Allegheny National Forest
Marienville Ranger District

Roads Analysis Report

Spring Creek Analysis Area – 2002
Version 1.0

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Introduction

Background

In August 1999, the Washington Office of the USDA Forest Service published Miscellaneous Report FS-643 titled Roads Analysis: Informing Decisions about Managing the National Forest Transportation System (USDA-FS 1999). 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, affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions. Roads analysis is not a decision process nor does it constitute a Federal action. It will serve to guide future project-scale analyses by identifying conditions, changes, and effects relevant to implementing forest plans.

In January 2001, the agency 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 in making major road management decisions (Federal Register 2001a & b).

Process

Roads analysis is a six-step process. The steps are designed to be 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 provides a set of possible issues and analysis questions for which the answers can inform choices about road system management. Decision makers and analysts determine the relevance of each question, incorporating public participation as deemed necessary. The six steps are:

- 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 product of a roads analysis is a report for decision makers and the public that documents the information and analyses used to identify opportunities and set priorities for future national forest road systems. Included in the report are maps displaying the known road system for the analysis area, and the risks, needs, and opportunities for each road or segment of road. This report will:

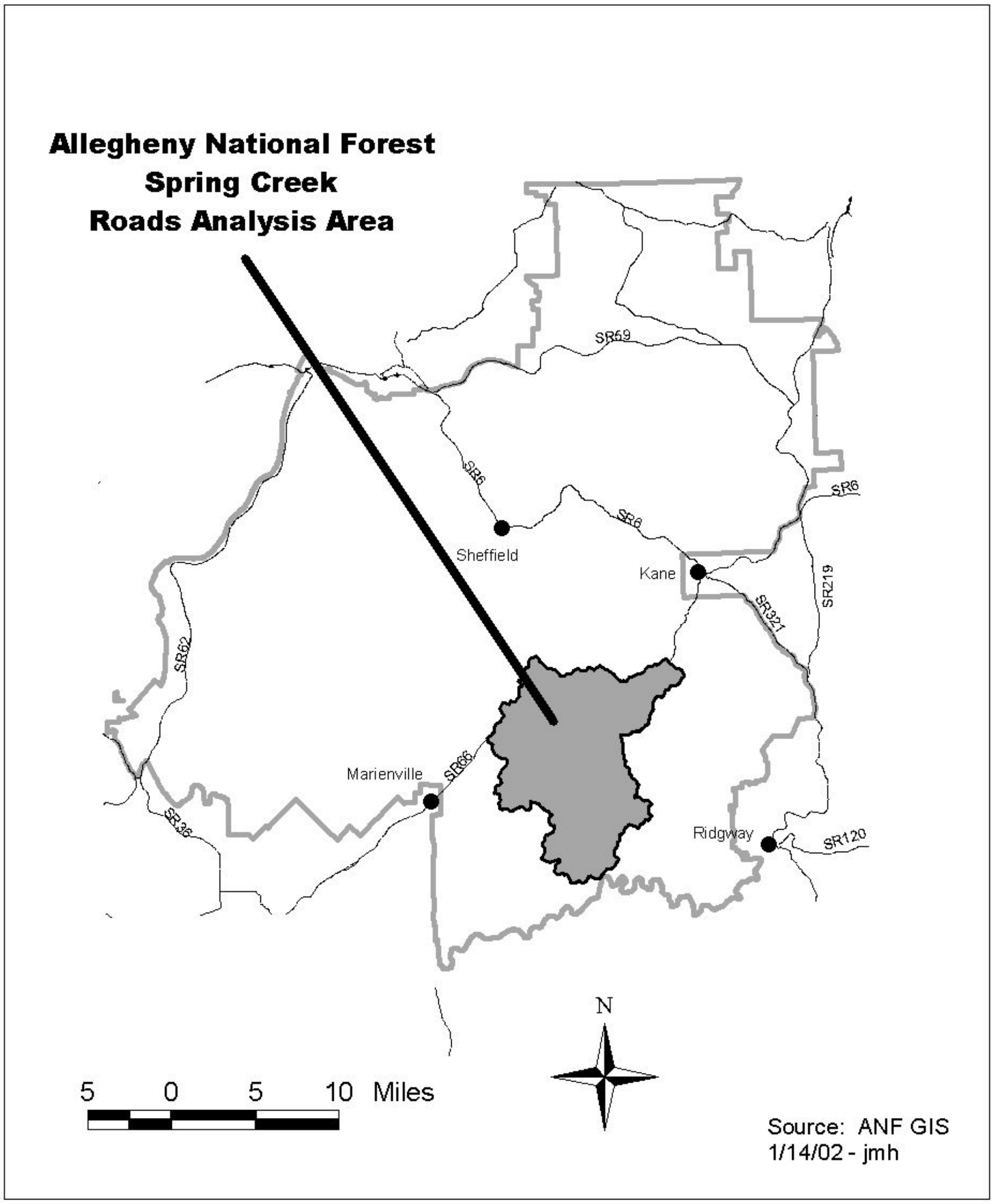
- Identify needed and unneeded roads;
- Identify road-associated environmental and public safety risks;
- Identify site-specific priorities and opportunities for road improvements and decommissioning;
- Identify areas of special sensitivity or any unique resource values.

