

For the individual road evaluations, each road or road segment is analyzed using GIS tools for each evaluation parameter resulting in a number of occurrences per road. The distribution of occurrences using all roads is then reviewed and a relative risk factor is assigned to each road. using a 0 through 2 numbering system to identify the relative potential risk to the related resource. A 0 indicates an estimated lower than average relative risk. A 1 indicates a moderate relative risk, and a 2 indicates a higher than average relative risk. The dividing point between low, moderate, and high risk is determined for each parameter based upon available information and input from the individual specialists. An attempt is made to assign this risk value based on actual potential impacts on the resource using the professional judgment of specialists.

The Hydrology and Wildlife factors are each assigned a rating after summing the six contributing factors as noted in their risk descriptions in 1 and 2 above. Each of the eight general relative road risk factors is then added together for each road. The distribution of the total for all roads is then reviewed and an overall relative risk is assigned to each road (0, 1, or 2). An attempt is made to conservatively assign the individual risk numbers such that a final general high risk assignment is meaningful.

A more detailed description of the above analysis is presented in Appendix C, E and F of this report along with detailed spreadsheets showing the resulting data. Page sized black and white maps are presented in Appendix H. The digital information will also be available to future project level teams.

The second stage of the analysis evaluates the individual maintenance level 3, 4, and 5 roads based on the relative value that the road provides to forest users. The following values have been identified:

1. **Access to Suitable Timber**
2. **Access to Range Allotments**
3. **Firefighting Access**
4. **Access to Fuel Treatment Areas**
5. **Recreation Access**
6. **Cross Forest Transportation**
7. **Visual Integrity and Social**

The process used to assign value numbers to roads is identical to the process used to assign risk. An attempt is made to include all important, measurable value categories and to assign values that are realistic.

A more detailed description of the above analysis is presented in Appendix I of this report along with detailed spreadsheets showing the resulting data. Page sized black and white maps are presented in the map section, Appendix H. The digital information will also be available to future project level teams.

As a third and final stage, the rankings for risk and value are consolidated by road into a ranking of priority areas, or areas of concern. A 3 x 3 matrix table is constructed to display the number of roads that fall into each of nine categories. Each section of the table is given a category number (1 thru 9) based on risk and value ratings. A road with a low value and low risk would be in Category 9. A road with a moderate value and moderate risk would be in Category 5, and a road with a high value rating and high risk rating would be in Category 1. The important categories relative to identifying problem areas and management options to deal with them are the high risk categories (1, 2, and 3). The category that may provide the list of roads with the most realistic possibilities for closure and/or obliteration is Category 3, High Risk / Low Value unless there are other important reasons for keeping those roads open.

Recommendations on how to address these areas of concern are covered in section 5 of this report. More detailed recommendations could later be determined during the development of applicable project-scale analysis based on more current or more detailed site specific information.

An important value of this analysis lies in the identification of relatively high risk roads and the presentation of a large amount of detailed information that could be expected to be used as a reference by subsequent project level ID Teams.

STEP 2: DESCRIBING THE SITUATION

The purpose of Step 2 is to describe the existing road system in relation to current Forest Plan direction (USDA-Forest Service 1997). Step 2 also provides an overview of the physical, biological, social, cultural, economic, and political environment in relation to the road system. Although the entire road system is generally described in this step, this RAP focuses on ML 3, 4, and 5 roads as required by FS-643 (USDA-Forest Service 1999a) for a forest-scale analysis.

2.1 GENERAL SETTING

The Black Hills National Forest (BHNF or the Forest) is located in southwest South Dakota and northeast Wyoming. There are approximately 1.5 million acres within the proclaimed National Forest boundary.

The BHNF, with its numerous private, residential, and tourism-related inholdings, is one of the most developed forested areas in the nation (USDA-Forest Service 1996a). Within the proclaimed National Forest boundary, approximately 19 percent of the land is privately owned with entire towns, (e.g., Custer, Hill City, Keystone, Lead, and Deadwood) located within the Forest. Custer State Park, Mount Rushmore National Memorial, Wind Cave National Park, Mickelson Trail, and Jewel Cave National Monument are under other jurisdictions but are located within or are adjacent to the Forest. As a result, Forest Service roads in the BHNF exist within a network of roads included under the jurisdiction of Federal, State, County and private entities.

2.2 EXISTING ROAD SYSTEM

2.2.1 General Description

Beginning in the 1880's, railroads and stagecoach lines were built to accommodate the thousands of people who were coming to the Black Hills in response to the discovery of gold. An extensive rail system was developed to haul mining timbers from the forest to the mines. Large tracts of forest were cut in order to provide timber to the growing mining industry and to provide housing for the people living in the Black Hills. In 1897, the Black Hills Forest Reserve was established, and in 1898 the first timber sale was sold to Homestake Mining Company. By the 1920's, a major highway system was developed and a Forest Road System was initiated. Tourism also justified the construction of a transportation system that was adequate for automobiles, which during the 1930's was augmented by the Civilian Conservation Corps (CCC). Subsequent years have seen further augmentation providing a well spaced, efficient system of roads of all maintenance levels for many different users.

The transportation system currently in place within the Forest is a result of the historic uses described above, and the public's expectation that the Forest is available for their use through an extensive roaded system. The area has since been extensively managed for timber production, livestock grazing, mining activities, big game hunting, wildlife, insect and disease risk, fuels, and, for recreational activities along roads and trails that include hiking, horseback riding, mountain bike riding, ATV use and snowmobile riding.

All of the BHNF goals within the *1997 Land and Resource Management Plan* (LRMP) pertain in some fashion to the transportation system:

Goal 1. Protect basic soil, air, water and cave resources.

Goal 2. Provide for a variety of wildlife through management of biologically diverse ecosystems.

Goal 3. Provide for sustained commodity uses in an environmentally acceptable manner.

Goal 4. Provide for scenic quality, a range of recreational opportunities, and protection of heritage resources in response to the needs of the BHNF visitors and local communities.

Goal 5. In cooperation with other landowners, strive for improved landownership and access that benefit both public and private landowners.

Goal 6. Improve financial efficiency for all programs and projects.

Goal 7. Emphasize cooperation with individuals, organizations, and other agencies while coordinating planning and project implementation.

Goal 8. Promote rural development opportunities.

Goal 9. Provide high-quality customer service.

Objectives designed to achieve these goals involve construction, reconstruction, decommissioning, and maintenance of Forest Service roads and are discussed throughout this RAP.

There are currently 8,333 miles of inventoried roads within and adjacent to the BHNF boundary. These roads fall under multiple systems as listed in Table 2-1.

Table 2-1. Miles of Inventoried Road by System for the BHNF

System	Miles of Road	Density (miles/square mile
Forest Service Classified	5,238	2.19
County, State & Federal	380	0.16
Local and Private	10	0.01
Non-System - Unclassified	2705	1.13
Total	8,333	3.48

* These figures were taken from the Forest Service Infrastructure GIS database. The lengths of these roads were cropped at the Forest boundary. The analysis area encompasses 2,391 square miles within the Forest Boundary.

The 2,705 miles of Non-System roads are roads in the Forest that are not needed and are not maintained by the Forest Service. This statistic represents 32 percent of all inventoried roads within the Forest boundary and is a number equivalent to 52 percent of all Forest Service System roads in the Forest boundary. The nature of these roads varies but they are primarily two track roads that came into being by vehicles leaving regular NFSR's. The routes were traveled with

sufficient frequency to leave an easily noticeable traveled way. Many of these roads are relatively short. Because they are unplanned, they are more likely to be poorly located on the landscape and more likely to have higher erosion potential. The positions of these roads was obtained primarily from interpretation of aerial photographs and they have not all been ground verified. Attempts are made to close these roads when possible however funding and physical location of the roads often limit these efforts. Some of the Non-System roads are also temporary roads that were constructed for vegetation / timber management. They have a road template but they were closed, revegetated, and not put on the system.

2.2.2 Regional Connectivity

The Forest is highly connected to the wider region by 12 Forest Highways designated under the Public Lands Highways program of the Transportation Equity Act for the 21st Century (TEA21). These roads are owned by the State, County, or Forest Service and qualify for Federal funding for improvement or enhancement. A complete list of the Forest highways within the BHNF is provided in Appendix A.

Interstate 90 skirts the periphery of the Forest crossing South Dakota from west to east and passing along the east central and northeastern edges of the Black Hills. I-90 serves as a major access corridor to the Forest.

2.2.3 Forest Service Roads

The roads that are maintained and used for Forest management and other uses are referred to as National Forest System Roads (NFSR's) or System roads. These roads are maintained to various standards depending on their function, level of use, and management. Of the approximately 8,333 miles of inventoried roads on the Forest, there are 5,238 miles (62 percent) System roads that are within the Forest boundary. These roads fall within multiple jurisdictions, as described in the following paragraphs.

The 5,238 miles of Forest Service System roads are roads that cross primarily Forest land and have an NFSR number. Seven percent of these roads (362 miles) are under the jurisdiction of and are maintained by counties.

Table 2-2. Miles of Road by Jurisdiction for the National Forest System and Non-System Roads (NFSR's)

Jurisdiction	Miles of NFSR	Density (miles/square mile)
Forest Service	4,863	2.03
County,	362	0.17
Private	13	0.01
Total Forest Service System	5,238	2.19
Total Non-System - Unclassified	2,705	1.13

* These lengths are from the Forest Geographic Information System (GIS) and are cropped at the Forest boundary. The analysis area encompasses 2,391 square miles within the Forest Boundary.

The Forest Service has direct maintenance and repair responsibilities for NFSR's under Forest Service jurisdiction. NFSR's under county jurisdiction are maintained and repaired by them and have county road numbers and names. Several of the longer, cross-forest roads have sections that are Forest jurisdiction and sections that are county. The county sections primarily serve portions of the forest with high private land density and or high public traffic volumes. Some high speed arterial roads such as Deerfield Road and Sheridan Lake Road (both paved) are entirely under the jurisdiction of the counties. County and Forest Service representatives meet periodically to discuss issues related to county and Forest Service jurisdiction roads that are of joint interest particularly if a major change such as realignment or a surfacing change is planned for a road. Road jurisdictions are periodically transferred as situations change.

Roads within the NFSR network are categorized into three functional classes: arterial, collector, and local roads. Arterial roads are the primary roads of the forest, providing connections between human populations, major recreation sites, highways, and collector routes. Collector roads are those that collect and distribute traffic to multiple access points or local roads. Local roads provide access to smaller and specific sites and form a network within the Forest to provide administrative, commercial, and recreation access. The local roads can also be single-purpose roads (e.g., used for timber, recreation or mineral extraction access) that are designed for intermittent use and are generally closed to vehicular traffic when not in use.

There are five Maintenance Levels (MLs) used by the Forest Service to determine the work needed to preserve the investment in the road. These MLs are described in FSH 7709.58 – *Transportation System Maintenance Handbook* (1992) and are briefly defined as follows:

ML1. Basic Custodial Care (generally closed)

ML2. High Clearance Vehicles

ML3. Suitable for Passenger Cars

ML4. Suitable for Passenger Cars, Moderate Degree of User Comfort

ML5. Suitable for Passenger Cars, High Degree of User Comfort

Maintenance level 1 and 2 roads are primarily one lane, native surface roads for high clearance vehicles. They are usually very low speed with minimal traffic volumes. They are used for hiking, biking, OHV riding, forest management, resource extraction, etc. The ML 1 roads have been closed to traffic for protection of a resource and are usually grassed over.

The emphasis of this RAP is on ML 3, 4, and 5 System roads. ML 3, 4, and 5 roads are typically crowned, bordered with vegetated ditches, and have cross drains that are generally, appropriately spaced for erosion control purposes. ML 5 roads provide the highest standard of maintenance and are generally double-laned and paved. ML 4 roads provide a moderate level of user comfort, can be single- or double-laned, and have mostly aggregate (gravel) surfacing. ML 3 roads are typically single-laned with aggregate surfacing.

Although the correlation is not direct, arterial and collector roads are primarily composed of ML 3, 4, and 5 roads, which are managed for public access with passenger cars; local roads are largely composed of ML 1 and 2 roads, but can span the entire range of management levels.

Miles of road by maintenance level and Functional Class for Forest Service roads are provided in Table 2-3.

The current ML 3, 4, and 5 System roads (including campground loops and administrative sites) total 979 miles and comprise just under 19 percent of the NFSR system. The objective in the 1997 Forest Plan is to provide for 1,200 miles of roads suitable for passenger cars (ML 3, 4, and 5) by 2007.

Table 2-3. Miles of Road by Functional Class and Maintenance Level for System Roads within the BHNF

Maintenance Level	Arterial	Collector	Local	Total	Percentage of Total
1	0	0.2	1121	**1122**	**21.4%**
2	2.4	114	3020	**3136**	**59.9%**
3	63	377	79	**519**	**9.91%**
4	283	109	36	**428**	**8.2%**
5	16	7	9	**32**	**0.6%**
Total	**364**	**606**	**4,266**	**5,238**	

% percent

Source: BHNF Roads GIS Coverage

2.2.4 Forest Road Density

Forest Service roads within the BHNF generally display an even distribution with pockets of higher density around cities and major points of interest. Road densities for the NFSR network have been calculated at several scales (i.e., total forest, ranger district, management area, and 6th -order watershed). Results at the levels of the Management Area, Ranger District, Forest, and Range Allotments are shown in Appendix B.

The road density of all System roads within the BHNF boundary was calculated to be 2.19 miles/square mile. National Forest System density, by comparison, was determined to be 2.03 miles/square mile. When the user-created Non-System roads are included, the density rises to 3.48.

2.2.5 Travel Management Objectives and Standards

Standards for the management of motorized travel in the BHNF are specified in the LRMP (USDA-Forest Service 1997). In general, designated NFSRs are open all year to appropriate motorized vehicle use, unless closed for one or more of the following:

Motorized use conflicts with Forest Plan objectives;

Motorized use is incompatible with the Recreation Opportunity Spectrum (ROS) class;

Motorized use creates user conflicts that result in unsafe conditions;

Physical characteristics of travelway(s) preclude any form of motorized use;

Travelways do not serve an existing or identified future public need;

Financing is not available for maintenance necessary to protect resources; or

Seasonal travel restrictions are required.

Based upon MA designations and their associated travel standards, unrestricted access is allowed on approximately 55 percent of the BHNF on a year-round basis. Access is either restricted or prohibited on the remaining 45 percent of the Forest. Motorized travel is restricted to designated routes in 11 percent of the Forest to protect sensitive areas. Seasonal restrictions are applied to 32 percent of the Forest to protect wildlife within the Big Game Winter Range Emphasis Area (MA 5.4). Restricted areas are managed to provide high-quality winter and transitional habitat for deer and elk, high-quality turkey habitat, habitat for other species, and a variety of multiple uses. Motorized travel is prohibited in two percent of the Forest. Travel opportunity objectives for the BHNF as identified in the LRMP are shown in Table 2-5 (USDA-Forest Service 1997). Travel management standards for each Forest Management Area (MA) are shown in Table 2-4.

The new Black Hills National Forest Travel Information Map (2005) shows specific closure areas and roads that are closed seasonally and yearlong. There are 1,122 miles of closed National Forest System Roads on the Forest. An additional 661 miles of roads are closed seasonally.

Table 2-4. Travel Management Standards for the BHNF Management Areas

Management Area #	Management Areas	Motorized Road Travel	Motorized Off-Road Travel	Snowmobile Travel
1.1A	Black Elk Wilderness	Prohibited	Prohibited	Prohibited
3.1	Botanical Areas	Restricted*	Prohibited	Restricted*
3.2A	Inyan Kara Mountain	Prohibited	Prohibited	Prohibited
3.31	Backcountry Motorized Vehicle Recreation Emphasis	Allowed	Restricted **	Allowed
3.32	Backcountry Non-motorized Recreation Emphasis	Prohibited	Prohibited	Restricted*
3.7	Late Successional Forest Landscape	Restricted*	Prohibited	Restricted*
4.1	Limited Motorized Use and Forest Product Emphasis	Restricted*	Prohibited	Restricted*
4.2A	Spearfish Canyon	Restricted*	Prohibited	Restricted*
4.2B	Peter Norbeck Scenic Byway (Section within the Norbeck Wildlife Preserve)	Restricted*	Prohibited	Restricted*
5.1	Resource Production Emphasis	Allowed	Allowed	Allowed
5.1A	Southern Hills Forest and Grassland Areas	Allowed	Allowed	Allowed
5.2A	Fort Meade VA Hospital Watershed	Restricted*	Prohibited	Restricted*
5.3A	Black Hills Experimental Forest	Allowed	Allowed	Allowed
5.3B	Sturgis Experimental Watershed	Restricted*	Prohibited	Restricted*

Table 2-4. Travel Management Standards for the BHNF Management Areas

Management Area #	Management Areas	Motorized Road Travel	Motorized Off-Road Travel	Snowmobile Travel
5.4	Big Game Winter Range Emphasis (Formerly Low-Elevation Wildlife Habitat)	Restricted***	Restricted ***	Restricted*
5.4A	Norbeck Wildlife Preserve	Restricted*	Prohibited	Restricted*
5.43	Big Game and Resource Production	Restricted*	Prohibited	Restricted*
5.6	Forest Products, Recreation and Big Game Emphasis	Allowed	Allowed	Allowed
8.2	Developed Recreation Complexes	Restricted*	Prohibited	Restricted*

* Restricted to Designated Routes** Restricted to Designated Trails*** Seasonal or yearlong restrictions may apply

Table 2-5. Travel Opportunity Objectives for the BHNF

Category	Percentage of Forest
All Motorized Travel Allowed Yearlong	59.1%
Seasonal Restrictions Apply	22.8%
Seasonal Restrictions – No Off-Road Travel	3.2%
Backcountry Motorized Recreation on Designated Trails	1.0%
Only OHV Travel Prohibited	11.4%
Motorized Travel Prohibited Except Snowmobiles	1.2%
All Motorized Travel Prohibited	1.3%

% percent

2.2.6 Use Patterns

While use of the road system by local residents is generally constant throughout the year, recreational road use and road use during hunting season in the Black Hills is both heavy and seasonal. The majority of the estimated 1.7 million site visits per year visit during the tourist season, which generally extends from Memorial Day to Labor Day (USDA-Forest Service 1996a). Winter road use is lighter and allows for seasonal road restrictions to be applied between October and May, as necessary.

In addition to standard recreational use, special events that test the capacity of the road system occur during the tourist season. One example is the Sturgis Motorcycle Rally, which occurs once a year for 1 to 2 weeks in August. During this event, more than half a million motorcycle enthusiasts converge in the Black Hills for the rally. The event routes the bikers on a number of different tours through the Northern, Central, and Southern portions of the Black Hills. In addition, the event attracts thousands of vendors to the town of Sturgis where an annual rally is held. Most motorcycle travel is on paved roads

2.2.7 National Forest System Roads Budget

The budget allocation for planning, construction, capital improvement, and maintenance of roads on the Black Hills has been decreasing noticeably in the last three years. The funding decreased from 3.2 million dollars in 2003 to 2.9 million in 2004 and then 2.3 million in 2005. Capital improvement funds acquired to conduct the road improvement work necessary to bring the roads up to the desired objective have been minimal in past years. The overall level of federal funding is not sufficient to perform the short and long term maintenance needs identified for Forest Service System Roads in general. As a result the long term condition of level 3, 4, and 5 roads are expected to deteriorate. A more detailed discussion of road related costs and funding sources is presented in the answer to question EC(1) - Economics on page 4-15

2.2.8 Scenic Byways

The major recreation activity in the BHNF is driving for pleasure and viewing scenery (USDA-Forest Service 1996a). To accommodate this recreational use and recognize scenic and popular routes, two scenic byways were created within the Forest, the Peter Norbeck and Spearfish Canyon Scenic Byways.

The Peter Norbeck Scenic Byway is a 70-mile drive through the heart of the Black Hills granitic core. This byway includes parts of U.S. Highway 16A (the Iron Mountain Road), S.D. Highway 87 (the Needles Highway), S.D. Highway 89 (the Sylvan Lake Road), and S.D. Highway 244 (the Mount Rushmore Highway). It lies adjacent, and provides access to, Mount Rushmore National Memorial and Custer State Park.

The Spearfish Canyon Scenic Byway is an 18-mile drive through a canyon carved into the sedimentary shale and limestone units in the Northern Hills Ranger District. This byway runs along U.S. Highway 14A between the towns of Spearfish and Cheyenne Crossing providing access to waterfalls, wildlife, and numerous recreational activities.

2.3 PHYSICAL ENVIRONMENT

2.3.1 Geographic Features

The Black Hills is an isolated group of rugged mountains that rise high above the surrounding plains. The Black Hills uplift formed about 62 million years ago as an elongated dome that is about 120 miles long by 60 miles wide. An extensive period of erosion occurred during and after the uplift, removing approximately 7,500 feet of sedimentary rocks and exposing the Precambrian crystalline rocks in the central portion of the Black Hills. The exposed igneous and metamorphic Precambrian rocks are referred to as the central core, extending from near Lead, South Dakota to south of Custer, South Dakota.

A layered series of sedimentary rocks is exposed, indicating the presence of roughly concentric rings around the central core. The inner rings of sedimentary rocks are primarily limestone and dolomites, which create the Limestone Plateau or the Minnelusa Foothills, a high altitude area of generally low relief in the western side of the Hills. Due to their karst features, these formations contain the major aquifers for the area and one of the world's largest collections of caves and

sinkholes. Most notable is the Jewel Cave (located off of U.S. Highway 16), which extends for more than 105 miles below the surface. Peripheral to these limestone units are the less resistant siltstone and gypsiferous shales, which eroded to create low areas such as the Red Valley in the northern portion of the Hills. The outer ring of sedimentary rocks forms a ridge, known as the "Hogback", which is composed of massive to thinly bedded sandstones, siltstones, and claystones. The ridge forms a general boundary between the Black Hills and the prairie (USDA-Forest Service 1996a).

Road construction and location are often linked to the geologic features of an area. The stability of the roadbed and difficulties in constructing the road (e.g., whether or not blasting is necessary) are both dependant upon the underlying geologic structure of the area.

2.3.2 Climate

The climate of the Black Hills area is continental and, therefore, highly variable. The area as a whole is characterized by hot summers, cold winters, and extreme variations in both precipitation and temperatures (Johnson 1933). These conditions are known to damage the road system. Spring storms, from April to June, account for approximately 50 percent of the yearly precipitation. These storms can be so intense that they wash out entire sections of roads and bridges. Additionally, roads can be damaged by frost heave, whereby the freezing of the ground causes the ground surface to heave and lift pavements. During the spring thaw, the foundation soil once again softens as the ice melts and weakens the structural support for the pavement, leading to cracks (McGee 1996).

2.3.3 Soil Conditions

Soils of the Black Hills are generally stable and productive, but there are also areas of erosive soils (USDA-Forest Service 1996a), which can be affected by road construction. The most erosive soils are derived from igneous rock of the central core and the interbedded siltstones, shales, and gypsum that are found in the Red Valley and the Hogback. Approximately 89 percent of the soils on National Forest System lands within the Forest are non erosive. Where more highly erosive soils do exist, soil loss is generally mitigated by the stabilizing effects of vegetative ground cover.

Mass movement of soils (gravity-induced movement of a portion of the land surface) also occurs on the Black Hills, primarily associated with the steep slopes of the Hogback in the northern and eastern portion of the Forest. Several landslides have also occurred in the Cook Lake area of the Bearlodge Mountains and in the Minnelusa Foothills. Higher precipitation rates in the northern Black Hills may contribute to the mass-movement potential in that area. Although the central core area is generally stable, road cutbanks in the micaceous schist may slump when the cut-slopes are parallel to the layers of bedrock (USDA-Forest Service 1996a).

Roads have the potential to increase natural rates of soil erosion by altering hydrologic flows and surface runoff and as a result of the land clearing, grading, and surfacing required for their construction. Although roads are designed to eliminate or mitigate soil loss, erosion can occur on the cut-and-fill slopes, the surface of the road, and the ditches paralleling the road. The amount of erosion is dependent upon the road surfacing, the cross drainage off the road surface,

the road material, and the cut-and fill soil types and slopes and the revegetation of these areas. Roads also have the potential to effect slumping or slope failure (mass movement) if road alignments cross unstable slopes. Revegetation of disturbed soils, mulching, silt fences, and drainage structures which are management practice applied by the Forest Service during road construction, can be expected to generally reduce on-site soil loss, water runoff, and sediment movement from general precipitation events and high intensity storms.

2.3.4 Surface Water

Surface water in the Black Hills area is highly influenced by geologic conditions. Numerous headwater springs, originating primarily from the Madison and Minnelusa aquifers, occur in the Limestone Plateau area and provide base flow for many Black Hills streams. These streams flow across the igneous and metamorphic rocks in the central core area, which is relatively impervious to water. As they cross the outcrops of the Madison and Minnekahta limestone formations, however, most of the streams lose all or part of their flow. Large artesian springs occur in many locations down-gradient from the loss zones. These artesian springs provide an important source of base flow in the many streams beyond the periphery of the Black Hills (USDA-Forest Service1996a).

Stream flow varies, coincident with the climate, from the southern to the northern Black Hills. Lack of precipitation between October and April contributes to most streams in the southern Black Hills area to be intermittent or ephemeral, whereas most of the streams in the northern Black Hills have perennial flow. All of the streams within the Forest empty into two encircling rivers, the Belle Fourche and the Cheyenne Rivers (USDA-Forest Service 1996a).

2.4 BIOLOGICAL ENVIRONMENT

The climatic and physical environment of the Black Hills has shaped the biological environment in unique ways. According to Bailey (1995), the Black Hills comprise an ecoregion distinct from the Southern Rocky Mountains and Great Plains, which contain all other lands administered by Region 2 of the Forest Service.

In many respects, the Black Hills can be thought of as a crossroads between east and west, north and south (USDA-Forest Service 1996a). The area's unique faunal and floral assemblages are primarily a consequence of several invasions and retreats of biotic communities found elsewhere since the Pleistocene glaciation. With roughly 139 bird, seven amphibian, 15 reptile, 62 mammalian, and 29 fish species and four major vegetative complexes, the Black Hills area represents a melting pot of species and habitats found at the periphery of their respective ranges and whose population cores are generally located elsewhere in North America (USDA-Forest Service 1996a). Some have estimated that only half a percent of Black Hills species may be considered endemic (McIntosh 1931).

The BHNF is predominately a Rocky Mountain Coniferous Forest Complex dominated by ponderosa pine and home to many western species including mule deer, mountain bluebird and western tanager. Northern species such as white spruce, paper birch, pine marten, red-breasted nuthatch, golden-crowned kinglet, gray jay; and Eastern deciduous hardwood species (e.g., bur oak, eastern hophornbeam,) and other eastern species (e.g., white-tailed deer, broad-winged

hawk, and ovenbird) also reside on the Forest. Over 80 percent of the Forest is currently in a forested condition. Meadows or prairie grasslands characterize a small portion of the Forest. Meadows are interspersed among montane forest; prairie habitat exists at lower elevations and is considered part of the Grassland Complex of the northern Great Plains.

Roads have the potential to affect the biological environment in a variety of ways. Adverse effects may include habitat loss, habitat fragmentation, sedimentation and/or soil movement and increased wildlife mortality from collisions with vehicles. For some species, especially aquatic species, roads may form insurmountable physical barriers to movement, effectively isolating them from other populations and/or habitats. Indirect adverse effects may result from increased human activity, vehicle noise and disturbance during critical periods such as breeding, nesting, or hibernation. These indirect effects may alter normal behavior and movements and can impact reproductive success and survival. In addition, road construction and road maintenance activities may create vectors for the establishment and invasion of noxious weeds.

In contrast, roads provide a number of benefits for humans including increased access to the Forest by the general public, resource managers, and researchers. By acting as artificial firebreaks, roads may also contribute to the protection of towns, wildlife habitats and botanical communities. Additionally, scarification from road construction, reconstruction, or maintenance, specifically in ponderosa pine stands, creates opportunities for access to forest products.

2.5 SOCIAL, CULTURAL, ECONOMIC, AND POLITICAL ENVIRONMENT

Motorized use of the Forest has a long history, and people are accustomed to utilizing the road system to access the Forest for economic, social, and cultural purposes. Any decisions made regarding the road system, including closures and construction, therefore become a public issue. As a result, Federal land managers operate in a social-economic context, attempting to balance and sustain productive uses with other qualities of the land that are valued in a manner that is expected to best serve the greater public both now and into the future. The following sections describe the social, cultural, economic and political environment in which the road system exists.

2.5.1 Historic Use

For centuries before the present road system was developed, numerous American Indian tribes, including the Arapaho, Cheyenne, Kiowa-Apache, Crow Shoshone, and Sioux, sustained themselves on the natural resources of the area. Hunting, fishing, and gathering of vegetative products provided food and shelter. Later, buffalo, sheep, and cattle were grazed. The spiritual foundation of American Indian tribes is tied to the land and its resources. Many of their cultural practices, (e.g., gathering plants for ceremonial and medicinal purposes) occur on National Forest System Lands and their unique cultures and traditional values add to the richness of the Black Hills social environment.

The influx of immigrants into the area during the late 1800s led to the expansion and improvement of the transportation system in the Black Hills to provide access for mining, grazing, and logging activities. Paths and trails that were likely used for foot or horse travel by American Indians were developed into more formal routes for wagons and wheeled vehicles.

Large tracts of forest were cut in order to provide timber to the growing mining industry and to provide housing for the people now residing in the Black Hills. By the 1920s, a major highway system was developed and a Forest Road System was initiated. The Civilian Conservation Corps augmented the system in the 1930s to accommodate tourists traveling in passenger vehicles.

The present ML 3, 4, and 5 road system has evolved largely in response to development within the Black Hills over the past 100 years, particularly from logging and the demand for access to private property. For long-time local residents who depend on these uses, it is important for resources to be managed in a way that sustains economic viability. More recently, the natural beauty and features of the area have prompted increased levels of tourism and recreation, which have also benefited from the road system.

In the past decade, areas have been restricted from motorized use in order to protect soil and water resources or to reduce disturbance to big game in critical winter range. These access restrictions have garnered opposition because closing areas to motorized use can affect traditional access patterns. On the other hand, support for road closures is received from numerous conservation groups, landowners, and other government agencies.

2.5.2 Economic Characteristics

The ease of access to the Forest can generate economic benefits, which are gained at local, regional, and national levels. The local economy benefits from the well-maintained roads that link communities to one another and to the greater region, which in turn fosters community development and facilitates access for fire suppression and emergency response. The NFSR system also provides a route of entry into the Forest for industries that rely on forest products, most notably timber harvest activities. Finally, roads channel tourists, and associated income into the area. A majority of the tourism on the Forest is motorized.

2.5.3 Private Land Development

Private land is an important component of the Black Hills and factors into transportation decisions made for the Forest. Homesteading acts opened the Black Hills to farming during the first decade of the 1900s and, while many of the farms proved unproductive, the homesteads and mining claims created thousands of private in-holdings within the Forest. Today, many of these in-holdings have homes or other developments on them giving the Black Hills the appearance of being one of the most developed forested areas in the nation (USDA-Forest Service 1996a). Applications for private land access under the FLPMA (Federal Land Policy and Management Act (FLPMA) of 1976) are increasing on the Forest. At times the Forest is receiving 1-2 applications per week. These are generally applications for ML 2 roads. Some applications are to use existing NFSR roads and some are for new construction. The new FLPMA roads will contribute to increased traffic on ML 3, 4, and 5 Forest roads.

Development of private land within the Forest boundary is predicted to continue at a constant rate over the next decade, which will place additional demands on the existing road system. The most rapid land development is occurring along the corridors within Boulder Canyon; along U.S. Highway 85 in the northern Hills; the Hill City area; toward Rapid City along Sheridan Lake road, and along Highways 385, 44, and 16 (USDA-Forest Service 1996a). Within 10 years,

private lands along these corridors could be upwards of 80 percent developed, resulting in increased traffic. The increase in residential traffic is expected to be greatest along the narrow strip adjacent to Interstate 90 where intense residential development is creating an annual growth rate of over 10 percent (USDA-Forest Service 1996a). As communities continue to grow, the level of human interest and activities could be expected to intensify. As a result, differences in social, economic, and cultural values may become more of an issue.

2.6 ROADLESS AREAS

Motorized travel is prohibited in four areas of the Forest for a variety of reasons. The first area is the Black Elk Wilderness in Pennington and Custer Counties, which Congress first designated as a wilderness in 1980. Recent congressional action expanded the wilderness by approximately 3,600 acres so that its land area now totals 13,420 acres. The objective of management is to allow ecological processes to operate relatively free from the influence of humans.

The other three areas (Sand Creek, Inyan Kara, and Beaver Park) met the criteria for roadless consideration under the 1978 RARE II study. They are considered the official roadless area inventory for the Black Hills. Sand Creek is a 7,944-acre roadless area located approximately 14 miles east of Sundance, Wyoming. This acreage was recently recalculated from 9,948 used in the 1997 Record of Decision (ROD) for the BHNF LRMP using GIS methods. There was no change in the boundary. It offers some spectacular scenery, primarily along Idol Gulch and Spotted Tail Creek, with cliffs and steep slopes of limestone in excess of 45 percent and elevation differences of more than 500 feet. Portions of the Sand Creek area are managed under four different management areas per the 1997 ROD for the BHNF LRMP. Inyan Kara is a 1,397-acre tree-covered dome-like upheaval surrounded by a grass-covered prairie. Because of the island effect, its presence establishes itself as a focal point on the landscape. The area is managed in an essentially unroaded condition as a Special Interest Area because of its cultural and botanical features. Beaver Park is a 5,109-acre area approximately five miles south of Sturgis, South Dakota, in the northeastern corner of the Forest with steep side slopes and an elevation change of 1,400 feet that dominate its topography. Portions of the Beaver Park area are managed under four different management areas per the 1997 ROD for the BHNF LRMP

2.6.1 Ecological Characteristics

The Black Elk Wilderness area contains Harney Peak, the highest point east of the Rocky Mountains, and includes the Upper Pine Creek Research Natural Area (RNA). It also contains 883 acres within the Norbeck Wildlife Preserve. The Black Elk Wilderness, Mt. Rushmore National Monument and The Needles area of Custer State Park collectively make up an area locally referred to as The High Granite Region. This area is ecologically distinctive from the lower and somewhat drier sites surrounding it (USDA-Forest Service 1996a). Massive granite outcrops rising above mature forest dominate the overall visual landscape. In some areas, however, natural openings occur in the forest canopy due to insect and disease infestations, montane meadows, recently burned areas and tree blowdown. The dominant forest associations of the Black Elk Wilderness are mature ponderosa pine (*Pinus ponderosa*) with areas of quaking aspen (*Populus tremuloides*), white spruce (*Picea glauca*), and other hardwoods are also present.

Inyan Kara

Inyan Kara is a forested dome-like landscape entirely surrounded by prairie, making it a visual and ecological focal point of the surrounding landscape. Areas of steep volcanic rock formations, including columns of laccoliths that rise to near vertical plane, are common.

Ponderosa pine forest is the most conspicuous vegetative element; however, stands of Rocky Mountain juniper (*Juniperus scopulorum*), quaking aspen, birch (*Betula spp*.), and bur oak (*Quercus macrocarpa*) are also present. There is a considerable amount of natural dead and down woody material in the area and dead and standing trees due to fire, insect and disease. At some sites, more mature pockets of trees or dense "dog-hair" stands occur.

Wildlife species of both the prairie and forest ecosystems are present. Because of Inyan Kara's isolated and remote nature, and the inaccessibility due to the lack of public access, scant research or documentation exists with respect to wildlife species present at this site.

Sand Creek

Steep slopes with elevation differences of more than 500 feet along Idol Gulch and Spotted Tail Creek have contributed to the Sand Creek area isolation and being relatively limited disturbances associated with past road development and timber management activities. Evidence of historic mining is present in the form of old shacks and roads, mostly across the creeks and outside the area.

Much of the area is characterized by Ponderosa Pine Forest and Upland Aspen community types, but some mesic Paper Birch (*Betula papyrifera*)/Hazel (*Corylus spp.)* Forest stands are also present. Finescale dace (*Phoxinus neogaeus*) were introduced into the Sand Creek drainage in 1982, but failed to become established.

Beaver Park

The Beaver Park area consists of foothills and upper watersheds of small drainages found along the eastern front of the Black Hills. Steep-sided slopes of shale-talus, limestone-talus and shallow to moderately deep soils are common. Livestock grazing use is permitted; however, the steep topography of the area and intermittent nature of water in stream-beds physically limits grazing use. Recently the area has suffered a nearly 100 percent kill of ponderosa pine stands as a result of mountain pine beetle infestation. Motorized access to the area was authorized to treat the beetle infestation and fuel build-up.

Bur Oak /Ironwood (*Ostrya virginiana*) Forests, Creeping Juniper (*Juniperus horizontalis*) Shrublands and Northern Great Plains Little Bluestem (*Schizachyrium scoparium*) Prairie communities are present in the area. Small stands of quaking aspen and birch species may also be found.

2.6.2 Social and Cultural Values

Some people value well-managed access to the forest for multiple-use. Many of these uses tend to generate road construction. Roads allow for pleasure driving and provide access for hunting,

camping, and other dispersed recreation. The issue of equity is also important to people with disabilities or limited mobility (e.g., the elderly) who cannot partake in wilderness opportunities without roads. However, roads also reduce the supply of roadless areas that provide for a more primitive recreation experience. Some people greatly value the chance to find solitude in remote and natural settings. Yet others believe that wilderness is essential for ecological reasons, and the slow conversion of landscape by the presence of people has broader implications on the human environment and health.