A complete list of all maps developed from this analysis is included in Appendix A. Hardcopies of maps were not included in this report due to their size and voluminous nature. The maps are available for viewing on the Spring Creek web site and can be made available electronically upon request. Appendix B contains large data tables and Appendix C includes photographs. The report, appendices, and maps are located through links on the Allegheny National Forest Homepage.

This Report

This report documents the roads analysis process used for the Spring Creek analysis area on the Marienville Ranger District of the Allegheny National Forest (ANF). The boundary of this analysis area is based on the Spring Creek 5th level Watershed (SCW) and encompasses 56,093 acres (Figure 1). In general, this area is located in the southeast quadrant of the ANF, north and east from Hallton to Highland Corners, and north and west to Sheffield Junction. This report is a "living" document and reflects the conditions of the analysis area at the time of writing. The document can be updated as the need arises and conditions warrant. Any future updates will be reflected in the title (e.g., version 2.0).

Figure 1. Vicinity Map of the Spring Creek Roads Analysis Area on the Allegheny National Forest, Marienville Ranger District, 2002.



Step 1 — Setting up the analysis

Purpose and Products

The purposes of this step are to:

- Identify the geographic scale or scales for the analysis,
- Develop a process plan for conducting the analysis,
- Clarify the roles of technical specialists and line officers in the team

The products of this step are:

- A statement of the objectives of the analysis,
- A list of interdisciplinary team members and participants,
- A list of information needs,
- A plan for the analysis

Objectives of the Analysis

The objectives of the Spring Creek Roads Analysis are to:

- Describe the existing road system in relation to current Forest Plan direction,
- Identify potential unroaded areas,
- Identify the key issues affecting road-related management,
- Compare the current road system with what is desirable or acceptable, and
- Describe options for modifying the road system to achieve desirable or acceptable conditions

This roads analysis was completed in advance of the Spring Creek Environmental Impact Statement (EIS) and is specific to the project scale. Unless otherwise stated, the boundary for this roads analysis matches the Spring Creek EIS project area boundary (Spring Creek 5th level watershed)(Figure 1 & Appendix A.) During this analysis, the Spring Creek EIS Proposed Action was not yet completed and was made available to the public for scoping in April 2002.

This report analyzes all the roads in the analysis area, which includes classified [existing Forest Service (FS) system roads, State and Township roads, oil and gas roads (OGM)], temporary, and unclassified roads (see Step 2 for definitions). It identifies benefits and risks of the road system in the Spring Creek watershed, describes opportunities, and sets priorities for the analysis area.

Interdisciplinary Team Members and Participants

The interdisciplinary team consisted of team members and support members (Table 1). Team members attended most meetings, contributed data for analysis and participated in the analysis, recommendation, and prioritization process. Support members were individuals who were consulted throughout the process when their expertise was needed for particular questions.

Table 1. Interdisciplinary team and support members for the Spring Creek roads analysis, Marienville Ranger District, 2002.

Name	Position	Role
Dan Salm	Civil Engineer	Forest Roads Analysis Leader/Transportation Planner
Jeanne Hickey	Geographic Information System (GIS) Specialist	Spring Creek Roads Analysis Team Leader
Brenda Adams-Weyant	Recreation Planner	Team Member
Chris French	Wildlife Biologist	Team Member
Amanda Glaz	Archaeologist	Team Member
Bernie Marocco	Civil Engineer Technician	Team Member
Brent Pence	Fisheries Biologist	Team Member
Scott Tepke	Forester	Team Member
Kevin Treese	Forester	Team Member
John Weyant	Natural Resource Specialist (NEPA)	Team Member
Leon Blashock	Marienville District Ranger	Line Officer/Support Member
Steve Burd	Law Enforcement Officer	Support Member
Brady Dodd	Hydrologist	Support Member
Kathe Frank	Budget Analyst	Support Member
Rick Hiemenz	Civil Engineer	Support Member
Rick Kandare	Archaeologist	Support Member
Gary Kell	Landscape Architect	Support Member
Carl Leland	Ecosystem Management Co-Team Leader/ NEPA	Support Member
Robert McBride	Forester	Support Member
William Moriarity	Soil Scientist	Support Member
Mary Schoeppel	District GIS Coordinator	Support Member
Terry Steffan	Wildlife Biologist	Support Member
Janet Stubbe	Landscape Architect	Support Member
Pamela Thurston	Wildlife Biologist	Support Member

Information Needs

All roads in the Spring Creek roads analysis area were mapped using a global positioning system (GPS) in the summers of 2000 and 2001. Although additional minor private road construction by oil and gas operators has occurred, the data currently in the geographic information system (GIS) will be the information used for this analysis. Road surveys of Forest Service system roads and non-system roads were completed in 2000 and 2001. Updates were made as new information became available. Extensive GIS maps were needed for the various resource analyses and are discussed in Step 2, referenced throughout, and listed in Appendix A.

Analysis Plan

Allegheny National Forest specialists completed this document. Outside specialists, Forest Service and non-Forest Service were consulted as needed. ANF staff specialists reviewed the document and the report is available for other National Forests as well. The report is available to the public upon request and is on the Spring Creek web page at Allegheny National Forest Homepage. This roads analysis report will be included in the Spring Creek EIS project file, as the information will be considered in the EIS. The Spring Creek interdisciplinary (ID) team conducted the analysis using data from field surveys, GIS, and public involvement. The team developed issues related to road management and reviewed all the questions in Step 4 to determine which were applicable to the analysis area. In Step 5, the team brought together all the resource information, made recommendations, and set priorities.