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STEP 3: IDENTIFYING ISSUES

The primary purpose of Step 3 is to identify and summarize the key issues affecting road-related management. These issues should be considered for analysis in future project level road analysis. The relevance of these issues may vary depending on the specific analysis area conditions.

3.1 IDENTIFYING ISSUES

Road-related issues for the BHNF were generated from the following sources: public response to the Phase II Amendment Notice of Intent, public response to a variety of other project proposals, IDT member input, review of existing documents, discussions with other public agencies, and local knowledge. The issues identified through these sources have been classified into three general categories:

- Economic Issues
- Social/Cultural Issues
- Environmental Issues

Issues in each of these categories are described in the following discussions.

3.1.1 Economic Issues

The following economic issues were identified as being of concern to the public.

1. Access to and from residential and commercial areas on ML 3, 4, and 5 roads within the Forest leads to increased vehicle travel and corresponding requests for higher roadway design standards and increased maintenance demands, such as snow plowing.
2. Traffic volumes and maintenance requirements from public use of ML 3, 4, and 5 roads may necessitate evaluation of road jurisdiction and/or maintenance responsibility transfers.
3. A number of different conditions in the Forest create or contribute to road maintenance funding needs and put pressure on a Forest budget that is already underfunded to meet all of the maintenance needs of the ML 3, 4, and 5 roads. These conditions include:
    - Catastrophic events, such as fire and floods, which create unexpected ML 3, 4, and 5 road maintenance funding needs; and
    - Outdated road designs and roads in locations subject to resource damage, which contribute to increased maintenance demands and may necessitate relocation and/or reconstruction.
4. The Forest Service does not have a legal right-of-way on some ML 3, 4, and 5 roads.
5. While timber purchasers maintain a portion of ML 3, 4, and 5 roads in the forest, the amount of maintenance is directly dependent on the volume of timber harvest and can, therefore, be variable.

6. ML 3, 4, and 5 road closures or maintenance level modifications may impact private businesses and commuters who directly depend on the roads for their economic well-being.
7. Many local economies depend on ease of tourist access over ML 3, 4, and 5 roads. Some private businesses depend on ML 3, 4, and 5 roads as snowmobile trails in the winter.

3.1.2 Social/Cultural Issues

The following social and cultural issues were identified as being of concern to the public.

1. Roads and driveways serving residential areas and business that intersect with Forest roads create vehicle speed and turning movement conflicts that can increase the potential for accidents (damaged vehicles and personal injury).
2. The mix of vehicles (large trucks, high- and low-clearance personal vehicles, all terrain vehicles, motorcycles, snowmobiles) traveling at different traffic speeds on ML 3, 4, and 5 roads create conflicts that can lead to traffic accidents and congestion.
3. Having ML 3, 4, and 5 roads adjacent to traditional, cultural, and historic sites in the BHNF can lead to vandalism of those sites.
4. ML 3, 4, and 5 road closures or maintenance level modifications may impact access to traditional, cultural, historical, residential, and commercial sites.
5. ML 3, 4, and 5 road closures or maintenance level modifications may impact access by Forest Service employees, permittees, cooperators, private owners, and other land management agencies (e.g., State, National Park Service) for management activities (e.g., fire, insect, disease, timber, range, minerals, water, fish, wildlife, and recreation).

3.1.3 Environmental Issues

The following environmental issues were identified as being of concern to the public.

1. Road use may reduce habitat effectiveness for threatened, endangered and sensitive species and species of local concern.
2. Roads may fragment wildlife habitats and populations and reduce species viability.
3. Road use may result in animal/vehicle collisions (which threatens humans as well as animals).
4. Roads located near streams or those with unimproved stream crossings may cause or increase erosion, degrade water quality, and/or impede the passage of aquatic organisms.
5. Road use, maintenance, and reconstruction may facilitate the spread of noxious weeds.

3.2 STATUS OF CURRENT DATA

Much of the data necessary to address the issues raised in Section 3.1 can be derived from existing GIS coverages available for the BHNF or available in existing documents.

Existing GIS coverages include:

- Roads
- Vegetative Cover (RIS)
- Streams
- Watersheds
- Management Areas
- Ranger District and BHNF Boundaries
- Topographic Quad Sheets

Existing documents include:

- BHNF LRMP (USDA-Forest Service 1997)
- Schedule A County Road Agreements for Crook, Lawrence, Meade, Pennington, and Custer counties (USDA-Forest Service 2000b)
- Travel management maps
- Road inventory and deferred maintenance summary (USDA-Forest Service 2003b)
- List of forest highways
- Scenic byway brochures for Spearfish Canyon and Peter Norbeck scenic byways
- Roads budget information from fiscal year 1997 through fiscal year 2005
- Road management objectives worksheet for ML 3, 4, and 5 roads

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STEP 4: ASSESSING BENEFITS, PROBLEMS, AND RISKS

The primary purpose of Step 4 is to examine the major uses and effects of the road system at the forest level to assess the various benefits, problems, and risks of the current road system and to assess whether or not the objectives of Forest Service policy reform and Forest plans are being met.

4.1 METHOD

For the purpose of this roads analysis, the Rocky Mountain Region 2 Roads Analysis Supplement (R-2 Supplement) to FS-643 (USDA – Forest Service 2004d) was used in conjunction with FS-643 (USDA-Forest Service 1999a) as an outline of questions to be answered to assess benefits, problems, and risks. Benefits are defined as the potential uses and socioeconomic gains provided by roads and related access. Problems are conditions for certain environmental, social, and economic attributes that managers deem to be unacceptable related to the road system. Risks are likely future losses in environmental, social, and economic attributes if the road system remains unchanged.

The R-2 Roads Analysis Supplement guideline document (USDA-Forest Service 2004d) provides direction and suggestions about the best scale at which each question could be answered. The overall guidance was used for this process. The questions identified in the R-2 Supplement are intended to scan the range of possible benefits, problems and risks, guide more in-depth assessment, and link to the scientific basis for each of the identified benefits, problems, and risks.

The R-2 Supplement contains 67 questions grouped into 12 major topics as follows:

- Aquatics (AQ)
- Terrestrial Wildlife (TW)
- Ecosystem Functions (EF)
- Economics (EC)
- Timber Management (TM)
- Minerals Management (MM)
- Range Management (RM)
- Water Projects (WP)
- Special Products (SP)
- Special Use Permits (SUPs)
- General Public Transportation (GT)
- Administrative Use (AU)
- Protection (PT)
- Non-Motorized Recreation (UR)
- Motorized Recreation (RR)
- Passive Use (PV)
- Social Issues (SI)
- Cultural/Historical Issues (CH)
- Civil Rights and Environmental Justice (CR)

Questions were answered for ML 3, 4, and 5 roads unless otherwise indicated.

4.2 AQUATICS (AQ)

Given that this is a forest-wide (i.e., programmatic) RAP, examination of the aquatic questions focuses on identifying watersheds where there is a higher relative risk of loss of watershed function or health and/or a higher relative risk of aquatic species to be affected by the road system. For this reason, all inventoried roads within the BHNF boundary are considered for this portion of the analysis. Examining all roads allows for a more applicable, broad-scale assessment of the risk to watershed function associated with the road system as a whole, rather than just the arterials and collectors. Analysis on this scale could also help to prioritize those watersheds on which to focus future smaller-scale analyses within the Forest.

In addition to the watershed analysis, analysis was also conducted at the road scale to determine which ML 3, 4, and 5 roads are at the highest risk of degrading water quality. High-risk watersheds and roads are identified in the road risk analysis description and results presented in Appendix C – Hydrology Relative Risk Analysis and in Appendix H – Maps.

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

Ground water and surface water in the Black Hills are closely related. Precipitation reaching the ground may either infiltrate into the soil or run off slopes into stream channels as overland flow. Water that infiltrates into the soils is held in place until the soil is saturated, when surface and/or subsurface flows begin. Subsurface flows generally percolate deeper into the groundwater zone where they move slowly into aquifers, seeps, springs, and streams (USDA-Forest Service 1996a).

Roads can modify the surface and subsurface hydrologic characteristics in specific locations on the Forest in a number of ways. For example, they can expand the drainage network by altering surface flow routing. Roads also tend to increase the impermeable surfaces in an area, which reduces the amount of precipitation that can directly infiltrate into the soil. If the change in impermeable surfaces is great enough, these reductions in the rate and quantity of infiltration into the subsurface can decrease the rates of groundwater recharge (Dunne and Leopold 1978). This can result in adverse consequences to streams during low flow periods when they are solely supported by groundwater contributions (Dunne and Leopold 1978). Another consequence of decreased infiltration and increased runoff is a decrease in the time of concentration and increased flood magnitudes during storm events (Dunne and Leopold 1978). The increase in flood magnitudes can result in unwanted flooding and adversely affect stream pattern and profile.

In general, roads intercept surface water runoff flowing across the landscape and divert that flow down the road, primarily along vehicle wheel tracks or into road ditches. In each case, concentrated flow reaches the channel faster than water traveling as subsurface flow (Wemple et al. 1996), resulting in an increased volume of surface flows and increases in erosion and sediment delivery to streams or other water bodies. The effects of roads on the hydrology of an area depend largely on local factors, especially the density of roads in a given area, the proximity of roads to streams, road/stream crossings, road grade, and erosion potential. The hydrology risk due to roads was calculated for each 6th-order hydrologic unit and each system level 3, 4, and 5 road on the Forest using a combination of these indices (see Appendix C). Risk to watersheds

was classified on a scale of 0 to 2 as explained in Step 1 and Appendix C. Of the 94 6th-order watersheds within the Forest boundary, 18 were ranked as 2 (i.e., having a relatively higher relative); 27 were ranked as 1 (i.e., having a relatively moderate risk); and the remaining 33 were ranked as 0 (i.e., having a relatively lower risk of adverse impacts). Although these areas are scattered throughout the Forest, the results of this analysis indicate that the greatest potential impacts from roads are located in the central and eastern portions of the Forest. Conversely, the southern portion of the Forest (Hell Canyon Ranger District) indicates the lowest relative risk..

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

Erosion hazard is the soil's relative susceptibility to sheet and rill erosion when the surface vegetative ground cover is completely removed from the site. Roads can result in more erosion than any other single management activity on the Forest (USDA-Forest Service 1996a). Erosion can occur on the cut-and-fill slopes, the surface of the road, and in the ditch paralleling the road. The amount of erosion depends on the road surfacing, the cross drainage off the road surface, the road material, and cut-and-fill soil types and slopes. Roads also have the potential to induce slumping or slope failure (mass movement) if a road alignment crosses unstable slopes. Once all disturbed areas are adequately revegetated, on-site soil loss, water runoff and sediment movement will generally decrease. Although the soils on the Black Hills generally do not have a high erosion hazard rating, slumping or landslides can occur on steep slopes in a few areas on the Forest. Within the Black Hills, the most erosive soils are typically found on slopes greater than 40 percent and on soils derived from granites and the interbedded siltstones, shales, and gypsum rock types that are found in the Red Valley and the Dakota Hogback (USDA-Forest Service 1996a). Approximately 16 percent of the forest is underlain by soils that are highly erodible in their unvegetated condition.

Key factors in minimizing the volume of surface flow that reaches surface water bodies include the type of drainage structure, targeted and actual function, and spacing. These factors have a direct effect on the degree of surface erosion in an area. The Regional Water Conservation Practices Handbook (FSH 2509.25) provides guidelines for drainage structure spacing. Most of the main roads on the BHNF have culverts or rolling dips spaced at sufficient intervals to divert the runoff from the road and onto the adjacent land. When implemented correctly, this system of culverts and turnouts is effective in reducing erosion on the road by limiting the amount of area where surface water can concentrate, by limiting the length of surface water flows, and by causing sediment to be deposited in areas with vegetative cover and gentle slopes.

Erosion at culvert outlets is minimized when they are located on flat slopes or in areas with high ground cover and established grasses. Placing rocks at the outlet to dissipate the energy of the discharged water also minimizes erosion. Erosion on adjacent slopes, however, is sometimes increased by the force of water discharged from culverts, especially on steeper slopes, highly erosive soils, or where there is little vegetation.

Construction of roads entails complete removal of vegetation during construction and for a relatively long period of time thereafter. Therefore, when erosion is an issue, erosion rates are typically high unless mitigation measures are used.

To evaluate surface erosion potential, the amount of soils (i.e., percent of the watershed) with high erosion potential and miles of road on highly erosive soils in each 6th-order watershed was determined (see Appendix D). Percentages ranged from 0 to 99 percent with the Mystic and Hell Canyon Ranger Districts containing the highest erosive soil potential. Six watersheds were found to have erosive soils accounting for 50 percent or more of their total area. Four of these six watersheds are located in the Hell Canyon Ranger District with the remaining two divided between Mystic and Bearlodge Range Districts. In addition, roads were analyzed and ranked for the number of miles of road in highly erosive soils and watersheds were analyzed and ranked for the number of miles of road in highly erosive soils per square mile of watershed. Those results are presented in Appendix C and maps 11 and 40. This analysis showed similar results with relatively high risk roads and watersheds appearing in all ranger districts.

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

Mass wasting is a gravity-induced movement of a portion of the land surface, such as a landslide. In general, road-related mass wasting results from a number of factors including:

- Improper placement and construction of road fills and stream crossings
- Inadequate culvert sizes to accommodate peak flows, sediment loads, and woody debris
- Roads located on soils prone to mass wasting
- Water diversion onto unstable hill slopes

The sensitivity of an area to mass wasting depends, in part, on the interaction of the soils and underlying bedrock, slope steepness, and the subsurface hydrology.

Within the Black Hills, there has been some mass wasting associated with the steep slopes of the Dakota Hogback in the northern and eastern portion of the Forest. The Dakota Hogback has interbedded sandstone and shale, which can be unstable on steep slopes. Several landslides have also occurred in the Cook Lake area of the Bearlodge Mountains and in the Deadwood and Opeche Formations. The higher amounts of precipitation in the northern Black Hills may contribute to the mass wasting potential there (USDA-Forest Service 1996a).

A significant factor in determining the potential risk of a road being involved in a mass wasting situation is the steepness of the slope in the area. An analysis was conducted to determine the number of road miles in high slope areas (slopes greater than 40%). The analysis was conducted for individual ML 3, 4, and 5 roads and for all roads at the watershed level. The description of the analysis and the results are located in Appendix C and on Maps 12 and 41.

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

Roads have often been cited as the major source of sediment addition to streams (USDA-Forest Service 1996a). In general, as the proximity of roads (particularly unpaved roads) to streams (see AQ2) and water bodies increases, the potential for degrading water quality also increases. The number of road channel crossings in a watershed is an important factor in evaluating water-quality response to disturbance.

Road-stream crossings have the potential to directly and indirectly affect local stream channels and water quality. Poorly designed crossings directly affect hydrologic function when they constrict the channel, when they are misaligned relative to the natural stream channel, or when improperly sized culverts are installed. Undersized culverts that cannot handle the quantity of surface water runoff from storm events cause stormwater to back up and flow over the road surface. This can cause the roadbed to erode and increase sediment loading to the stream. Downstream of the culvert, water velocities can increase, causing stream headcutting and changes to stream morphology and aquatic habitat. Undersized culverts also frequently become clogged with sedimentation and debris, requiring frequent cleanings to avoid erosion of the road surface. Washouts also occur mainly at stream crossings when flows from the drainage ways overtop the roads, especially on unimproved surfaces, even where there are culverts. Finally, in areas where there are no culverts installed, road traffic across fords loosens bare soil that erodes downstream when there is water in the channel.

Road-stream crossings also act as "connected disturbed areas" where water and sediment are delivered directly to the stream channel. Connected disturbed areas (CDAs) are defined as "high runoff areas like roads that discharge surface runoff into a stream or lakes" (USDA-Forest Service 1995). The biggest water quality concern associated with the road system is sediment delivered to the stream system through CDAs.

The number of road-stream crossings in each 6th-order watershed per square mile was used to determine those watersheds where road-stream crossings posed a potential risk to local stream channels and water quality. The analysis description and results are detailed in Appendix C and Map 37. Of the 94 watersheds analyzed, 16 (18 percent) fell within the relatively higher risk category for stream-crossing risk and 17 (18 percent) fell within the relatively moderate risk category. Fifteen of the sixteen higher risk watersheds are located in the east-central and northern hills. The number of road crossings per road was also analyzed and rated. The results show the higher risk roads in the same areas. Those results are in Appendix C and Map 8.

AQ(5): How and where does the road system create potential for pollutants, (e.g., chemical spills, oils, de-icing salts, sanding, or herbicides) to enter surface waters?

Not addressed during Forest Scale Analysis per Region 2 Supplement, March 23, 2004.

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

As described in responses to questions AQ(1) and AQ(4), the road system is hydrologically connected to the stream system where there are connected disturbed areas (e.g., road-stream crossings; and areas where roads are adjacent to a stream course and there is an insufficient buffer strip between the road or road drainage structures and the stream system.

An analysis was conducted to estimate the risk from a road because of an insufficient buffer strip between the roads and streams. A buffer width of 119 feet was used as a long term, buffer width for capturing 97% of the sediment from a road in an area of highly erosive soils (Williams No Date). The risks were rated by ML 3, 4, and 5 road and by watershed. The analysis and the results are presented in Appendix C and Maps 10 and 39.

All of the factors identified in AQ(1-4) and the 119 foot buffer factor were used to develop an overall watershed risk rating. The overall risk rating represents the risk potential for hydrologically connected areas, which can affect both water quality and water quantity. The analysis and the results are presented in Appendix C and Maps 35 thru 41 and 48.

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?

States assign beneficial or designated uses to their streams and set water quality standards for each use. South Dakota has assigned streams on the Forest, at a minimum, as having the beneficial uses of wildlife propagation, stock watering, and irrigation (USDA-Forest Service 1996a). In addition, major or significant streams have been assigned additional beneficial uses (e.g., domestic water supply or coldwater permanent fish life propagation) (USDA-Forest

Service 1996a). Wyoming has designated all streams on the BHNF as Class 2 streams (i.e., surface waters that are determined to currently support game fish; have the hydrologic and natural water quality potential to support game fish; or include nursery areas or food sources for game fish) (USDA-Forest Service 1996a).

With increasing population in the Black Hills area and rapid development of inholdings within the Forest Boundary, stream and lake use for recreation and fishing will likely increase proportionately. Demand for water from stream fed reservoirs and aquifers for municipal and rural water supplies is increasing at a rapid pace. Demand for water for downstream irrigation will likely increase as well unless the increasing cost of the water makes irrigation unprofitable. Periodic droughts have a significant impact on the volumes in many of the streams and lakes with subsequent effects on their use.

The major potential effect of roads on steams and lakes is related to sedimentation. Serious sedimentation in some streams would effect some fish and bird populations. The potential sedimentation risk of each level 3, 4, and 5 road has been analyzed in other sections of this report.