Step 2 Describing the situation

Purpose and Products

The purpose of this step is to:

- Describe the existing road system in relation to current forest plan direction

The products of this step are:

- A map or other descriptions of the existing road and access system defined by the current forest plan or transportation plan,
- Basic data needed to address roads analysis issues and questions

Existing Road and Access System Description

The Spring Creek roads analysis area is defined by the Spring Creek 5th level watershed (SCW), a 56,093 acre area located in Elk and Forest counties (Figure 1). The SCW is situated between Marienville and Ridgway, and is used mostly by local residents for day use and road-related activities such as hunting, fishing, driving, firewood gathering, etc. The area is a recreation destination due to off-highway vehicle (OHV) and snowmobile trail systems and State Game Lands. There is illegal OHV use occurring in the area. Dispersed camping is widespread throughout the watershed, with most sites located near water features. Oil and gas has been produced in the watershed since the 1860s. Producing reserves are present under the entire area and are owned by private parties. Timber sales have occurred in the area as well.

State Highways SR66 and SR948 are the primary access routes, which border or run through the analysis area. Many Forest Service roads are gated; however, keeping locks on gates is difficult due to vandalism. Several Forest Service roads are opened during hunting season. Oil and gas roads are not open for public use, however many OGM operators do not gate their roads. Although Forest Service roads are usually marked at the entrance with a road number, it is often difficult to determine the difference between a Forest Service road and an OGM road. The Sackett oil and gas field makes up approximately one-quarter of the analysis area and is heavily roaded with many miles of private, unmarked OGM roads. Because OGM roads are not marked, the maze of roads makes the area confusing to navigate.

The Spring Creek analysis area includes Forest Service land assigned to Management Areas (MA) 1.0, 3.0, 6.1, and 6.3 (Figure 2, Appendix A - Map 1). Forest Plan direction for road management in these MAs is summarized in Table 2. Road density for Forest Service system roads within the Spring Creek watershed were calculated at 1.4 miles/square mile in Management Area (MA) 1.0, 1.7 mi./sq. mi. in MA 3.0, 1.8 mi./sq. mi. in MA 6.1, and 0.6 mi./sq. mi in MA 6.3. All of these road densities are well within Forest Plan Standards and Guides (USDA-FS 1986a). These road densities were calculated by taking miles of road and dividing by square miles in the project area, management area, etc. This results in one average (discrete) value for the entire area. This has been the standard method used for calculating road densities cited in the literature including the 1986 Forest Plan and monitoring reports.

In the Spring Creek roads analysis, road density variation was calculated on a more site specific basis using a new methodology. Using GIS, the forest was divided into 30 meter by 30 meter pixels (approximately 100 feet by 100 feet). Each pixel was assigned a value based on whether a road was present in the pixel or not. The computer then took each of those pixels, one at a time, and summed the number of pixels that had a road present within a one mile block centered on each pixel. Thus, each 30 meter by 30 meter pixel, had a road density assigned to it. This methodology produces a map that displays road density variation across an area.

Using this method, total road density variation (i.e., all roads - including private, OGM, and Forest Service) within the Spring Creek watershed ranges from 0 to 15.1 miles/square mile (Appendix A - Map 2a) with the highest road densities occurring in the Sackett oil and gas field. Only 29.7% of the roads contributing to the total road density are Forest Service administered roads (Table 3). Forest Service system road density variation ranges from 0 to 4.96 miles/square mile in the Spring Creek watershed (Appendix A - Map 2f).

Based on the older averaging method, road densities for Forest Service system roads meet Forest Plan direction for all management areas within the roads analysis area. Based on the newer site specific method using GIS, road density variation would appear to exceed Forest Plan direction in some areas within the Spring Creek analysis area. However, because two different methods were used to calculate road density, their numerical values cannot be directly compared. The road density variation values should not be used to determine consistency with management area direction because they are calculated using a different methodology. The newer method is useful to identify or highlight areas where road density or the effects of high road density may be a concern.

Figure 2. Management Areas and private land (acres/%) within the Spring Creek watershed, Marienville Ranger District, 2002.