The 1996 Final Environmental Impact Statement (EIS) indicates that roads may be a contributing factor to surface water quality degradation in Castle Creek, Rapid Creek, and Slate Creek (USDA-Forest Service 1996a). With regards to surface water quality in the BHNF, Carter et al. (2002) state that "Most streams generally meet water-quality standards established for designated beneficial uses. The primary exceptions are streams in the exterior setting (outside the Forest), which occasionally fail to meet standards for temperature and dissolved oxygen during low-flow conditions. Standards for suspended sediment have been exceeded in some streams (South Dakota Department of Environment and Natural Resources, 1998)." In most cases those exceedences were described as minor and it was not stated if they were road related. Subsequent reports in 2000 and 2002 reported a decreasing number of excedences due to suspended sediments. A review of the 2004 South Dakota (DENR) Integrated Report for Surface Water Quality Assessment and Wyoming's 2004 305(b) State Water Quality Assessment Report and 2004 303(d) List of Waters Requiring TMDLs revealed no listings for Black Hills streams as impaired in the Black Hills due to road derived pollutants such as sediment.

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

The road system may affect wetlands by altering surface water runoff patterns, by contributing sediment and/or other contaminants, by fragmenting or removing wetland habitat and by increasing the pathways for noxious weeds. The road system is more likely to affect wetlands in valley bottom locations where wetland sites and road locations are more likely to coincide versus on drier, upland sites.

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

Roads can directly affect physical channel dynamics where they encroach on floodplains or restrict channel migration. Floodplains help dissipate excess energy during high flows and

recharge soil moisture and groundwater. Floodplain function is compromised when roads encroach on or isolate floodplains. This can increase discharge velocities during peak flows and results in increased bed and/or bank erosion and overall channel instability. Roads that reduce the storage capacity of floodplains can also affect flood magnitudes downstream of the affected area. Restricting channel migration can cause channel straightening which increases the stream energy available for channel erosion. This can also result in channel instability. Altering channel pattern affects a stream's ability to transport materials, including wood and sediment.

Miles of road within 30 feet of a stream is a good initial indicator of where the road system might be affecting physical channel dynamics (Williams No Date). The potential risk to channels using this 30 feet indicator has been analyzed as a hydrology risk factor for each level 3, 4, and 5 road. The analysis description and the results are presented in Appendix C and Map 9. A similar analysis was conducted for each watershed. Those results are also in Appendix C. The distribution of relatively higher risk roads and watersheds for this factor is similar to the results of the analysis for stream crossings.

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 (i.e., fish and amphibians)?

Road-stream crossings can directly restrict the migration and movement of aquatic organisms at crossings containing culverts. Generally, the restriction is on upstream migration, although downstream migration can also be affected, and is due to hanging or perched culverts (i.e., hydraulic jump), high flow velocities, and/or inadequate water depth for fish migration. In some locations, migration barriers may be desirable to protect native species.

Barriers to aquatic species migration/movement are assumed to occur on the Forest. However, an inventory of culverts on perennial streams has not been conducted. These migration/movement barriers likely affect native fish species, as well as several non-native fish species. It is likely that the majority of culverts that do pose migration/movement barriers to fish were originally set to the then-current grade of the stream, and that scour has occurred over time, creating waterfalls at culvert outfalls that are upstream migration/movement barriers.

Native fish species that occur on the Forest and are designated as Region 2 sensitive species include the finescale dace, lake chub, and mountain sucker. Within the BHNF, the lake chub is only known to occur in the Deerfield Reservoir (Isaak et al. 2003); its movements are therefore unlikely to be affected by the existing road network. With the exception of one site, all areas where finescale dace have been sampled occur in the Redwater Creek drainage in the Bearlodge Ranger District of the Wyoming Black Hills (Isaak et al. 2003). Isaak et al. (2003) were unable to determine a trend in the current populations because the historic distribution of the finescale dace is largely unknown. However, they concluded that, "Fragmentation will have increasingly negative effects on finescale dace as populations disappear because dispersal of individuals needed to refound extirpated populations will be inhibited" (Isaak et al. 2003).

Mountain suckers are relatively well-distributed in streams throughout the Forest (USDA-Forest Service 2004b). The movement of the mountain sucker could potentially be adversely affected by the road network.

The movement of aquatic mammals and amphibians also needs to be considered. The northern leopard frog is a Region 2 sensitive species and occurs on the BHNF in a wide variety of habitats including creeks, lakes, ephemeral wetlands, and ponds (Smith 2003). Northern leopard frogs are considered common in the Black Hills and are found at all elevations. For this species the roads themselves, not culverts, pose a movement barrier, and road-related mortality is one of the risk factors associated with this species (Smith 2003). Due to their widespread use of a variety of habitats, specific road mitigation measures to reduce road-related mortality are difficult to develop and implement effectively. Smith (2003) suggests that frog populations should be considered when siting new roads and that frogs and their habitat be considered when decisions are being made to close or manage existing roads.

Beaver are semi-aquatic and are proposed as a management indicator species on the Forest. Movement of this species is not expected to be substantially affected by the road network. Culverts at road crossings provide convenient locations for beaver to dam in order to create ponds. These dams can result in road damage through overtopping and road fill saturation.

The movement/migration of aquatic macroinvertebrates can also be affected by road culverts, though the specific effects on particular species are largely unknown (Vaughan 2002). An indirect effect of culverts on macroinvertebrate assemblages can be channel degradation or instability, which changes microhabitats and increases sedimentation into the stream (Vaughan 2002).

Mitigation to re-establish aquatic connections at migration barriers would involve either re-setting a culvert to the current grade or orientation of the stream, or replacing the culvert with a bridge, bottomless culvert, or hardened low-water ford.

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

The road network may remove or impede the growth of overstory vegetation adjacent to stream channels that would provide shade. Riparian plant communities may be removed where roads cross streams or encroach on riparian areas. Roads also can alter overall stream dynamics which can affect succession of vegetation change and increase the likelihood of noxious weeds which affect overall plant communities. An analysis was conducted to estimate the potential risk of roads to riparian areas in the Forest using the potential for sediment being transported into and affecting the riparian habitat. A buffer width of 119 feet from a riparian area was used as a long term buffer width for capturing 97% of the sediment from a road in an area of highly erosive soils (Williams No Date). A second buffer width of 30 feet was also analyzed that could help represent the potential for stream channel effects caused road encroachment into a riparian area. The risks were rated by ML 3, 4, and 5 road and by watershed. The analysis and the results are presented in Appendix C and Maps 13 and 47. This risk estimate could also be used to approximate the risk of road mortality of riparian area inhabitants, riparian habitat fragmentation and the risk of resource damage from OHV access.

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

Species of local concern or sensitive aquatic species on the BHNF include finescale dace, lake chub, and mountain sucker and the northern leopard frog. None of these species have commercial or recreational value and so their persistence is not affected by fishing or poaching.

The road system can contribute to direct habitat loss where mass movements associated with roads directly impact stream channels (see AQ[3]) ; where sediment is delivered directly to the stream channel through connected disturbed areas (see AQ[6]); at road-stream crossings (see AQ[4]); and where the road system is restricting channel migration and isolating floodplains (see AQ[9]).

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

Roads facilitate access to developed and undeveloped recreation sites along streams and reservoirs found on the BHNF. The road network generally follows valley bottoms where multiple access points or stream crossing provide ready access to aquatic habitat for the intentional or unintentional introduction of non-native aquatic species. All game species on the Forest are introduced non-native species whose transplantation was facilitated by the road network.

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?

Areas of high aquatic diversity or productivity or areas containing rare or unique aquatic species or species of interest are limited to areas containing the lake chub, mountain sucker, finescale dace, northern leopard frog, American dipper, and to walk-in fisheries. As described in AQ(10), the lake chub is restricted on the BHNF to the Deerfield Reservoir and the finescale dace is restricted to the Redwater Drainage in Wyoming. The road system provides a number of access points to Deerfield Reservoir in the form of boat ramps and developed recreation sites. The mountain sucker and northern leopard frog are more widespread on the Forest and a greater degree of overlap occurs with these species. An estimated 320 miles (3.8 percent) of all roads on the Forest occur within 30 feet of a stream (see Appendix C).

Spearfish Creek, located in Spearfish Canyon, is home to one of the remaining resident populations of American dipper found in the Black Hills. Approximately 9 miles of ML 3, 4, and 5 roads occur in the Spearfish Canyon Management Area (MA 4.2A). Walk-in fisheries may also be considered areas of high productivity and occur on Rapid, Boxelder and Castle Creeks in South Dakota and on Sand Creek in Wyoming. The degree of overlap with the road system is limited to stream crossings at these locations.

McIntosh Fen is a wetland area and is discussed along with other areas of high diversity in TW(4).

4.3 TERRESTRIAL WILDLIFE (TW)

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

Roads can improve habitat for some species, but generally have a negative effect on wildlife populations (Forman et al. 2003). The direct impact of the road system on terrestrial wildlife is habitat loss. Roads affect different wildlife species differently; some wildlife species are much more vulnerable to habitat loss and fragmentation caused by roads than are other species. Wildlife that are the most vulnerable to habitat loss are large, long-lived species that require large home ranges and occur in low densities and have low reproductive rates such as many large carnivores. Similarly, interior forest species are also particularly vulnerable to habitat loss caused by roads because roads create edge habitats that interior forest species typically avoid (Forman et al. 2003). The creation of a road can create a disproportionate increase in the amount of edge habitat in an area, and result in a dramatic reduction in the amount of effective or useable habitat available to interior forest dwelling wildlife (Forman et al. 2003). This may not be as directly applicable to the Black Hills because of generally more open grown forest conditions that occur presently and did historically.

Habitat degradation occurs adjacent to roads to different degrees due to increased noise, increased pollution (i.e., air pollution, litter, dust) and erosion and sedimentation. Most roads on the Black Hills National Forest are very low traffic volume; 20% are closed (ML1), 60% are high clearance with slow moving traffic, and 19% are gravel with relatively slow moving traffic.

In South Dakota, deer comprise the majority of road kill, other species such as elk, mountain lion, big horn sheep, turkey, and American marten are also killed by motor vehicles. Road kill numbers are generally higher on paved roads than on gravel roads. Road kill in the Bearlodge Ranger District in Wyoming is reported to be highest along State Highway 24, with a low incidence of road-related wildlife mortality on Forest System Roads (Sandrini 2005)

An attempt was made to estimate the potential relative risks that roads present to wildlife both by road and at the watershed scale. A detailed discussion of the analysis and the results are in Appendix F and on maps 13 thru 17, 19, 42 thru 47 and 49. The analysis included road densities, riparian areas, and important species for which GIS data was available such as goshawks, snails, american dippers, and martens. This analysis is not all encompassing because it does not include a majority of the species in the Black Hills and the risk rankings could only be set at relative values as methods of assigning absolute risk were not apparent. These results do indicate that the relative risk from roads for these categories is highest in parts of the northern and central hills.

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

Human activities that affect habitat include management of public lands by Forest Service personnel and their cooperators; commodity production (i.e., livestock, timber, and mining); off-road vehicle travel; trail use; camping; and hunting and fishing. Wildlife forage, nesting, and thermal cover habitat are affected by these activities to varying degrees, depending on the intensity and frequency of use. Commodity production such as tree harvest, forage use, and

mining activity have the potential to cause the most influential impacts to habitat due to the extent of these activities on the Forest; and (in the case of logging and mining) ground-disturbing activities, noise, and habitat alteration. Note that logging and livestock use can benefit habitats of some wildlife species.

Off-road vehicle travel on undesignated routes is facilitated from existing roads on gentler terrain. It is estimated that there are approximately 3,400 miles of wheel-track roads that have been formed by Forest users driving cross-country (USDA-Forest Service 2004a). Off-road vehicle travel affects habitat through the loss and trampling of vegetation, spread of noxious weeds, soil compaction, increased erosion, and contributing sediment to surface waters. Impacts to habitat can have either short-term or long-term effects.

Trail use, camping, and hunting and fishing can affect habitat in the same ways as those described for off-road vehicular use. In addition, due to the increased presence of humans in an area, these activities can affect wildlife distribution and use of habitat located near popular trails, fishing areas, and campsites. Hunting, especially in the fall, can influence the movement and distribution of game species, such as elk and deer.

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 road system facilitates access to the Forest by humans. Vehicular travel accounted for 1.7 million recreation site visitor days on the Forest in 2004and was the most popular recreation activity (USDA-Forest Service 2004a). These conditions can lead to higher incidence of vehicle-animal collisions.

In 2002, approximately 45,800 recreation visitor days were estimated for hunting (USDA-Forest Service 2004a). As shown in Table 4-1, the majority of hunters in the Black Hills hunt turkeys in the spring and deer in the fall. The Wyoming Game and Fish Department issued 4,503 hunting licenses for white-tailed deer; 2,518 for mule deer; and 302 for elk for the Bearlodge Ranger District (Leonard 2004a), and issued 2,842 hunting licenses for turkey for the Wyoming portion of the Black Hills in 2003 (Leonard 2004b.

Table 4-1. Annual Number of South Dakota Hunting Licenses Sold, 1997 - 2003

Year	Spring Turkey	Fall Turkey	Elk	Deer
1997	2,574	No data	805	11,824
1998	3,475	No data	752	7,985
1999	3,552	675	1,019	7,849
2000	3,374	628	1083	7,921
2001	3,998	No season	1,124	6,707
2002	4,761	325	1,229	6,454
2003	5,053	432	1,579	6,438

Source: Huxoll 2004.

Poaching on the Forest is known to occur and is facilitated by improved roads (Sandrini 2005). The majority of poaching violations in the Bearlodge Ranger District in Wyoming are for deer. They occur on ML 3, 4, and 5 roads, and they typically involve shooting from a public roadway or shooting from inside a vehicle (Sandrini 2005). Mr. Sandrini also reported that poaching violations also occur due to hunters utilizing closed Forest System roads to access private land, such as in the northern portion of the Bearlodge Ranger District (north of Highway 24), in the vicinity of the community of Mosskee, and in the Black Buttes (Sandrini 2005). Turkey and elk are also poached in the Bearlodge District, but to a much lesser extent than deer (Sandrini 2005). Areas in the Bearlodge Ranger District where numerous deer poaching violations have been documented are Blacktail Junction (junction of FR 849 and FR 838), Sand Creek Road (FR 863) just south of the Ranch A boundary and near Thompson Gulch. Spring turkey poaching is also known to occur in these areas as well as around Cook Lake (FR 842) (Sandrini 2005).

Hunting directly effects the populations of the animals involved and is considered the most important method of managing populations of deer, elk and turkeys on the Black Hills. As a result, maintaining a road system that allows efficient access to forest for hunting is an important factor in managing game species of all types. Examples of indirect effects could be a change in game species distribution, increased disturbance (e.g., noise, human presence) to non game wildlife species, and increased disturbance to habitats.

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

A number of unique or high quality plant communities found in the BHNF are managed under Management Area (MA) 3.1 – Botanical Areas. The number of miles for ML 3, 4, and 5 roads found in MA 3.1 are 2.74 miles, 1.14 miles, and 0 miles, respectively; for a total of approximately 3.9 miles. The specific number of road miles found within each of the eight botanical areas is provided in Table 4-2.

Table 4-2. Number of Maintenance Level 3, 4, and 5 Roads (in miles) in Each of the Botanical Areas

Botanical Area	Maintenance Level 3, 4, and 5 Road (miles)	Road Maintenance Level
Bear/Beaver Gulches	0	Not Applicable
Black Fox Valley	1.35	3
Dugout Gulch	0	Not Applicable
Englewood Springs	0	Not Applicable
Higgins Gulch	1.4	3
McIntosh Fen	1.14	4
North Fork Castle Creek	0	Not Applicable
Upper Sand Creek	0	Not Applicable

Roads in the botanical areas facilitate recreational use of these areas, and so could be expected to increase the likelihood of noxious weed establishment in these areas. Due to the facilitated

access provided by the ML 3 and 4 roads in the Black Fox Valley, Higgins Gulch, and McIntosh Fen Botanical Areas, these Botanical Areas are likely the most susceptible to noxious weed establishment associated with roads.

Maintenance level 3, 4, and 5 roads were analyzed for there potential relative risk to botanical areas. The analysis description and the results are in the overall risk analysis in Appendix F and on map 22.

4.4 ECOSYSTEM FUNCTIONS (EF)

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

The Black Hills is a relatively well roaded forest. The major unroaded areas are the three areas listed as inventoried roadless areas, Inyan Kara, Sand Creek, and Beaver Park. The ecological attributes of those areas were discussed earlier in this report in section 2.6

EF(2): To what degree does 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?

One of the primary concerns regarding exotic organisms is the introduction and establishment of invasive, non-native plant species (i.e., noxious weeds). Currently, there are a total of 21 noxious weeds species targeted for control (USDA-Forest Service 2003a). Of these 21 species, 10 are a high priority for control on the Forest, three are considered to be of medium priority, and eight are low priority noxious weed species (USDA-Forest Service 2003a). Throughout the BHNF, ML 3, 4, and 5 roads may facilitate the spread of noxious weeds directly through vehicular transportation of the organisms and/or indirectly through habitat alteration/disturbance (i.e., bare soil or patchy ground cover) that favors the establishment of noxious weeds. Noxious weeds degrade the quality and quantity of forage available to livestock and wildlife and can adversely impact other components of habitat quality and quantity (e.g., percent cover, dominant species, species richness and diversity) and thereby degrade ecosystem function.

According to the BHNF Noxious Weed Management Plan (USDA-Forest Service 2003a), "Consistent implementation of road construction/maintenance mitigation and control measures is needed to prevent establishment and spread of approximately 2,315 acres of weed infestation predicted to occur in the absence of elevated management over the next 10 years on the Forest from scheduled road construction/maintenance activities."

Interstate road travel may cause future problems with non-native insects on the BHNF. Though not currently an issue on the BHNF, the gypsy moth has inadvertently been introduced into the Black Hills on numerous occasions since the late 1980s. However, it is not known to have established a breeding population (USDA-Forest Service 1996a, USDA-FS 2004b). Due to the increasing mobility of people and the interstate transport of nursery stock, the likelihood of the

gypsy moth becoming established in the Black Hills has increased in the last decade (USDA-Forest Service 1996a).

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

This question is addressed in concert with EF(4).

This question is most applicable at the local level during project analysis. ML 3, 4, and 5 roads are the main access routes to maintenance level 1 and 2 roads, which provide the majority of access to areas of suitable timber. Road access facilitates direct and indirect management and control of insects, diseases and parasites by providing access for crews and equipment to the affected sites. In general, the higher the road density, the more area that is able to be treated. Conversely, the presence of roads can induce stress in vegetation in proximity to a road, which can lead to a higher incidence of insect and parasite infestation (USDA-Forest Service 1996a).

The Black Hills is a well roaded area as described in section 2 of this report and shown on maps 1 thru 6. The number, length, maintenance level, and spacing of roads make them well suited for facilitating the control insects, diseases, and parasites.