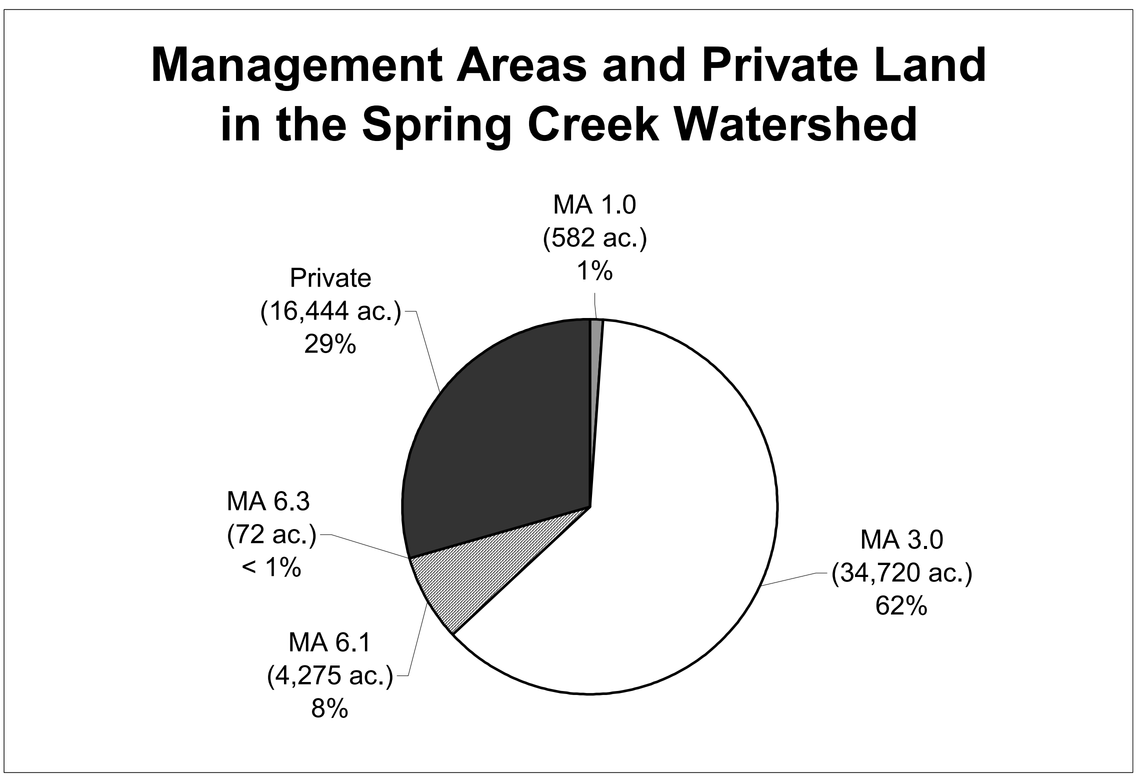


Table 2. Forest Plan direction for Management Areas in the Spring Creek watershed, Marienville Ranger District, 2002 (USDA-FS 1986a).

Management Area	Purpose
1.0	• Emphasize habitat management for ruffed grouse and other wildlife species associated with early successional stages of forest habitat • Provide a high quality of wood fiber production • Provide a roaded natural setting for all types of dispersed recreation opportunities Road Management • Forest Service road density will range from one to three miles per square mile • Local roads will be either traffic service level (TSL) "C" or "D". TSL "D" roads will be closed to all public traffic, except as specifically allowed to meet resource objectives. TSL "C" roads will be open to public traffic, except for certain seasonal restrictions to achieve wildlife objectives
3.0	• Provide a sustained yield of high-quality Allegheny hardwood and oak saw timber through even-aged management. • Provide a variety of age or size class habitat diversity from seedling to mature saw timber in a variety of timber types. • Emphasize deer and turkey in all timber types and squirrel in the oak type. • Provide a roaded natural setting for all types of developed and dispersed recreation opportunities, with an emphasis on motorized recreation activities Road Management • Forest Service road density will range from two to four miles per square mile • Local roads will be either TSL "C" or "D". TSL "D" roads will be closed to all public traffic, except as specifically allowed to meet resource objectives. TSL "C" roads will be open to public traffic except for certain seasonal restrictions to achieve wildlife objectives.
6.1	• Maintain or enhance scenic quality • Emphasize a variety of dispersed recreation activities in a semi-primitive motorized setting • Emphasize wildlife species which require mature or over mature hardwood forests, such as turkey, bear, cavity-nesting birds, and mammals Road Management • Forest Service road density will range from one to three miles per square mile • Local roads will be TSL "D". These local roads will be closed to public traffic. • New road construction in this management area will be restricted to TSL "D". Existing roads may be reconstructed, but to no higher a standard than TSL "D".
6.3 (Buzzard Swamp)	• Intensively manage for wildlife species which require riparian habitat, including waterfowl, furbearers, and warm-water fish • Emphasize dispersed recreation activities particularly hunting, fishing, and wildlife observation in a semi-primitive motorized recreation setting Road Management • Local roads will be TSL "D". These local roads will be closed to public traffic.

About one-third of the roads in the Spring Creek analysis area are under Forest Service jurisdiction (Table 3 & Appendix A - Map 3). Roads in the Spring Creek area are managed in the categories Open, Closed, and Restricted (Figure 3, & Appendix A - Map 4). An open road is available to the public for vehicular use, whereas a closed road is not. A restricted road is opened seasonally to public vehicular use, generally for deer hunting or some other specific resource purpose.

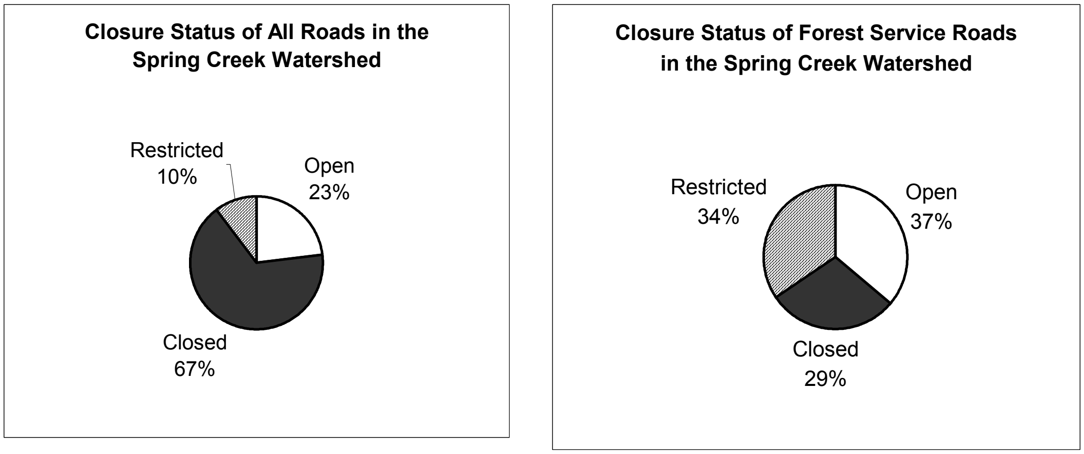
Table 3. Total road miles in the Spring Creek watershed, Marienville Ranger District, 2002.