Specific information for all roads found in each of the 6th-order watersheds found in the BHNF is found in the watershed risk analysis (Appendix C).

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

The types of natural disturbances that have had the most pronounced effects on the Black Hills include wildland fire, drought, wind, and insects (including the mountain pine beetle and the pine engraver beetle). Of these disturbance types, wildland fire and drought have likely had the most visual effect on wildlife habitats in the BHNF. Roads provide an important management tool both as fire and fuel breaks and in providing rapid deployment to the burning area, thereby facilitating the initial attack and fire suppression efforts.

ML 3, 4, and 5 roads can exacerbate or alleviate local drought conditions by rerouting water flows and by preventing/limiting infiltration of precipitation into the soil. These types of effects occur on the local scale and are beyond the Forest-scale level of analysis covered in this document.

Wind damage can occur anywhere in the Forest if the appropriate conditions exist. However, roads generally increase the amount of forest edge, which can increase the susceptibility of forested areas to wind damage (i.e., windbreak, windthrow) (Kimmins 1987). The specific interactions between a road edge and wind is dependent on-site specific conditions, including the site's topography, aspect, orientation of the road relative to prevailing winds, and type of forest stand (open or dense).

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

Not addressed during Forest Scale Analysis per Region 2 Supplement, March 23, 2004.

4.5 ECONOMICS (EC)

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

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 monetary costs associated with the road system in the Black Hills are substantial to the Forest Service, the counties and the state & federal highway organizations. The estimated costs to the Forest Service to manage Forest Service System roads to standard, for the long term, are calculated using the Forest Service Infrastructure (INFRA) database. The INFRA database estimates annual and deferred maintenance costs which include estimated maintenance costs, and overhead. Annual maintenance costs include such things as routine road surface blading and culvert cleaning and the annualized cost of replacing signs, and road surfaces, mostly gravel. Deferred maintenance costs are those that have been identified as needed but have been deferred for a future date. These costs could include aggregate placement, turnout construction, road widening, and culvert & sign replacement. The estimated costs for ML 1, 2, 3, 4, and 5 roads for annual and deferred maintenance are shown below.

Table 4-3. Annual and Deferred Maintenance Costs for System Roads on the Black Hills with Forest Service Jurisdiction

Maintenance Level	Total Miles*	Annual Maintenance Cost	Deferred Maintenance Cost
1	1,029	$688	$3,748,894
2	3,172	$9,054	$13,668,148
3	485	$4,900,092	$13,802,021
4	176	$1,709,116	$5,179,193
5	13	$178,915	$1,508,918
Total	**4,863**	**$6,797,865**	**$37,907,174**

* Miles of road reflect current road inventory measured on the ground and do not, therefore, coincide directly with GIS miles.

GIS Geographic Information System
ML Maintenance Level

The historical resources expended to perform the reconstruction, maintenance and repair of all Forest Service roads are shown in Table 4-4

Table 4-4. Road Management Funding Sources

Funding Source	Type	FY 2003	FY 2004	FY-2005
FS - Congressional Appropriations	Road Construction / Maintenance Fund	$3,244,000	$2,934,600	$2,324,784
Road & Trail Deposits	10 % Fund	$400,000	$77,100	$45,000
	Total	**$3,644,000**	**$3,011,700**	**$2,369,784**
Timber Purchasers Direct	TS Road Reconstruction	$496,265	$839,280	$182,560
	TS Road Maintenance	$67,200	$55,055	$72,124
	Maintenance Deposits	$4,928	$6,111	$8,068
	Surface Rock Replacement	$120,169	$75,491	$89,464
	Reconstruction Deposits	$201,358	$100,834	$141,372
	Total	**$889,920**	**$1,076,771**	**$493,588**

The Congressional Forest budget allocation for planning, construction, capital improvement, and maintenance of roads on the Black Hills has been decreasing noticeably in the last three years. The funding decreased from 3.2 million dollars in 2003 to 2.9 million in 2004 and then 2.3 million in 2005. The FY 06 allocation for road maintenance is 1.44 million. Indications are that these funds can be expected to remain constant or decrease further in the future.

Recent changes in the timber receipt allocations will result in a reduction of the Road and Trail Deposits (10% Fund) and an increase in Knudson-Vandenberg Act (K-V) deposits available to the Forest. This change will begin in 2006, however, it is not expected to have a significant impact on declining budgets.

Capital improvement funds acquired to conduct the road improvement work necessary to bring the roads up to the desired objective have been sporadic and minimal in past years. However, the Forest has benefited from a regional bridge program which has funded 9 bridge replacements in the last 5 years. Of the 55 bridges on the Forest, 6 are currently rated deficient due to not meeting standards.

A portion of the road maintenance on Forest roads is performed by timber purchasers and fuels treatment contractors on roads where timber products are being transported. The cost of road maintenance work performed by the purchasers is shown in Table 4-4. The level of expenditure is linked to the volume of timber, number of sales, and the miles of road needed to remove the timber from the Forest. Timber sale impact road maintenance is funded by the purchasers in two ways. The first is road maintenance work performed by the purchasers directly. The second is payments for maintenance and surface rock replacement that are made to the Forest Service who then contracts or performs the work. In addition, timber sale receipts are used for road reconstruction deposits which fund engineering services necessary to design the reconstruction

elements of the timber sale road specifications. These road reconstruction funds are collected based on the actual cost to the Forest Service for these services.

The overall level of federal funding and timber purchaser expenditures is not sufficient to perform the short and long term maintenance needs identified for Forest Service System Roads in general and the federal portion of that funding can be expected to remain constant or decrease further in the future. As a result, the long term condition of level 3, 4, and 5 Forest System Roads are expected to deteriorate.

The Forest Boundary encompasses 56 miles of county system roads and 362 miles of roads recorded as being in the Forest road system but under the jurisdiction of the counties. These roads are integral to the Forest transportation system. In some cases, the Forest Service and the counties have jurisdiction over different sections of the same road. The counties receive payments from the Forest Service that can be used to support these roads under two programs, Payment in Lieu of Taxes (PILT) and 25% funds. The PILT funds are based on the acres of Forest Land in the county and are intended to help compensate for the loss of taxable base. The expenditure of PILT funds is at the discretion of the counties. In 2004, the counties with boundaries within the Forest received PILT funs of $1,375,547. The 25% funds are that portion of receipts the Forest Service receives each year primarily from the sale of timber. The 25 Percent Fund Act provided for 25% of actual receipts to be paid to the counties. The Secure Rural Schools and Community Self-Determination Act of 2000 provided the option for counties to receive the average of the three highest 25% payments made annually from 1986 to 1999. All counties within the Black Hills elected to receive payments by this leveled method. Therefore, the impact of fluctuating timber receipts is minimized. The use of these funds is limited to roads and schools. In 2004, the counties received $4,239,000 which is a figure that has been adjusted for inflation since 2001.

The R2 guidance for this question determined that there are three basic categories of roads: those that will always be open; those that will have motorized access restrictions due to serious resource damage or annual budgetary constraints; and those that do not fall into either of the first two categories. This RAP considers ML 3, 4, and 5 roads, which, in general, are assumed to be always kept open. Most of these roads were developed over the years for a variety of access needs, and considerable capital investments were incurred to construct and maintain these roads. They are the core of the Forest transportation system.

To assess costs and revenues of the existing ML 3, 4, and 5 system roads, a Road Value versus Risk matrix was developed to determine where possibilities might exist to change the road system to reduce risk, reduce costs, and or increase revenues. The detailed analysis can be found in Appendix C, E, F, G, H, and I. The results of the risk/value analysis are presented in Appendix J and in Section 5.

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

Not addressed during Forest Scale Analysis per Region 2 Supplement, March 23, 2004. See answer to EC1

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

Not addressed during Forest Scale Analysis per Region 2 Supplement, March 23, 2004. See answer to EC1.

4.6 COMMODITY PRODUCTION

4.6.1 Timber Management (TM)

R2 Supplement recommends addressing TM(2) and TM(3) together before TM(1).

TM(2) and 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?

Many of the ML 3, 4, and 5 roads on the Forest are heavily used for timber management. ML 3, 4, and 5 roads are the main access routes to maintenance level 1 and 2 roads, which provide the majority of access to areas of suitable timber. Overall road density of system roads throughout the Forest is 2.19 miles/square mile. This density generally provides adequate access to suitable timber areas for management and treatment activities.

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

This question is most applicable at the local level during project analysis. However, the affect of road spacing and location on logging system feasibility is an important consideration when determining timber suitability, management area allocations, and economic efficiency.

The Black Hills region is home to a modern, efficient wood-product industry. Approximately two-thirds of the local timber industry's needs have been supplied by the BHNF, with the remainder being supplied from private lands, State lands, or other National Forests (USDA-Forest Service 1996a). During the past century, virtually all suitably operative forest acres have been entered for harvest at least once (USDA-Forest Service 1996a). This translates into approximately 5 billion board feet that have been harvested since the completion of the first Federal timber sale (called Case No. 1) in 1899 on the Black Hills Forest Reserve (now the Black Hills National Forest) (USDA-Forest Service 2004a).

In general, close road spacing (i.e., higher road densities) results in more efficient and economic timber production to the purchases because it permits more rapid turn-around times and higher production that reduces yarding cost and increases stumpage value. Closer road spacing can increase the total cost for road building due to a higher number of road miles. This can be reduced with the use of temporary roads. The road system in the Black Hills has developed over the years into an efficient transportation system for all uses including timber management. The basic grid of level 3, 4, and 5 (arterials and collectors) is well spaced to access most general areas of the Forest. From this basic system, there is another well spaced grid of level 1 and 2 (local) roads that reach areas in between. The number of level 1 and 2 roads fluctuates yearly based on

their need and risk. Most timber sales result in closing and/or decommissioning some roads after the timber is removed for resource protection or if they are no longer needed. Some sales also result in the construction of new level 2 roads to areas that cannot be treated efficiently. They are usually short roads and few in number.

As shown in Table 4-5, the road densities of ML 3, 4, and 5 roads found in three of the four resource production management areas on the Forest are higher than the ML 3, 4, and 5 mean road density found on the Forest. In keeping with its management goals, Management Area 4.1, Limited Motorized Use and Forest Product Use has a road density lower for ML 3, 4, and 5 roads than the mean road density for these road types found on the Forest.

Table 4-5. Road Densities Found in Resource Production Management Areas

	Maintenance Level 3, 4, and 5 Roads	
	Amount of Roads (miles)	Density (miles/square mile)
Forest-Wide Mean Road Density	1,309	0.43
Management Area		
4.1 - Limited Motorized Use and Forest Product Emphasis	20	0.29
5.1 - Resource Production Emphasis	478	0.54
5.4 – Big Game Winter Range Emphasis	221	0.36
5.43 - Big Game and Resource Production	10	0.64
5.6 - Forest Products, Recreation, and Big Game Emphasis	24	0.57

4.6.2 Minerals Management (MM)

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

Mineral resources on National Forest System lands are managed in three categories: locatable, leasable, and saleable minerals. The public has different rights to access an area dependant on the category of mineral being developed.

The Forest Service does not manage the mineral resources on National Forest System lands. That authority resides with the Secretary of the Interior. Forest service authority is directed at the use of the surface of National Forest System lands, including the development of roads in connection to the operations authorized under the United States mining laws (30 U.S.C. 21-54).

Locatable minerals are those deposits subject to location and development under the General Mining Law of 1872 (as amended). An individual or a company may locate a mining claim, and thus establish a property right to minerals on that claim, and the right to reasonable access to that

claim. With the exception of public lands withdrawn from mineral entry (Forest land purchased as acquired land rather than public domain), the BHNF is open under the general mining laws. Locatable minerals important to the history and economy of the Black Hills include gold, silver, iron, feldspar, uranium, tin and mica.

Leasable minerals are federally owned fossil fuels (e.g., oil, gas, coal, and oil shale), geothermal resources, sulfur, and phosphates. These minerals are subject to exploration and development under leases, permits, or licenses issued by the Secretary of the Interior with Forest Service consent. The 1920 Mineral Leasing Act (as amended) together with the 1989 Federal Onshore Oil and Gas Leasing Reform Act provide the authority and management direction for Federal leasable minerals on National Forest System lands. Road construction to locate drill pads and for access by service vehicles is a common activity in an oil or gas field.

Currently there is no leasable minerals activity on the Black Hills National Forest

Salable minerals include mineral materials such as deposits of sand, gravel, clay, rock, or stone. There are a number of mineral material sales on the Black Hills every year, with access generally provided by the existing Forest road system. Gravel quarries are only available to the Forest Service and counties

4.6.3 Range Management (RM)

RM(1): How does the road system affect rangeland management (including gates left open, funding and maintaining cattle guards, need for increased fencing, creation of travel routes for livestock, increased public access, etc.)?

ML 3, 4, and 5 roads in the BHNF facilitate the management of range allotments by BHNF range management specialists and facilitate access by allotment permittees. Maintenance level 1 and 2 roads provide the majority of access to allotments and also facilitate access and management activities. The affect of roads on rangeland condition is generally thought to increase the likelihood for noxious weed introduction and potential erosion.

Roads of all jurisdictions in the Black Hills frequently cross range allotment fence locations requiring cattleguard and or gate installations depending on the location of the road. Funding to manage cattleguards is currently being provided from range and road program funds and permittees as the situation and funding levels allow. Declining budgets will make adequate levels of maintenance and repair of these features difficult. Gates left open are an issue on level 1 and 2 roads. The severity of the problem is generally related to the road's proximity to population centers and the area's popularity for dispersed recreation and hunting. Cattleguards on ML 3 and 4 roads periodically become full of gravel and allow livestock to move off allotments.

As shown in Appendix B, 21 of the 128 allotments (16 percent) do not have any ML 3, 4, and 5 roads within their boundaries. These allotments are: Oak Creek, Huett Springs, Inyan Kara, Pheasant Draw, Lame Jones, Alabaugh, Argyle, Chilson, Falls Canyon, Cascade, McClure, Mine Pit, Washboard, Willoughby, Driftwood Canyon, Logan Flats, Sutherland, Rimmer, Pillar Peak,

and Gudat. In addition, four allotments contain a total road density of less than 1 road mile per square mile; these allotments are Argyle, McClure, Willoughby, Washboard. These 21 allotments may be underserved by road access, making rangeland management and monitoring activities more difficult in these areas.

The value of ML 3, 4, and 5 roads for range management was included in the risk / value analysis in section 5. The analysis description and the results are presented in Appendix F and on map 28.

4.6.4 Water Projects (WP)

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

The existing road system is sufficient to access existing water diversions, impoundments, and distribution canals and pipes. The larger structures tend to be accessible by ML 3, 4, and 5 roads. These roads, in turn, provide connectivity to local roads required for some maintenance activities.

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

This question is inherent within AQ(7) an is answered there. (Per Region 2 Supplement March 23, 2004)

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

Since 1917, Homestake Mining Company has diverted stream flows from Little Spearfish Creek and Spearfish Creek into pipelines for hydroelectric power generation at the facility. Power lines, water transmission conduits and aqueducts all cross Forest Service lands. Homestake Mine/Barrick has recently shut down and reclaimed one of the power plants and sold the other to the city of Spearfish. Access to the area has been sufficient in the past and is not expected to be an issue in the future.

4.6.5 Special Products (SP)

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

The current ML 3, 4, and 5 road system provides adequate access to the Forest for collecting special forest products. Accessibility for special forest product collection may be considered in project specific analysis for road closures (permanent or seasonal).

4.6.6 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)?

Special use authorizations and road easements are required for all instances of commercial uses of the NFS road system, including utility corridors, power lines, pipelines, water transmission lines, minerals, range use, and water production sites. Road systems located on NFS lands directly influence the management of all special use authorizations to access, construct, and maintain privately owned lands and facilities within or adjacent to the Black Hills National Forest proclamation boundary.

According to the 2004 data representing special uses from the USFS SUDS INFRA database, there are currently 762 special use authorizations issued on the Black Hills National Forest. **Table 4-6** provides a breakdown of these authorizations for non-federal use of FS lands:

Table 4-6 Breakdown of Special Use Authorizations

Special Use Type	Number of authorizations
Communication Sites	7
Concession Recreation Permits	1
Marinas	2
Organization Camps	2
Outfitter Guide Permits	43
Road Easements / Permits	320
Recreation Residences	164
Other (utilities, water lines, misc.)	198
TOTAL AUTHORIZATIONS	**762**

There are currently several utility corridors crossing portions of the Black Hills National Forest in both Wyoming and South Dakota. The NFS road system provides the majority of the access required for power line maintenance. Together, the county and NFS road system (all maintenance levels and jurisdictions) provide sufficient access to utility corridors throughout the forest.

Special use authorizations or other formal written instruments (easements) are required for private land owners that have need for use of NFS system roads and use of NFS land for private

roads to provide access to their property. Despite this requirement, there are numerous private land inholdings (private lands surrounded by National Forest System lands) scattered throughout the BHNF that do not have documented access or easements across NFS lands. While use of open NFS roads is allowed, any additional road work needed to provide and maintain year-round access to private lands would require a permit for the individuals to do this work. Many landowners find they need an easement when transferring property or establishing title. There have not been any instances of the Forest Service taking action against any adjacent or intermingled landowners using the NFS road system.

There is a commercial traffic restriction on NFS roads. This results in a permit being required for commercial use of the system. The Forest Service enforces this restriction whenever possible.

Outfitter guide use on the Forest is authorized for a variety of activities including hunting, fishing, trailriding, rock climbing, and snowmobiling. The road system is used to disperse these varied uses throughout the Forest. In general, most recreation special use proposals and authorizations are designed around the existing road system as guides are often attracted to the easy access provided to the Forest.

4.7 GENERAL PUBLIC TRANSPORTATION (GT)

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

Most access points into the BHNF originate from the twelve Forest Highways (Appendix A) that traverse into or through the Forest. These highways provide connectivity to the National Forest system roads, which, in turn, connect numerous public roads managed and operated by federal, state, county and local governments. Many of the ML 3, 4, and 5 system roads on the BHNF serve as the primary through routes that connect communities and allow local residents, tourists, and industries access to the Forest. These roads connect to arterial, collector, and some local roads where traffic is dispersed into the Forest for a variety of uses.

A number of communities are directly served by Forest roads as are a large number of private land inholdings. Table 4-7 lists several of the key communities within the BHNF and the primary routes of access into those communities.

Table 4-7. Primary Public and Forest System Access to Larger Communities within the Forest

Community, Town, or City	Public Roads	National Forest System Roads
Deadwood/Lead	US 385 US 85 Forest Highway 17	False Bottom Mt. Roosevelt
Hill City	US 385 US 16 Forest Highway 17	Rochford Rd
Keystone	US 16A SD 40	
Custer	US 16A	Sidney Park

	SD 89 US 385	Hazelrodt Cutoff Lower French Creek Marble Quarry Iron Creek Pleasant Valley Stagg
Pringle	US 385 SD 89	Carroll Creek South Rifle Pit Beaver Creek

Source: BHNF GIS Roads Coverage

These roads and others on the Forest are important to and are used by numerous smaller communities in and around the Forest as well. Many people in these smaller communities rely on access to the Forest for their livelihood as well as for recreation.

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 Black Hills area is widely intermingled between developed areas, Forest administrated lands, towns, and national and state park system lands. There are a number of private and other inholdings dispersed within the Forest. The amount and dispersion of these lands as well as their development vary across the forest. Most of these lands are accessed by arterial and collector roads (ML 3, 4, and 5). Additional access needs to inholdings are addressed on an individual basis as requests are received. Forest Service policy dictates that access is to be provided to a level that is reasonable and suitable for the uses occurring on the land. When landowners desire access, they must apply for a special use or road use permit if new construction or reconstruction is needed. The application is analyzed through the National Environmental Policy Act (NEPA) process to determine possible environmental effects and the level of reasonable access required. If access is provided by a public road agency such as the County or State, the Forest Service may not be obligated to provide any additional access over Federal lands. Furthermore, when larger developments or subdivisions are built and inholding traffic is expected to exceed that generated by the users of the National Forest, agency policy is to pursue transferring jurisdiction of the Forest road to another public road authority such as the county or state.

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, Department of Transportation easements)?

Numerous roads crossing the Forest fall under the jurisdiction of agencies other than the Forest Service. When mutually beneficial and desirable, cooperative agreements can be established to share road improvement and maintenance responsibilities.

A Memorandum of Understanding (MOU) has been entered into between the Forest (the Rocky Mountain Region and Northern Region), the South Dakota Department of Transportation (SDDOT), and the Federal Highway Administration (FHWA-South Dakota Division [MOU – R-2 Supplement 1500-96-1]). The MOU establishes procedures for coordinating transportation

activities on National Forest System lands within the State of South Dakota. Under the MOU, the SDDOT is responsible for the planning, location, design, construction and perpetuation of a safe and efficient public highway system needed for the benefit of the using public (R-2 supplement). The FHWA administers Federal highway funding to the states. The Forest is charged with the protection, occupancy, and multiple use management of Forest lands and resources for the use and benefit of the public and for the development of a Forest Transportation System needed to accomplish these purposes.

Since many public highways traverse Forest lands, the SDDOT needs authorization to occupy those lands for rights-of-way, waste areas, material sources, and highway construction and maintenance operations. Similarly, since elements of the Forest Transportation System and other improvements are connected or adjacent to public highways, the Forest needs approval for development and improvements, which may have an effect on highway administration. The MOU grants those authorities and establishes procedures for consultation and project activities. The Forest highways currently designated by the Federal Highway Administration are listed in Appendix A.

Formal agreements also exist between BHNF and the counties within which the Forest is located to share operations or maintenance for those roads that are part of both the County and Forest system road network. The counties and the Forest Service both recognize that the documentation of development and operation responsibilities can be expected to minimize costly and unnecessary differences through advance coordination and increased understanding.

Rights-of-way, reciprocal rights, and easements are recorded in the Forest files and county courthouse documents and are too numerous to list in this document. The Forest recognizes these rights and works with the owners to maintain access while protecting the natural resources and facilities on adjacent National Forest lands.

Maintenance level 3, 4, and 5 roads for which the FS does not have a recorded easement across private property represent a small potential risk for increased costs to the FS or for possible restriction of public access. That risk was analyzed by determining which roads lack easements across private land. The analysis description and results are presented in Appendix F and on map 24.

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

Design, maintenance, and traffic control on ML 3, 4, and 5 roads generally emphasize user safety and economic efficiency. The largest proportion of road maintenance and improvement funds allocated to the Forest is spent on these higher standard roads. Maintenance, roadside clearing, and installation and maintenance of warning and regulatory signs are performed on an annual basis. Seasonal restrictions are imposed when necessary for the protection of road users.

When accidents occur on Forest roads, often the Forest Service is not immediately informed (unless an employee is involved). Accidents involving only public motorists are reported to the local authorities when they are reported at all. When the Forest is informed of an accident, an investigation is initiated to attempt to identify the cause. If a feature of the road is found to be unsafe, addressing the condition becomes a high priority.

Maintenance funding for ML 3, 4, and 5 roads is inadequate to perform all necessary projects (see EC1) and a deferred funding backlog exists. As budget allocations continue to decrease, it is expected that road condition will deteriorate causing further safety concerns.

4.8 ADMINISTRATIVE USE (AU)

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

In all four ranger districts on the BHNF, the ML 3, 4, and 5 Forest roads appear to provide adequate access for research, inventory, and monitoring.

There is one, existing RNA on the BHNF. The Upper Pine Creek RNA, located in the Hell Canyon Ranger district west of Keystone, is located entirely within the Black Elk Wilderness. The RNA, by design and FS standards and guidelines, is unroaded and closed to motorized recreation.

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

ML 3, 4, and 5 roads on the BHNF generally provide 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 adequate access to the many developed trailhead-parking areas. While the road system provides access to perform investigative and enforcement activities, it also provides access for increasing public use of the National Forest system lands, which can lead to increased crime and, consequently, increased enforcement activity. Known problems include unauthorized off-road travel, poaching of wildlife, illegal campfires, arson, and timber theft.

4.9 PROTECTION (PT)

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

Fuels management is a primary topic of concern for the BHNF. The extensive BHNF road system provides a means to access most parts of the Forest to conduct fuels management activities. The ML 3, 4, and 5 roads provide connectivity to ML 1 and 2 roads to access more remote areas of the Forest.

The Forest recently initiated several major fuel reduction projects, and more projects are likely during the next several years in response to public concern and reduce fire hazard. The focus of much of this fuel reduction planning is the Wildland Urban Interface, particularly the issue of public safety in these areas.

Roads can also function as fuel breaks during fuel hazard reduction projects such as prescribed burning. Firewood removal helps to meet fuel reduction goals and is facilitated by the road system.

The value of ML 3, 4, and 5 roads for fuels management was analyzed in Appendix I. The description of the analysis and the results are presented there, in section 5 and on map 30

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

Not addressed during Forest Scale Analysis per Region 2 Supplement, March 23, 2004.

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

Not addressed during Forest Scale Analysis per Region 2 Supplement, March 23, 2004.

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

Air quality impacts from Forest System roads are associated with vehicle emissions and dust from traffic on unpaved roads. These effects typically are localized and temporary, and their extent depends on the moisture levels and the amount of traffic. Most of the unpaved ML 3, 4, and 5 roads in the BHNF under FS jurisdiction are located in unpopulated areas with low traffic volumes. Dust abatement is a relatively expensive activity and is dependent on budget levels and priorities. Historical budgets have not been sufficient to support other than minimal suppression activities. Dust abatement activities have been required primarily when project level analysis for timber harvest projects identifies needs near residential areas. In those cases, the abatement efforts are made the responsibility of the timber purchaser under the timber sale contract.

4.10 RECREATION

UR & RR(1): Is there now or will there be in the future excess supply or excess demand for non-motorized recreation opportunities? Is there now or will there be in the future excess supply or excess demand for motorized recreation opportunities?

The Black Hills economy depends heavily on recreation and tourism. The Forest is important as both a primary destination and as a backdrop for other destinations (e.g., the region's two National Parks, two National Monuments, a National Memorial, Custer and Bear Butte State Parks, Bureau of Land Management lands, and historic towns). The NFSR system links all of these sites through the Forest.

A National Visitor Use Monitoring sample was conducted in 2003 and determined that recreation use on the forest for fiscal year 2003 was 1,252,175 national forest visits. The 80 percent confidence interval width was +/- 18.1 percent. There were 1,684,885 site visits, an average of 1.22 site visits per national forest visit. Included in the site visit estimate are 55,436 Wilderness visits.(USDA Forest Service BHNF NVUM Report June 2004).

There was an average of 2.43 people per vehicle with an average of 2.03 axles per vehicle. This information in conjunction with traffic counts was used to expand observations from individual interviews to the full forest population of recreation visitors.

A description of visitor activity during their national forest visit was developed. This basic information includes participation in various recreation activities, length of stay on the national forest and at recreation sites, visitor satisfaction with national forest facilities and services, and economic expenditures.

The average length of stay on this forest for a national forest visit was 27.9 hours. Thirty-four percent of visitors stayed overnight on the forest. During their visit to the forest, the top five recreation activities of the visitors were viewing wildlife, relaxing, viewing natural features, driving for pleasure and fishing. Each visitor also picked one of these activities as their primary activity for their current recreation visit to the forest. The top primary activities were fishing, relaxing, hiking/walking, driving for pleasure and motorized water activities. One-third of the recreation visitors interviewed were asked about the types of constructed facilities and special designated areas they used during their visit. The five most used facilities/areas were: picnic area, scenic byway, forest roads, forest trails, and developed campground.

Vehicular travel is one of the most popular recreation activities on the Forest (USDA-Forest Service 2004a). The high demand for vehicular travel opportunities is currently being met by the road system; however, at times many of the roads exhibit congestion during peak seasons. With an average road density of approximately 2.19 miles per square mile on the Forest, there may be more demand for unroaded areas than are currently available.

Over time, the amount of recreation use is expected to increase. Where demand for motorized recreation stays constant or increases, and the area where that opportunity is allowed stays constant or decreases, crowding and a reduction in the quality of the recreation experience can be expected. The same holds true for areas where the demand is for non-motorized recreation.

Recreation on the Forest is managed in compliance with the requirements of the adopted ROS classes. The classes are summarized in Table 4-8 below by management area.

Table 4-8. Recreation Opportunity Spectrum Classes by Management Area

Management Area	Name	Acres	P	SPNM	SPM	RN	RNNM	R
1.1A	Black Elk Wilderness	13,542	X					
3.1	Botanical Areas	8,120		X		X		
3.2A	Inyan Kara Mountain	1,345	X					
3.31	Back Country Motorized Recreation Emphasis	11,865			X			
3.32	Back Country Non-Motorized Recreation Emphasis	11,532		X				
3.7	Late Successional Forest Landscapes	25,026					X	

Table 4-8. Recreation Opportunity Spectrum Classes by Management Area

Management Area	Name	Acres	P	SPNM	SPM	RN	RNNM	R
4.1	Limited Motorized Use and Forest Product Emphasis	43,647					X	
4.2A	Spearfish Canyon	9,399				X		
4.2B	Peter Norbeck Scenic Byway	1,695				X		
5.1	Resource Production Emphasis	536,869				X		
5.1A	Southern Hills Forest and Grassland Areas	89,685				X		
5.2A	Fort Meade VA Hospital Watershed	3,308		X		X		
5.3A	Black Hills Experimental Forest	3,393				X		
5.3B	Sturgis Experimental Watershed	1,079		X				
5.4	Big Game Winter Range Emphasis	396,289				X		
5.4A	Norbeck Wildlife Preserve	10,074		X				
5.43	Big Game and Resource Production	12,174				X		
5.6	Forest Products, Recreation, Big Game Emphasis	27,173				X		
8.2	Developed Recreation Complexes	11,395				X		

P=Primitive; SPNM=Semi-primitive non-motorized; SPM=Semi-primitive motorized; RN=Roaded Natural; RNNM=Roaded natural non-motorized; R=Rural.

Non-motorized areas make up 10 percent of the Forest with the other 90 percent being open to motorized use. The Primitive class (1 percent) is managed to be essentially free from evidence of humans and on-site controls. Motor vehicle use within the area is not permitted. The Semi-Primitive Non-motorized class (3 percent) is important for nonmotorized recreation in a predominantly unroaded context. All non-motorized activities are allowed in these areas. Semi-Primitive Motorized (1 percent) offers access on level 1 and 2 roads. There are no restrictions on the type of vehicles that can use these roads, so they provide opportunities for recreational off-road travel, as well as access for hunting. ML 3, 4, and 5 roads are used to access the roads to these areas. The Roaded Natural areas (89 percent) tend to have more of the arterial and collector roads, but may still have qualities of naturalness that are conducive to sightseeing. Roaded Natural Non-motorized areas (6 percent) are managed to provide a natural-appearing environment with moderate evidence of humans.

UR & 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 or roaded recreation opportunities?

More than 89 percent of the BHNF is currently managed as roaded natural (RN) ROS class, which emphasizes roaded recreation. Approximately 6% is managed as roaded natural non-motorized. Another 1% of the BHNF is managed as semi-primitive motorized, which permits motorized use although at a lesser degree of development. Given the abundance of roaded recreation opportunities in the BHNF, building roads into currently unroaded areas, road maintenance and road decommissioning, except on a large scale, would have a small effect on the quality or quantity of roaded recreation opportunities, but developing new roads into unroaded areas could have an affect on unroaded recreation opportunities because of the limited amount of unroaded areas currently available (4%).

When travel is limited, as when roads are decommissioned or the maintenance level is reduced such that travel is no longer possible for a portion of users, some users will gain and others will lose. For example, when an area is closed to motorized travel to protect wildlife, there is a secondary effect on people: the closure not only shuts off motorized travel, but it also restricts access for persons with disabilities, limits firewood gathering, and may reduce some forms of recreation, such as hunting. On the other hand, a closure to motorized travel provides increased solitude for hikers and cross-country skiers.

In general, decommissioning or reducing the maintenance level of existing roads would be expected to indirectly benefit people who prefer non-motorized recreation while developing new roads would be expected to benefit those users who prefer motorized recreation. Given the roaded nature of the Forest, the minimal amount of decommissioning, development of new roads, and change in maintenance levels should have no substantial change in the quantity, quality, or type of recreation opportunities on the Forest as a whole.

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

Not addressed during Forest Scale Analysis per Region 2 Supplement, March 23, 2004.

UR & RR(4) & (5): Who participates in unroaded recreation and road-related recreation in the areas affected by constructing, maintaining, and decommissioning roads? What are these participants' attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

The principal recreation activities on the BHNF are driving for pleasure and viewing scenery (63 percent), camping and picnicking (9 percent), hunting and fishing (7 percent), hiking and horseback riding (7 percent), and snowmobiling (4 percent). These uses occur in dispersed areas and at developed sites. The remaining 10 percent is comprised of nearly 50 other activities.

All Forest users travel on ML 3, 4, and 5 roads either exclusively or to access level 1 and 2 roads.

The “Recreation Corridor” centered along Highway 16 is specifically tourist-oriented. Such tourist attractions as Custer State Park, Wind Cave National Park, Jewel Cave National Monument, Mount Rushmore National Memorial, Crazy Horse Monument, Keystone, Hill City, and Reptile Gardens are in the area. The heaviest use occurs between Memorial Day and Labor Day.

Generally, recreational users of the Forest are very attached to the area as a place to go for a “drive in the country”, find peace and quiet, enjoy the scenery and outdoor experiences, to gather forest products, and enjoy the many national attractions contained within the Forest boundary. Multiple opportunities exist for the variety of recreation uses throughout the Forest. When planning for future construction, maintenance, and decommissioning of roads, impacts to recreational use of those particular areas are generally considered on a project-by-project basis.

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

New roads can affect scenic integrity by detracting from the natural form, line, and color of the surroundings. Improperly designed roads, specifically those with fresh cut-and-fill slopes, would especially reduce scenic quality. Decommissioning roads, by contrast, would, in the long-term, likely restore scenic integrity as the unused road is returned to its natural state. Scenic integrity will be addressed as new road construction, reconstruction, or decommissioning is proposed. Reducing the maintenance level of roads can result in visible erosion damage, which decreases scenic integrity. Increasing road maintenance can target better protection and conservation of the scenic integrity within the road corridor.

Two scenic byways are located on the Forest. The 70-mile Peter Norbeck Scenic Byway traverses portions of Highways 87, 89 and 16A and enters into Custer State Park for a portion of the route. Mount Rushmore, the Norbeck Overlook, the Gordon Stockade, Cathedral Spires, Needles Eye, the Norbeck Wildlife Preserve, and Sylvan and Horsethief lakes are a few of the points of interest along the route. The Spearfish Canyon Scenic Byway, which also functions as a commercial highway (US 14A) connects I-90 to US 85. The steep, high Paha Sapa Limestone walls, which surround the Canyon, are a constant, dominant feature.

The scenic integrity value of level 3, 4, and 5 roads was analyzed in Appendix I of this report. A discussion of the analysis, and the results are presented in Appendix I and on map 33.

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

Primitive recreation opportunities on the Forest are limited to the Black Elk Wilderness and Inyan Kara Mountain (no public access to Inyan Kara). Motorized use in these areas is prohibited thereby protecting the natural integrity, natural appearance, and opportunities for solitude at these sites. Unroaded recreational experiences can be had in other areas of the Forest. Should currently unroaded areas become roaded, visitors may be displaced to other undeveloped

areas, including Black Elk Wilderness and Inyan Kara Mountain, which could result in crowding of these areas.

4.11 PASSIVE USE (PV)

Passive use value questions have been incorporated into the Social Issues questions.

4.12 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 the forest?

The road system provides access for use of the Forest, including access for developed and dispersed recreation, timber production, livestock and rangeland management, mineral production, access to historical sites, management of fire and fuels, wildlife needs, and insect and disease risk. In addition, the road system provides access to private land holdings within the Forest boundary and provides a throughway for the transport of goods and services to the human communities within and near the Black Hills region. Because the Black Hills region is an area of national tourist destinations, users of the road system include residents of many states and other countries, as well as communities within the region.

The Forest road system provides access for recreation opportunities for people of many states. The principal recreation activity in the BHNF, accounting for 63 percent of RVDs, is driving for pleasure and viewing scenery (USDA-Forest Service 1996a). To accommodate this recreational use and recognize scenic and popular routes, two scenic byways were created within the Forest– the Peter Norbeck and Spearfish Canyon Scenic Byways. The Peter Norbeck Scenic Byway, a 70-mile drive through the heart of the Black Hills granitic core, includes parts of U.S. Highway 16A (the Iron Mountain Road); S.D. Highway 87 (the Needles Highway); S.D. Highway 89 (the Sylvan Lake Road); and S.D. Highway 244 (the Mount Rushmore Highway). It lies adjacent to, and provides access to, Mount Rushmore National Memorial and Custer State Park. The Spearfish Canyon Scenic Byway is an 18-mile drive through a canyon carved into the sedimentary shale and limestone units in the northern Hills area. This byway runs along U.S. Highway 14A between the towns of Spearfish and Cheyenne Crossing providing access to waterfalls, wildlife, and numerous recreational activities.

Other principle recreational uses are camping and picnicking (accounting for 9 percent of RVDs, annually); hunting and fishing (7 percent); hiking and horseback riding (7 percent); and snowmobiling (4 percent). The remaining 10 percent of recreational use includes nearly 50 other activities (USDA-Forest Service 1996a). The road system of the Forest provides access to Forest lands for these recreational uses. In addition, the road system provides access to other national destinations that are located within or adjacent to the boundary of the Forest, including Wind Cave National Park, Mount Rushmore National Monument, Jewel Cave National Monument, and Custer State Park (USDA-Forest Service 1997a).