Ownership	Road Miles (%)
Forest Service	110 (29.7%)
State/Township	45 (12.5%)
OGM/SGL/Unknown[1]	212 (57.8%)
Total	367

1 – OGM=Oil, Gas, and Mineral (private ownership); SGL=State Game Lands

Figure 3. Road management as (a) percent (%) of all roads and (b) Forest Service roads in the Spring Creek watershed, Marienville Ranger District, 2002.

a.) b.)



Most of the roads (75%) in the Spring Creek watershed have pit run surfacing (Table 4, Appendix A - Map 5). The surfacing material has been shown to be an indicator of the potential for erosion and sedimentation for a road. Bituminous (paved) roads have the least potential for erosion and sedimentation while roads constructed with a native surface have the most potential for erosion and sedimentation concerns. Pit run material has typically been used in this area to mitigate the effects of road-caused erosion and sedimentation. Limestone surfacing is a relatively new mitigation measure for reducing erosion and sedimentation effects in this area. Its high cost in relation to pit run surfacing prohibits its use on a wide scale (USDA-FS 1990, unpublished data). Table 1a and 1b in Appendix B shows the current standard and management of all roads in the Spring Creek watershed.

Table 4. Road surfacing type for all roads and Forest Service roads in the Spring Creek watershed, Marienville Ranger District, 2002.

Road Surface Type	All Roads (miles)(%)	FS Roads (miles)(%)
Bituminous	18.1 (5%)	0.1 (< 1%)
Limestone	5.0 (1%)	1.5 (1%)
Native	69.6 (19%)	0.1 (<1%)
Pit Run	275.1 (75%)	107.7 (98%)
Total Miles	367.8	109.5

Road Definitions (36 CFR 212.1)

As mentioned above, the Federal Register published the Final Rule and Administrative Policy, January 12, 2001, which established new definitions for road management on the national forests. Listed below are the new definitions for roads (Federal Register 2001b, p. 3231).

Classified Road – Roads wholly or partially within or adjacent to National Forest System lands that are determined to be needed for long-term motor vehicle access, including State roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service.

Temporary Roads – Roads authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the forest transportation system and are not necessary for long-term resource management.

Unclassified Roads – Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization.

Road Decommissioning – Activities that result in the stabilization and restoration of unneeded roads to a more natural state. A road can be decommissioned by applying one or more of the following treatments: 1) Reestablishing former drainage patterns, stabilizing slopes, and restoring vegetation; 2) Blocking the entrance to a road; installing water bars; 3) Removing culverts, reestablishing drainage-ways, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed; 4) Completely eliminating the roadbed by restoring natural contours and slopes; or 5) Other methods designed to meet the specific conditions associated with the unneeded roads.

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

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

Road Realignment – Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway.

Unroaded Areas

In the roads analysis process, unroaded areas are defined as "areas that do not contain classified roads"(USDA-FS 1999, p. 11). Forest Service Road Management Policy further defined unroaded areas as "any area without the presence of a classified road, that is of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. Unroaded areas are distinct from and do not overlap with inventoried roadless areas." (Federal Register 2001b, p. 3229, Ch. 1920). There are no inventoried roadless areas in the Spring Creek watershed.

Unroaded areas were identified in the Spring Creek analysis area using a one-quarter mile buffer on all classified roads (Appendix A - Map 6). Motorized off-highway vehicle (OHV) trails (all-terrain vehicles [ATV], trailbikes, and snowmobiles) were included in determining unroaded areas because of the noise and activity associated with these trails. The one-quarter mile buffer was used for the following reasons:

- This is usually the area where recreation use changes (zone of influence from road, walking distance, new recreation setting category),
- The noise levels from a road would not generally be heard beyond a one-quarter mile,

- The skidding distance for timber harvest is generally within one-quarter mile of an access road.

Using the one-quarter mile buffer, 8,361 acres (14.9%) of approximately 56,093 acres in the analysis area were classified as unroaded areas (Table 5). There were 52 areas ranging in size from less than 1 acre to 2,248 acres. Four areas were greater than 1000 acres, although some of these extended beyond the Spring Creek analysis area boundary (Appendix A - Map 6). The majority (86%) of the unroaded areas were less than 100 acres, and of the 52 areas, 32 areas (61%) were 25 acres or less and only small fragments of land without roads. Because of the size and configuration of the smaller unroaded areas, and the current and potential oil and gas development, the team decided that there were no unique wildlife and recreational landscape features identified within the scope of the analysis in Step 4. (Appendix A - Map 6).

Table 5. Unroaded areas and acres identified in the Spring Creek watershed, Marienville Ranger District, 2002.

Unroaded Area Name	Management Area				
	Private Land	1.0	3.0	6.1	Total[1]
SC1	442	345	640	821	2248
SC2	841		1012	1	1853
SC3			536	906	1442
SC4	411		528	359	1297
SC5[2]			198		198
SC6[3]			13		13
SC7			125		125
SC8				102	102
SC9	27		71		97
SC10	2		90		91
SC11			85		85
SC12			84		84
SC13	84				84
SC14[2]	1		16		17
SC15	79		3		81
SC16[2]			25		25
SC17			70		70
SC18			65		65
SC19			60		60
SC20			44		44
SC21			38		38
SC22			32	3	36
SC23[4]					0
SC24	26		0	1	27
SC25			24		24
SC26			22		22
SC27			17		17
SC28			14		14
SC29	13				13

Table 5. Unroaded areas and acres identified in the Spring Creek watershed, Marienville Ranger District, 2002.

Unroaded Area Name	Management Area				
	Private Land	1.0	3.0	6.1	Total[1]
SC30			13		13
SC31					0
SC32	8		0		9
SC33			7		7
SC34			7		7
SC35	6		0		6
SC36		6			6
SC37			5		5
SC38			5		5
SC39				5	5
SC40			5		5
SC41			4		4
SC42	4				4
SC43	4				4
SC44			2		2
SC45			2		2
SC46			2		2
SC47			1		1
SC48			1		1
SC49			1		1
SC50			0		0
SC51			0		0
SC52			0		0
SC53			0		0
SC54			0		0
Total Acres[1]	**1948**	**350**	**3867**	**2196**	**8361**

1 - Totals may be off slightly due to round off error.
2 - Unroaded block reduced in size with the addition of new road construction approved in the East Side EIS.
3 - SC6 reduced and split into three parts with the addition of new road construction approved in the East Side EIS.
4 - SC23 was combined with SC4 upon removal of an unclassified road.

OHV/Bike Trails Within the Spring Creek Watershed

Motorized Off-Highway Vehicle (OHV) trails (all-terrain vehicles (ATV), trailbikes, and snowmobiles) are not included in the roads analysis process. However, on the ANF, the motorized trail system is often located on the road system (Appendix A - Map 7). Therefore, we addressed the motorized trail system to the extent that the trail system affects the road system. As noted above, we also considered the motorized trail system in defining the unroaded areas. In the Spring Creek watershed (SCW) there are two main ATV trail systems: Timberline ATV (19.2 miles within SCW) and Marienville ATV/Bike (26.3 miles within SCW). In February 2000, the ANF developed a 5-year maintenance and trail rehabilitation plan for all five ATV/Trailbike trails on the ANF. The following information is specific to the trail mileage within the SCW.

Approximately 52% of the entire Timberline trail system and 44% of the entire Marienville ATV trail system is located on roads (Table 6). Roads can provide an enjoyable riding experience for beginner and intermediate riders. Typically, these roads are not open to public travel, but are used by timber and oil/gas operators. Joint use roads may increase the potential for accidents and the long-term goal is to locate trails off roads where feasible and practical. Native road surface material breaks down rapidly due to the constant scrubbing action created by ATV tires loosening the fines that bind the surface material together. New stabilization products and techniques are being tested to better stabilize the road surface and reduce long-term maintenance needs and costs.

Table 6. Miles of trails on roads by trail type in the Spring Creek watershed, Marienville Ranger District, 2002.

Trail Type	Miles of Trail on Roads
ATV	16.2
Trailbike	1.8
Snowmobile	30.4
Total	48.4

The Marienville Bike Trail

The Marienville Bike Trail rehabilitation project was completed in May, 2002. The purpose and need for the project was to reduce negative resource impacts caused by overuse, lack of annual maintenance programs, poor trail location, and improper trail design. The project included 5.4 miles of trail relocation and another 4.3 miles of trail reconstruction that considered new trail design techniques, soils, topography, and surface water flow. Construction techniques included broad based dips, super elevated turns, tread hardening, and natural topography breaks to control water runoff, and reduce erosion/sedimentation. Additional culvert pipes were installed to better manage water runoff. Placement of commercial gravel on unstable sections of trail hardened the tread surface and reduced long-term maintenance costs. Limestone surfacing was used on the trail surface along streams and at stream crossings. All abandoned trail sections were obliterated and seeded with recommended seed mixtures.

Marienville ATV Trail

After completing trail condition surveys on the Marienville ATV Trail in the summer of 2000, several sections of the trail were identified as needing major repair. Due to the popularity and overuse of this trail, it needs some additional restoration work to improve the recreational experience for trail users. Restoration will include culvert pipes, limestone, trail reconditioning, commercial stone, and limestone riprap. Final design work is scheduled for the fall of 2002 with construction commencing in October of 2003.

Timberline ATV Trail

In 1998, a complete inventory of all needed restoration work for the Timberline ATV Trail was completed. Due to overuse and lack of an annual maintenance program, there was a loss of tread surfacing material on the 38-mile trail system. The current plans include for the entire trail system to be resurfaced with commercial stone and compacted with a vibratory roller. Additional culvert pipes will be installed where identified and limestone surfacing will be applied on the trail surface at all stream crossings and adjacent to all active streams. Phase I of the rehab effort (14 miles) was completed in January, 2002. The completion date for phase II (24 miles) is expected to be May 24, 2003.