In addition to standard recreational use, special events occur during the tourist season, which test the capacity of the road system. One example is the Sturgis Motorcycle Rally, which occurs

once a year for a week in August. During this event, more than half a million motorcycle enthusiasts converge in the Black Hills. The event routes the bikers on a number of different tours through the Northern, Central and Southern portions of the Black Hills, primarily on paved roads. In addition, the event attracts thousands of vendors to the town of Sturgis where an annual rally is held. Other special events in the region include the Days of ’76 and the Black Hills Roundup Rodeo in Belle Fourche (USDA-Forest Service 1996a).

While use of the road system by local residents is generally constant throughout the year, recreational road use and road use during hunting season in the Black Hills is both heavy and seasonal. The majority of the RVDs per year occur during the tourist season, which generally extends from Memorial Day to Labor Day (USDA-Forest Service 1996a). Winter road use is lighter and allows for seasonal range restrictions to be applied between October and April, as necessary.

The road system also provides access for timber harvest. The BHNF has the highest allowable sale quantity of any forest in the Rocky Mountain region. A high demand exists for wood products manufactured from ponderosa pine, the dominant species in the Black Hills, and from white spruce. The Black Hills region has a modern and efficient wood-products industry that has a capacity to process over 200 million board feet annually. Forest System lands have contributed about two-thirds of the industry’s capacity, and demand for sawtimber (logs) from the Forest is expected to remain higher than supply (USDA-Forest Service 1997a). The road system provides access for the harvest and transport of sawtimber as well as roundwood (products other than logs) throughout the majority of the Forest.

People in and near the forest also use the road system in the management of livestock and rangeland. About 1.0 million acres of Forest lands are suitable for livestock grazing and browsing, which represents over 80 percent of the Forest Service land within the proclaimed Forest boundary (USDA-Forest Service 1996a). These 1.0 million acres represent about 128,000 animal unit months. Recently, actual authorized use has ranged from about 84 to 93 percent of permitted use (USDA-Forest Service 2004a). Livestock grazing occurs throughout the Forest. The road system allows for management activities such as monitoring rangeland condition and transport of livestock to and from pastures. However, road construction and maintenance can disturb land that could otherwise be used for grazing livestock (USDA-Forest Service 1996a).

The road system supports mineral production by allowing access to private lands within the Forest boundary and transportation routes for extracted resources. Historically, important locatable mineral products from the Black Hills have included gold, silver, iron, uranium, and pegmatite (USDA-Forest Service 1996a). However, although a number of large-scale gold mines operated in the area within the last decade, there is only one large-scale, heap leach gold mine still operating in the Black Hills, the Wharf Resources mine near Lead, located on private property (USDA-Forest Service 2004a). Pegmatites, which contain feldspar and mica as well as other minerals, occur primarily around the Harney Peak uplift in the southern Black Hills and in the Tinton area of the northern Black Hills (USDA-Forest Service 1996a). As of 1997, the southern deposits were being used for commercial production of potash feldspar, scrap mica, and quartz, but the Tinton deposits were not being used for commercial production. Pegmatite mines exist on both private and Forest System lands (USDA-Forest Service 1996a). Sand and crushed gravel (for Forest Service and counties only) are also taken from Forest System lands (USDA-

Forest Service 2004a). Forest System roads provide access for exploration, development, production, and transportation of these minerals. The only known leasable minerals on BHNF are oil and gas (USDA-Forest Service 1996a); there are currently no oil and gas leases or exploration on BHNF lands (USDA-Forest Service 2004a).

The road system provides access to historic and heritage sites for the general community (e.g., Custer State Park) as well as for the American Indian community. Heritage resources, formerly called "cultural resources," are the physical remains and conceptual content or context of an area. They include artifacts, rock art, ruins, landscapes and structures, or settings for legendary, historic, or prehistoric events. There are over 1,500 historic and 1,900 prehistoric resources in the Forest, and an additional 5,000 historic and 6,400 prehistoric resources may exist (USDA-Forest Service 1996a). The road system provides opportunities for protection of these heritage resources, as well as scientific study and public visitation of some resources, but can also lead to excessive disturbance that could harm heritage resources. For many American Indians, the Black Hills are sacred. Based on American Indian input, it is estimated that there are at least 500 spiritual areas between the southern Black Hills and the Rapid City-Spearfish area (USDA-Forest Service 1996a). Cultural practices such as gathering plants and practicing spiritual ceremonies occur on Forest System lands, and the road system provides essential access for these purposes. At the same time, road construction and maintenance and public access have the potential to damage these resources.

Forest Service employees use the road system to access Forest lands to conduct management activities such as: fuels, suppress forest fires, manage wildlife, manage recreation, and manage insect and disease risk. These activities occur throughout the Forest.

In addition to providing access to Forest System lands, the road system provides access to private land holdings within the Forest boundary. Nearly 19 percent of the 1.5 million acres within the proclaimed Forest boundary is privately owned, with entire towns (e.g., Custer, Hill City, Keystone, Lead, and Deadwood) located within the Forest. Thus, private landowners and residents make up a large portion of road users. Dispersed inholdings require access. Many inholdings are being developed with related increases in traffic.

Finally, the forest road system provides throughways for the transport of goods and services to the human communities within and near the Black Hills region. Commercial transport occurs on predominantly on Forest Highways, but Forest System Roads also provide throughways for transport of goods and services to communities located within the proclaimed Forest boundary.

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

Motorized use of the Forest System lands in the Black Hills has a long history and people are accustomed to utilizing the road system to access the Forest for economic, social, and cultural purposes. The Black Hills has a strong tradition of multiple use of resources, with many people tied to the way the Forest is managed either by employment (e.g., through the logging, ranching, and tourism industries) or people looking to enjoy the outdoor recreation opportunities that the Forest has to offer (e.g., sightseeing, hunting, fishing, biking, hiking, snowmobiling, and skiing) or people who value the heritage resources or spiritual values provided by the Black Hills.

The present ML 3, 4, and 5 road system was established largely to provide access for logging and access to private property.. However, the road system now supports other opportunities, such as recreational access, and access to heritage sites. In some cases, such as that of heritage sites, the road system can both support preservation and protection of resources and can also facilitate the degradation and destruction of resources (USDA-Forest Service 1996a).

The communities in and near the proclaimed Forest System boundary value access to the Forest for commodity values (such as timber and minerals), amenity values (such as recreation and visual resources), and non-market forest products. This final category includes the use of traditional plants by American Indians, as well as gathering of forest products by other individuals.

Access is also important for the management of Forest System lands as well as non Forest-owned lands within the proclaimed Forest System boundary. ML 3, 4, and 5 road closures or maintenance level modifications may impact access to traditional, cultural, historical, residential, and commercial sites. Such closures or maintenance level modifications may also impact access by Forest Service permittees or cooperators, as well as private owners and other land management agencies (e.g., the National Park Service) for management activities.

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

Seven counties contain parts of the BHNF and, overall, about 12 percent of the land area in those counties is Forest System land (USDA-Forest Service 2004a). Thus, road system management decisions impact social and economic conditions in communities in these counties. Access to lands within the Forest boundary is essential for the economic health of the region and access also has important social benefits outside the region since the Black Hills region is a national tourist destination. The local economy generally benefits from the well-maintained roads that link communities to one another and to the greater region, which in turn fosters community development and facilitates access for fire and emergency response. The road system also provides a route of entry into the Forest for industries that rely on forest products, most notably timber harvest activities. Finally, roads channel tourists, and associated economic benefits, into the area.

Timber is a recognized commodity of the Forest System lands and roads, and provides substantial job opportunities for local residents. The wood products industry directly employs about 1,600 people in the seven-county region; about 1.5 percent of total jobs in the area (USDA-Forest Service 2004a). Recreational use of the road network and surrounding lands also provides employment opportunities for industries that support tourism, as well as recreational opportunities for the region and for the nation. It is difficult to measure employment related to recreational activity, because that employment occurs in many sectors (USDA-Forest Service 2004a). However, it is important to note that many tourism-related jobs are seasonal and do not pay a wage or have benefits that would attract families (USDA-Forest Service 2004a). Other important economic uses of the road system and the Forest System lands include mineral production and livestock grazing (USDA-Forest Service 2004a).

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

The influx of immigrants into the area during the late 1800s led to the expansion of the transportation system in the Black Hills for accessing mining, grazing, and logging activities. Paths and trails were developed into more formal routes for wagons and wheeled vehicles. Large tracts of forest were cut in order to provide timber to the growing mining industry and to provide housing for the people now residing in the Black Hills. By the 1920s, a major highway system was developed and a Forest Road System was initiated. The Civilian Conservation Corps augmented the system in the 1930s to accommodate tourists traveling in passenger vehicles. The present ML 3, 4, and 5 road system has evolved largely in response to resource production on the Forest over the last 100 years, particularly from logging and the demand for access to private property.

Area residents typically value rural or small-town life, family-oriented recreational use, and scenery-related quality of life, as well as valuing the commodities production that provides essential employment and income for the region. Many residents, particularly in the western portion of the region, are descended from original pioneer families who settled the land a century or more ago. These residents in particular tend to have a close tie to the public land, including the need to use it economically to make a living (USDA-Forest Service 1996a).

The population also enjoys the diverse recreational opportunities and fairly easy access to the Forest. The 2004 Draft EIS for the Forest LRMP Phase II Amendment found that generally, residents of the area favor continued timber production and management on the Forest. They enjoy the benefits of the timber road network for recreation and would prefer to have the roads maintained and open (USDA-Forest Service 2004a).

For some residents, the existence of roadless areas in the Forest, which comprise approximately 26,000 acres, or roughly 2 percent of the Forest, provides an important value for their sense of place. Like other natural attributes of the forest, people have different values about the need for or desirability of preserving roadless and pristine areas. Some people value well-managed access to the forest for multiple use. Many of these uses tend to generate road construction. For recreation, roads provide access for pleasure driving, hunting, camping, and other dispersed recreation, although they reduce the supply of roadless areas that provide for a more primitive recreation experience. The issue of equity is also important to some people, since persons with disabilities or limited mobility (such as the elderly) cannot partake in certain wilderness opportunities. Some people greatly value the chance to find solitude in remote and natural settings. Others believe that wilderness is essential for ecological reasons, and the slow development of natural landscape has broader implications on the human environment and health.

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?

There is a conflict currently regarding the use of the Forest and Forest Road System for consumptive versus non-consumptive uses, depending on the area. Some areas, such as those around Newcastle and Sundance, are generally more commodities oriented, while others, such as the Highway 16 corridor, are generally more recreation oriented. This conflict is reflected in the recent concern over Forest management by some environmental organizations, and emphasized by the number of appeals to Forest projects, which have gained wide media attention. The diversity of opinion may reflect a growing change in local attitudes towards Forest management.

For long-time local residents who depend on logging and other commodity production, the general objective is for resources to be managed in a way that sustains economic viability. More recently, the natural beauty and features of the area have prompted tourism and recreation, which have also benefited from the road system. Thus, although there may be some trends toward an increased awareness of the outdoors and non consumptive resources, there is still a strong component that relies on consumptive uses (USDA-Forest Service 1996a). Especially as the population around the Forest increases, the desire among some residents to have unroaded areas may conflict with the desire of other residents to use the Forest for either commodity production and/or more developed recreation.

Another conflict associated with the road system and its management is related to the development of private land within the Forest boundary. Roads and driveways serving residential areas and business that intersect with Forest roads create vehicle speed and turning movement conflicts that can increase the potential for accidents, resulting in both damaged vehicles and personal injury. Additionally, the mix of vehicles (large trucks, high- and low-clearance personal vehicles, all terrain vehicles, motorcycles, snowmobiles) traveling at different traffic speeds on ML 3, 4, and 5 roads create conflicts that can lead to traffic accidents and congestion.

Another conflict is related to the issue of access to traditional and heritage sites. ML 3, 4, and 5 roads that are adjacent to traditional, cultural, and historic sites in the BHNF can lead to vandalism of those sites. On the other hand, ML 3, 4, and 5 road closures or maintenance level modifications may impact access to traditional and heritage sites, which can reduce opportunities for protection, interpretation, and visitor access.

In general, conflicts associated with multiple use and the development of private land can be expected to increase as communities in and near the area continue to grow and change. Manufacturing employment in the area has generally declined, spurred in part by recent declines in timber supply and the closing of Homestake gold mine. However, other industry has been increasing and is being promoted. At the same time, retiree populations have increased, and overall the population has increased in the last decade (USDA-Forest Service 2004a). As communities continue to grow, the level of human interest and activities can be expected to intensify. Differences in social, economic and cultural values may become more of an issue as a result.

4.13 CULTURAL/HISTORICAL ISSUES (CH)

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

Access to heritage resources (e.g., archaeological, historical and paleontological sites) is a multi-faceted subject with the opportunity both to benefit and to adversely affect the resource. Whether or not access is a desirable condition depends on how access can be expected to affect a resource, and in specific cases competing interests may even come to different conclusions (USDA-Forest Service 1996a). With over 6,000 archaeological and historical resources identified to date on the BHNF, and an estimated 11,000 projected resources present (of which as many as 1300 or more are eligible for the NRHP [USDA-Forest Service 1996a]) examples of every possible scenario can be found on the Forest. Fewer paleontological resource sites have been recorded, but they are subject to the same effects as heritage resources.

Access to cultural resources provides an opportunity for study, learning, preservation, protection from fire (USDA-Forest Service 1996a), monitoring, and traditional use. Balancing the benefits of reaching cultural resources more easily are the deleterious effects possible from over-use, vandalism or looting, and other physical effects both intended and unintended. Effects harder to identify in advance include the effects to the NRHP integrity of a resource as a result of changes in setting due to traffic or visitors.

In contrast to good or improved access, lack of access to cultural resources also may have both a beneficial and deleterious effect. Archaeological and paleontological sites usually retain greater integrity when they are not visited for any purpose, particularly when isolation results in protection from looting. However, lack of access can result in unrecognized physical deterioration from natural causes such as erosion. Similarly, isolated structural resources such as buildings, bridges, or mining features are generally protected from vandalism or overuse when they are not readily accessible, but can lose NRHP integrity when neglect results in their collapse, other deterioration, or fire (36CFR800.5(a)(2)(vi)).

Traditional cultural resources are subject to the same complex mix of conditions as archaeological, architectural, and paleontological resources. Although difficulty in reaching traditional use areas can have the effect of conserving the resource from overuse or unwanted intrusion from cultural outsiders, lack of access has the same effect as removing the resource. On the other hand, traditional resources are particularly sensitive to overcrowding and usage conflicts.

American Indians, particularly the Oglala and Standing Rock Sioux, have expressed concerns about access to traditional resource use areas on the BHNF (USDA-Forest Service 1999b). However, these concerns center more on the availability of the resources, such as medicinal plants, and the ability of traditional users to harvest them or use the locations for ceremonial purposes than around roadways to the traditional use areas.

The construction, maintenance, and use of road systems has the potential to result in ground disturbance and cause adverse effects to significant archaeological, cultural, and paleontological sites. A common mitigation measure used by the BHNF is to “cap” or cover significant

resources with gravel or earth fill and fabric cover. A major risk to significant heritage or paleontological resources is the use of native surface roads. Continued use can result in rutting, erosion and disturbance of intact artifact deposits and paleontological resources.

The BHNF seeks to balance the needs of its various constituencies and its own mission when considering specific road projects; both improvements and closures. The Forest already conducts consultation with interested groups, including government-to-government consultation with American Indians. Because of the extent of the road system, the effects of each proposal is evaluated in the context of complying with Section 106 of the NHPA.

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

Management of the road system in BHNF is of concern to American Indians, particularly as it relates to other development activities on the Forest. American Indian issues related to management of BHNF include: (1) recognition of traditional American Indian values, (2) protection of sacred areas, (3) access to practice traditional ceremonies, (4) appropriate reburial of human remains, (5) greater involvement in land management decisions, and (6) employment and training opportunities (USDA-Forest Service 1996a).

American Indians, particularly the Oglala and Standing Rock Sioux, have expressed concerns about access to traditional resource use areas on the BHNF (USDA-Forest Service 1999b). These include resource gathering areas, general historic use areas, and sacred sites. Treaty issues surrounding the 1868 Treaty of Fort Laramie and subsequent abrogation of the Treaty in 1877 remain unresolved, although BHNF continues to consult with American Indians to resolve issues of resource protection, access and use. The Forest Service is required by policy (USDA-Forest Service 1997b) to protect the rights and privileges guaranteed to American Indians by treaty rights.

The BHNF road system provides access for traditional uses (e.g., harvesting of resource materials such as tipi poles and native plants), and for religious ceremonies. Tribes will be able to continue to harvest tipi poles and traditional and medicinal plants. Negative impacts from road closures that can result if traditional users are unable to access traditional resources could be balanced by the increased access provided by reconstructed or otherwise improved or new roads. However, increased access can also create conflicts between traditional uses and recreation or extractive uses (USDA-Forest Service 2000a).

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

Historic roads and trails meeting the NRHP criteria are considered historic properties; even such resources that are not eligible for the NRHP on a national level may have local or state significance. Included in this resource type are bridges, culverts, and or other structural elements of the transportation system. Roads having historic value are often still used as routes throughout the Forest, adding another layer to their heritage value (USDA Forest Service 2000a).

A number of historic heritage resources that are part of the current road system in the BHNF have been listed on the NRHP or are considered eligible (USDA-Forest Service 1996b). The NRHP-eligible sites listed below are representative of the various site types.

- Portions of the Cheyenne-Deadwood Trail
- Cheyenne-Deadwood Trail
- Belle Fourche Bridge
- Iron Mountain Road and Pigtail Bridges
- Forest Roads associated with Civilian Conservation Corps (CCC) activities and facilities: Pactola; Rochford; Hill City; Rockerville; Custer; Tigerville and Deerfield; Savoy and Summit; and Park Creek
- CCC features associated with roads
- McLaughlin Tie 7 Timber Railroad

Effects on historic roads and trails are considered on a project-specific level, to comply with Section 106 of the NHPA. Projects could include reconstruction of roads that are or follow historic routes, replacement or repair of historic features such as bridges or CCC-related structures, construction of new roads that follow historic routes, or decommissioning of historic roads. While most of these projects could affect the historic character of a resource by modifying or demolishing it, decommissioning roads with historic features could result in the deterioration of these features through neglect ((36CFR800.5(a)(2)(vi)).

4.14 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?

Users of Forest System roads include people with disabilities and people of all racial backgrounds and income levels. None of the counties in the Black Hills contain low-income or minority populations as defined by Executive Order 12898 (USDA-Forest Service 2004a). In general, changes in road management, including closing or decommissioning of roads, would have similar effects on all people, including minorities and low-income populations. Closing or decommissioning roads would have somewhat greater impact on people with disabilities.