Annual and Heavy Maintenance Programs

The Allegheny National Forest has developed and implemented light annual maintenance and heavy maintenance programs for all ATV/Trailbike trails on the ANF. Primary objectives for the annual maintenance program, effective May 1, 1998, include inspection, trail clearing, culvert and ditch cleaning, and litter removal. The primary objectives for the heavy maintenance program, effective May 1, 2001, include maintaining the trail template for proper drainage, reducing erosion and sedimentation, restoring drainage dips and ditches, blading to smooth surfaces and reclaim displaced surfacing, and berming. The program will also identify periodic rehabilitation needs, which are based on level of use.

Snowmobile Trails Within the Spring Creek Watershed

There are currently 361 miles of developed snowmobile trail on the Allegheny National Forest. Of that, approximately 37 miles of snowmobile trail are located within the Spring Creek watershed. The Allegheny Snowmobile Loop (ASL) accounts for 15.2 miles, while connectors 11, 12, 13, 14, 15,16, 23, 25 account for the other 21.7 miles.

On the ANF, on average there are less than 28 days during the winter season when there is sufficient snow for winter recreation activities. For snowmobile use, there may be only two weekends per season when there is enough snow to groom trails and provide users with a quality trail experience. Despite this, the snowmobile community has been successful in establishing many miles of snowmobile trail and connectors over the last two decades. As a result, the snowmobile trail system is the only trail system on the Forest that has met and exceeded the Forest Plan goal for trail miles (350 miles) (USDA-FS 1986a, pg. C-1)

When adequate snow cover is present, trail use is high on weekends with moderate use during the week. Illegal use is prevalent across the forest. Most users prefer to ride right from their camp or home and not trailer to a trailhead.

The ANF has developed and implemented a grooming and maintenance contract for snowmobile trails and connectors. The contract is reviewed by the contracting officer annually and reissued for bid every five years. Funding for these activities are made possible through Pennsylvania snowmobile registration receipts, which are administered by the Pennsylvania Department of Conservation and Natural Resources (DCNR). Large-scale trail improvement projects are funded through appropriated dollars and TEA21 grant monies. Costs for administering and maintaining snowmobile trails are relatively low in comparison to the costs associated with maintaining an ATV trail system.

Joint Use Roads for Snowmobile Trails

Many of the snowmobile routes through the SCW follow open public roads (Table 6 and Appendix A-Map 7). The Forest Service has the obligation to accommodate joint use as efficiently and safely as possible. Joint use roads may increase the potential for accidents, but the most common conflict occurs when timber and oil/gas operators plow snow off roads designated for snowmobile use. The goal is to minimize user conflicts and to provide a high quality recreation experience while accommodating road use needs. Timber and oil/gas operators are asked to make every reasonable effort to maintain a snow covered running surface in joint use locations. Because of this, snowmobiles have little impact on soil and water resources.

Basic Data Needs

Basic data needed to adequately address the issues for the Spring Creek Roads Analysis are listed below. Some of the data are included in this report, while other data used to help answer questions in Step 4 are located on file at the Marienville Ranger District or in the Forest Supervisors Office in Warren.

- GIS layer of existing road network
- Road logs and non-system road survey
- GIS layer of wildlife cover types
- GIS coverage and mapping of critical, unique or sensitive wildlife habitats
- GIS map of unroaded areas (classified roads buffered ¼ mile)
- Classification of all roads by type and level of use, season of use and maintenance needs
- Identification of illegal OHV use and garbage dumping sites within the analysis area
- Mapping of wetlands, landforms, and ecological land types within the analysis area
- Identification of wildlife species whose viability is a concern and are most at risk from roads
- On-forest wildlife monitoring data
- Identification of wildlife habitat management needs facilitated by the existing road system
- Estimates of deer density and an assessment of road management strategies that affect hunter access
- Identification of existing monitoring/inventory sites and the required roads necessary for access
- The location or roads relative to riparian boundaries and the intersections that influence riparian vegetative communities
- The location of roads relative to known wetland areas
- Vegetation inventory data
- Recreation facilities, designated trails, and areas of concentrated dispersed recreation use

Step 3 Identifying issues

Purpose and Products

The purpose of this step is to:

- Identify the key questions and issues affecting road-related management,
- Describe the origin of the issues

The products of this step are:

- A summary of key road-related issues, including their origin and basis, presented by general categories of environmental, socio-cultural, and economic
- A description of the status of current data including sources, availability, and methods of obtaining information

Issue Summary

Road-related issues were generated externally from the public, as well as, internally from Forest Service employees. Public comments were received through a variety of means. Two Spring Creek newsletters were published with request for comments during the Spring Creek roads analysis process and two news releases were published requesting public comment. In addition, public comments received during two public comment periods for the Big Run project area were reviewed for road-related issues. The Big Run project was dissolved and reorganized and the area within the Spring Creek Watershed boundary is now included in this analysis and the future Spring Creek project EIS. In general, the following topic areas represent the range of road-related comments received from the public:

- ***Road management:*** Traditionally, many of the local public voice their desire for more open roads for motor vehicle access. Written public comments received during this roads analysis did not reflect that opinion. Comments received noted the following: Restrict vehicular access to main artery roads, except during hunting season (October-December); desire more road closures-both permanent and seasonal; desire to know if Forest Plan Standards were exceeded; roads not on inventory; disclose more information related to costs
- ***Road decommission:*** Retire roads no longer needed, but do not obliterate; keep old road corridors as travelways for non-motorized uses; obliterate and revegetate all roads
- ***Road construction:*** Minimize new road construction; oppose road construction, restoration, reconstruction; concern for effects of increased roads from oil production; impacts on recreation and cultural resource sites
- ***Road maintenance:*** Minimize use of non-native limestone due to high transport costs; bridges need maintained; too much costly maintenance required with little manpower