However, for project-level decisions, particular attention is generally paid to roads that provide access to recreation areas that are accessible to people with disabilities or with limited mobility (e.g., the elderly) since they generally have difficulty with or cannot partake in certain wilderness opportunities.

In addition, project-level decisions should consider the particular needs of American Indians. Among other purposes, American Indians use the road system for gathering traditional plants and accessing sites of particular spiritual importance. However, road system planning and

management is essential, because road construction, maintenance, and public access can disturb such sites.

Finally, it should be noted that minorities hold jobs in the wood-products industry in a much higher proportion than the population of minorities represented in the region (USDA-Forest Service 2004a). Thus, road management decisions that affect access to timber-producing areas, or increase costs of timber production, could have indirect adverse effects on minority populations.

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STEP 5: DESCRIBING OPPORTUNITIES AND SETTING PRIORITIES

Step 5 involves focusing on where opportunities exist to improve the NFSR system on the BHNF and setting priorities. In order to do so, roads in this analysis were categorized based on the key values and identified risks associated with each road. The methods used to assign values and risks are described below.

5.1 METHOD

ML 3, 4, and 5 roads on the BHNF were evaluated to assess the risks and values associated with the current road system using the following tools: GIS assessment, road matrix spreadsheets, and a road management graph.

GIS Assessment. The estimated potential relative risks and values presented by Forest roads were evaluated at the road and watershed scales. The analysis used GIS computer technology combined with the current BHNF roads inventory and cartographic feature files. The analysis at the road scale analyzed risks and values associated only with ML 3, 4, and 5 roads. The watershed analysis was not limited to ML 3, 4, and 5 roads, but included all currently inventoried roads on the Forest. Analyzing all roads allowed for a more accurate description of road density, watershed condition, and watershed risk assessment on the Forest. Maps were produced to illustrate the spatial aspects of the road and watershed parameters analyzed.

The Road Matrix Spreadsheets. The Road Matrix Spreadsheets list all selected maintenance level 3,4 and 5 National Forest Service Roads, the assigned low, moderate, or high relative risk/value ratings for each, and the data values that were used to determine those ratings. Since this road analysis is an overview assessment, the detail and accuracy for relative road risk and values contain a degree of subjectivity and potential for value changes. The road matrix spreadsheets do, however, provide road-specific information on roads that may pose a higher than average risks to resources and can be used in conjunction with road value assessments to assist with prioritizing future local-level analysis or projects. As more information becomes available or is updated, the road matrix information should be validated and updated accordingly.

The Road Management Graph. The Road Management Graph was developed following procedures outlined by the Allegheny National Forest Roads Analysis Report (USDA-Forest Service 2003) to display the information in the road matrix spreadsheets. The graph categorizes the relative values and risks of the current road system, helps identify opportunities for managing the road system, and prioritizes expenditures of Forest road maintenance and improvement funds. This graph is strictly a management guide and is not to be considered firm direction as it combines many of the road matrix risk and value variables.

5.2 CRITERIA FOR ASSIGNING VALUES AND RISKS TO THE ROAD SYSTEM AND WATERSHEDS

To assess the impact of roads on the BHNF and to identify opportunities and priorities for road management, a ranking system of relative risks and values was developed based on the issues,

problems, risks, and benefits identified in the previous steps. Eight road-related risk criteria and seven road-related value criteria were developed for the BHNF RAP. The relative rating of the sums of these values was used to place each road identified in the road matrix into one of the nine road management categories displayed in the road management graph. The risks and values from the road matrix spreadsheets are defined below.

A similar assessment process was conducted at the watershed scale. The watershed analysis used all of the roads in the forest as opposed to looking at only the ML 3, 4, and 5 roads. This analysis considered only potential hydrology and wildlife risks. The same risk factors used for the road scale analysis were used. The results for watershed Hydrology risks are presented in Appendix C with the road information. Results for watershed Wildlife risks are presented in Appendix E with the road information. Maps showing the results by watershed are in Appendix H. The results of the watershed analysis were not used in the Road Management Graph.

5.2.1 Road-Related Risks

In all cases, the individual risk indicators are based on relative amounts of a parameter found on the Black Hills National Forest. The actual or 'absolute' risk that roads pose to the selected parameters could not be determined within the scope of this analysis. An attempt was made to be conservative in assigning risk conditions to increase the likelihood that high risk areas would be identified. The assigning of these risk conditions and the relative ranking of the results is based, in most cases, on the professional judgment of the specialists involved. It is important to note therefore that the relative risk rankings should only be used as an indicator of the road's potential for impact and as a flag for project level analysis teams to look at a road in more detail.

In combining the individual risk factors into the overall relative road risk rating, the factors were weighted equally. It is likely that certain risks would contribute more or less to the overall risk of a particular road, area, or watershed but a valid method of weighting them could not be determined.

General relative risk categories were assigned as follows:

0 - There are no or relatively low potential risks.

1 - There are relatively moderate potential risks.

2 - There are relatively high potential risks.

Relative road risk was evaluated using the following relative risk indicators. The detailed discussion of these overall relative risk factors and the results are presented in Appendix F and on numerous maps in Appendix H.

1. **Hydrology Risks**
2. **Wildlife Risks** .
3. **Weed Infestation Risk**

4. **Resource Damage Area Risk**
5. **Botanical Area Risk**
6. **Heritage Area Risk**
7. **Land Right of Way Risk**
8. **Maintenance Cost Risk.**

The risk rating for each of the above risk factors was added for each road with sixteen being the highest possible sum. None of the roads reached the highest possible sum. The distribution of these sums was reviewed and an overall relative road risk factor was assigned. The overall ratings are as follows:

0 - Relatively Lower Overall Road Risk: 0 to 4.5 relative points

1 - Relatively Moderate Overall Risk: 5 to 7.5 relative points

2 - Relatively Higher Overall Road Risk: 8 to 14.5 relative points.

Hydrology Risk

The hydrology relative risk factor above was further divided into six individual hydrology related factors. A detailed discussion is presented in Appendix C and on numerous maps in Appendix H. The individual factors are:

1. **Road Density Risk**
2. **Perennial Stream Crossing Risk**
3. **Stream Proximity Risk (30 feet)**
4. **Stream Proximity Risk (119 feet)**
5. **Highly Erosive Soils Risk**
6. **High Slope Risk**

Each individual factor was assigned a risk rating number of 0 to 2. The ratings were added together. The highest possible risk sum was 12. The overall hydrology relative road risk ratings assigned to each road was distributed as follows. This number was used in the overall relative risk analysis above for Hydrology risks.

0 - Relatively Lower Overall Hydrology Road Risk: 0 to 4 relative points

1 - Relatively Moderate Overall Hydrology Road Risk: 5 to 8 relative points

2 - Relatively High Overall Hydrology Road Risk: 9 to 12 relative points.

Wildlife Risk

The wildlife relative risk factor is also based on the combination of six individual related factors. A detailed discussion is also presented in Appendix C and on numerous maps in Appendix H. The individual factors are:

1. **Road Density Risk**
2. **Goshawk Nest Proximity Risk**
3. **Marten Habitat Risk**
4. **Snail Colony Risk**
5. **Riparian Area Proximity Risk**
6. **American Dipper Stream Proximity Risk**

Each individual factor was assigned a risk number of 0 to 2. The highest possible risk number was 12. None of the roads had the highest possible risk number. The overall wildlife road risk ratings assigned to each road was distributed as follows. This number was used in the overall relative risk analysis above as the Wildlife Risk.

0 - Relatively Lower Overall Wildlife Road Risk: 0 to 3 relative points

1 - Relatively Moderate Overall Wildlife Road Risk: 4 to 5 relative points

2 - Relatively High Overall Wildlife Road Risk: 6to 9 relative points.

5.2.2 Road-Related Values

Relative value ratings were selected, analyzed, rated and compiled using the same method described for relative risks. The detailed discussion and the results are presented in Appendix I and on numerous maps in Appendix H.

Relative road value was evaluated using the following relative value indicators:

1. **Timber Access Value**
2. **Range Access Value**
3. **Firefighting Access Value**
4. **Fuels Treatment Value**
5. **Recreation Access Value**
6. **Transportation Value**
7. **Visual and Social Value.**

Overall Relative Value.

The value rating for each of the above risk factors was added for each road with fourteen being the highest sum. The distribution of these sums was reviewed and an overall relative road value factor was assigned. The lowest value for a road was three. The cumulative ratings are as follows:

0 - Relatively Lower Overall Road Value: 3 to 5 relative points

1 - Relatively Moderate Overall Road Value: 6 to 8 relative points

2 - Relatively High Overall Road Value: 9 to 14 relative points.

5.2.3 Watershed Related Risks

Overall Hydrology Relative Risk – by watershed

Relative watershed risk was evaluated using the same relative risk indicators that were used for roads. The evaluation by watershed was performed to provide a more general picture of concentrations of potential hydrology risks throughout the forest and to provide the data at a scale that is frequently used during project level analysis. Unlike the data for the calculation by level 3,4,5 system road above, the data used for this calculation includes all roads (system and non-system, all jurisdictions). The risk indicators were added up in each 6th order watershed and divided by the square miles in that watershed. Therefore, the units of these risk factors are occurrences or miles per square mile vs. the occurrences per road. As with the roads analysis, the risks were summed up for each watershed and an overall relative hydrology risk was assigned to each watershed.

The risk rating for each of the above hydrology risk factors was computed and added for each watershed. The distribution of these sums was reviewed and a cumulative hydrology relative risk factor was assigned. This factor was not used in the overall road risk computation but it is useful in showing a relative risk over a large area. A map was generated to show the resulting relative risk of each watershed. The cumulative ratings are as follows:

0 - Relatively Lower Overall Risk: 0 to 3 Overall Watershed Risk Score

1 - Relatively Moderate Overall Risk: 4 to 7 Overall Watershed Risk Score

2 - Relatively Higher Overall Risk: 8 to 12 Overall Watershed Risk Score

Overall Wildlife Relative Risk – by watershed

Relative watershed risk was evaluated using the same relative risk indicators that were used for roads. The analysis was conducted in the same manner as for hydrology watershed risk above.

The risk rating for each of the wildlife risk factors was added for each road with twelve being the highest sum. The distribution of these sums was reviewed and a cumulative wildlife relative risk factor was assigned. This factor is used in the overall road risk computation. The cumulative ratings are as follows:

0 - Relatively Lower Overall Risk: 0 to 3 Overall Wildlife Risk Score

1 - Relatively Moderate Overall Risk: 4 to 6 Overall Wildlife Risk Score

2 - Relatively High Overall Risk: 7 to 10 Overall Wildlife Risk Score

5.3 ROAD SYSTEM MANAGEMENT OPTIONS—SETTING PRIORITIES

By characterizing the values and risks on a low, moderate, and high scale, a three by three matrix of road priorities (Categories) can be constructed. The categories can be assigned numbers that relate to the priority that the roads in that category should have when allocating maintenance, repair, and mitigation funds and when making forest wide transportation management decisions. The relatively high risk categories are assigned the high priority numbers starting with High Value / High Risk as a 1 or Highest Priority, followed by Moderate Value / High Risk with a 2, etc. In a similar manner, the Moderate Risk Categories are priority 4 thru 6 with 4 being High Value / Moderate risk. The Low Risk Categories are priority 7 thru 9.

Table 5-1 shows the Category Matrix and the number of miles of road that falls within each category / priority. The matrix also shows some options for future road maintenance and transportation management decisions. These recommendations are general recommendations. Project level analysis teams would have to look at these roads, particularly the relatively high risk roads, in their project area in the context of the current budget levels and many other issues relevant to the road at the time.

Table 5 – 1. Value/Risk Analysis Priority Matrix – Road Management Categories

	VALUES				
RISKS	**Scores**	**Low (3 – 5)**	**Moderate (6 – 8)**	**High (9 – 14)**	Totals
	Low (0 - 4.5)	**Category 9** Evaluate Need (6.0 miles)	**Category 8** Maintain (102.3 miles)	**Category 7** Maintain (282.6 miles)	391 miles
	Moderate (5 - 7.5)	**Category 6** Mitigate, Restrict ? (0 miles)	**Category 5** Mitigate, Maintain (7.0 miles)	**Category 4** Mitigate, Maintain (322.3 miles)	329 miles
	High (8 – 14.5)	**Category 3** Mitigate, Restrict, Close, Decommission ? (0 miles)	**Category 2** Mitigate, Maintain (15.0 miles)	**Category 1** Mitigate, Maintain (224.1miles)	239 miles
	Totals	6 miles	124 miles	829 miles	959 miles

The lowest value road had 3 value points and the highest risk road had 14.5 point out of 16 possible.

Based on the results of this relative analysis, roads with a value of 6 or more represent those roads that constitute the Potential Minimum Road System for management and use of the BHNF. Those roads with a value of 5 or less are those roads that show the most potential for maintenance level reduction or decommissioning. Roads with a risk rating of 8 or more represent those roads that may be causing resource impacts, while those with a risk rating less than 8 are not as much of a resource impact concern.

Within each category, there are possible management actions for roads as follows:

Category 7. High Value/Low Risk—Ideal Situation

283 road miles

- Maintain to standard by focusing road maintenance funds on these roads.
- Review for potential resource concerns.
- These roads form part of the potential minimum road system for the Forest.

Category 1. High Value/High Risk—Priorities for Capital Improvement

224 road miles

- These roads are a high priority for local-level roads analysis to identify high-risk reduction needs.
- These roads are a high priority for capital improvement funding.
- Increase maintenance funding to these roads to keep resource risks from increasing.

Category 3. Low Value/High Risk—Priorities for Risk Analysis

0 road miles

- These roads are moderate priority for local-level scale roads analysis to identify high-risk reduction needs and to confirm low road use value.
- These roads have potential for reducing maintenance level.
- Consider decommissioning if not needed for other purposes.

Category 9. Low Value/Low Risk—Priorities for Reducing Maintenance Level/Decomissioning

6 road miles

- These roads are lowest priority for expending annual road maintenance funds.
- These roads are moderate potential for decommissioning or reducing maintenance level.
- Consider for conversion to trail or linear wildlife opening depending on need.

5.4 OPPORTUNITIES FOR ADDRESSING PROBLEMS AND RISKS

This section provides suggestions (in addition to the Guidelines presented in Appendix G) on how to mitigate problem and high risk areas. The primary road-related problems identified are general travel management, erosion and resulting sediment delivery to surface water drainages, wildlife habitat fragmentation, and inadequate funding

Travel Management. For roads in the low, or in some cases, moderate value rating, options include either decommissioning, reducing the maintenance level, or considering ways to raise the value (e.g., by providing recreation opportunities along the road). Overall recreation use on the Forest is increasing and road-related opportunities exist to better disperse this use and lessen recreation impacts that are occurring elsewhere. An example of increasing recreation use on a low value road would be to develop a trailhead and trail system at the end of the road.

Erosion and Sediment Delivery Risk. The watershed assessment identifies potential effects of roads, which can impact watershed condition. Watersheds, and associated aquatic resources, that are at greatest road-related resource risk could be prioritized for separate watershed analysis to better identify specific areas of concern that may need repair. The following opportunities address road impacts on specific aquatic/watershed situations.

Opportunities to consider if roads are likely to modify surface and subsurface hydrology including the following:

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

Opportunities to reduce surface erosion include the following:

- Lay out roads on less than 10 percent grade with a minimum of stream crossings.
- Increase the number and effectiveness of drainage structures.
- Evaluate the appropriateness of existing drainage structure sizes.
- Consider using fords stabilized with rock instead of culverts at road-stream crossings where stormwater runoff frequently overtops and erodes the road surface.
- Improve the road surface by either graveling, or adding a binding material to those roads that have native surfaces with no inherent binder.
- Improve drainage ditches that are associated with roads by graveling.

Opportunities to address existing roads in areas with high mass failure potential include the following:

- Relocate roads to areas with more stable soils.
- Relocate drainage structures so that the outlets are on less sensitive areas, which may include flatter slopes and better-drained soils.
- Install rock riprap at stream banks keyed into channel bottoms to act as deflectors for runoff.

Opportunities to improve local channels at road-stream crossings include the following:

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

Opportunities to address roads that affect riparian plant communities and wetlands include the following:

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

Wildlife habitat fragmentation. Wildlife fragmentation could be minimized by decommissioning roads, especially those in the low value rating, provided that those roads are not necessary for private access.

Inadequate Funding. This BHNF RAP clearly demonstrates that annual maintenance funding is inadequate to maintain the current road system on the Forest. Over time, road conditions can be expected to continue to incur additional deferred maintenance costs and degrade unless maintenance funding increases and significant road reconstruction / improvement funding becomes available or the number of roads is reduced. The challenge for the Forest Service is to identify ways to more efficiently spend the limited road maintenance dollars allocated to the Forest, to identify ways to reduce costs, or to raise revenues. One approach is to reduce or eliminate expenditures on roads that are not needed or not needed at their current maintenance level. As might be expected because of the nature of the roads analyzed, there are very few low value roads. Other management options include reducing overall maintenance efforts and concentrating on road segments in poor condition. This would not be a desirable long term approach. A review of roads could be conducted with the counties towards identifying roads that could realistically be shifted to county jurisdiction or could be jointly maintained. This would be conducted in an environment when county budgets also are inadequate. Surface rock replacement rates charged timber purchasers for use of gravel roads could be reviewed to determine if the current rate being charged is appropriate for the amount of gravel lost during timber haul. Increased volumes of timber sold could be expected to increase the number of miles of road maintained periodically by timber purchasers. These miles include blading of ML 3, and 4 roads and reconstruction and maintenance of ML 1 and 2 roads. Reconstruction / improvements to ML 3, 4, and 5, roads could be added to timber sale road packages when resource and user safety issues are significant. Selected roads in low risk areas could be withdrawn from the maintenance schedule, allowed to deteriorate, and signed as a non-maintained road. Some roads for which year round access is not required could be identified for temporary or permanent closure.

5.5 ASSESSMENT OF BUILDING ROADS IN ROADLESS OR UNROADED AREAS

The Black Hills is a relatively well roaded forest. The major unroaded areas are the three areas listed as inventoried roadless areas, Inyan Kara, Sand Creek, and Beaver Park. Portions of these three areas are managed under four different management areas per the 1997 ROD for the BHNF LRMP. Any changes to the intended management of these areas would likely be the result of a detailed analysis and a Forest Plan Revision. The ecological attributes of those areas were discussed earlier in this report in section 2.6

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STEP 6: REPORTING

6.1 PURPOSE AND PRODUCTS

The purpose of Step 6 is to report the key findings of the analysis.

The products of this step are:

- A report including maps, analyses, and documentation of the RAP.
- Maps that show the data and information used in the analysis, and the opportunities identified during the analysis.

6.2 REPORT

This analysis is expected be reviewed periodically by the Black Hills National Forest and updated as necessary as further information becomes available. This report is available to the public on the BHNF website.

6.3 MAPS

All maps used for this report are included in Appendix H.

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