- ***Road access:*** Respect private road rights; too much access; increased camping resulting in increased littering
- ***Stone pit management:*** Use existing pits and minimize new pits; oppose stone pit development and extraction
- ***Protect aquatic resources:*** Maintain all roads to protect water resources; use limestone surfacing at critical points, use cross drains and adequate culvert sizes; use well constructed fords versus small bridges
- ***Recreation:*** Expand recreation opportunities by using existing road system for both motorized and non-motorized recreation uses; explore alternatives to cover potential increased maintenance costs associated with these recreation uses; control illegal ATV use
- ***Wildlife Impacts:*** Consider impact of logging roads on forest interior species; fragmentation; road kills; roadless areas

Based upon responses from the public and interdisciplinary team involvement, the following were identified as issues for this roads analysis. The listed order of the issues identified below does not imply any order of priority or importance.

Issue 1 – Management of Existing Road System

Road Closures: Historically, there has been opposition to existing road closures and proposals for additional road closures. Public comments received for this analysis indicate additional closures are desired at least seasonally. There is a need to determine which roads, if any, should be closed. Although some roads into recreational facilities have seasonal closures, this has not been an issue.

Illegal Use Off-Highway Vehicles (OHV) & Passenger Vehicles: The existing road system in the Spring Creek analysis area is being used for illegal activities. Members of the public regularly open gates to several roads in the area that are closed to public access, usually by breaking off the locks. The illegal OHV use in the area is primarily from private lands, either through the existing road system or pipelines. Once in the area, OHV riders are using existing travelways for illegal riding, creating erosion and sedimentation into streams, mainly at stream crossings, and causing impacts to vegetation and wildlife.

Legal ATV use: There are sections of ATV trail that are on roads open to the general public. There are many ATV trails that cross open roads.

Dispersed Camping: Many dispersed camping sites are located in ecologically sensitive areas such as along streams and wet areas. Camping areas used during hunting season may be restricted from road access during other times of the year. There is a concern about littering and sanitation at many dispersed camp sites because recreationists typically do not pack home the garbage they accumulate during their stay.

Issue 2 – Access (current and future needs)

Access for Vegetation Management: On-going and proposed vegetative treatments exist in the Spring Creek analysis area. The current road system, along with oil and gas (OGM) roads, can access a large majority of the area; however, there may be a need in the future to access stands for silvicultural treatments that currently do not have adequate access. New roads would be proposed if there was not adequate access for vegetation management. The Spring Creek EIS will evaluate various alternatives with different road access needs. When considering access for vegetation management, the Forest Service analyzes all current roads in the area to minimize any new road construction (e.g., looks at potential for using existing Forest Service and OGM management roads).

Access to privately held mineral rights, associated abandoned wells, equipment, etc.: There are no USA, government-owned minerals in the Spring Creek analysis area, meaning that all of the subsurface mineral rights are privately held. The area contains numerous wells, pipelines, and associated roads. The oil and gas operators build and maintain roads to access their existing and new developments in accordance with guidelines published by the Pennsylvania Department of Environmental Protection (PA-DEP) . Roads are built to a standard to accommodate the intended use, but may not always be built to the standards of Forest Service system roads. The Forest Service works with operators to identify and correct problems associated with OGM roads, but the regulatory authority rests with the PA-DEP. There is no sure way to predict the amount of oil and gas wells that will be developed in the future. Before closing any Forest Service system roads, consideration must be given to whether or not the road will be needed for oil and gas operations (e.g., plugging wells, removing equipment, new developments, etc.) in order to lessen or prevent future soil disturbance or road building by oil and gas companies.

Access to private and State Game Lands: Before closing any Forest Service system roads, consideration must be given to whether or not the road will be needed for access to private or State Game Lands. The Forest Service will work in cooperation with private and other public landowners to ensure adequate access is maintained.

Access for Deer Management/Hunting (seasonal, year-round): The road system provides hunter access in the fall/winter, helping to control the deer population. Roads are used to help disperse hunters throughout more of the area than they would cover by walking; as a result some roads are opened seasonally for hunter access. High deer populations are a concern on the ANF because of the effect of selective browsing on forest vegetation, particularly over an extended period of time. Deer prefer hardwood species seedlings as food, including oaks, white ash, red and sugar maples, yellow poplar, aspen, hemlock, and pin cherry. This selective browsing and elimination of seedling species affects the development and species composition of future forests. The loss or reduction of understory and shrub layer vegetation also adversely affects many wildlife species because of the removal of protective cover, food sources, and nesting sites. The effects of selective browsing by high deer populations is evident throughout the analysis area, though portions of the analysis area do exhibit some minor reductions in local deer populations. In order to disperse deer hunters over a larger area, additional roads have been opened seasonally for deer hunter use than were anticipated in the Forest Plan.

Issue 3 – Potential Impacts to Water Quality

Potential impacts to water quality from roads occur from surface erosion, stream crossings, undersized culverts, and other culvert problems, etc. On the ANF, limestone is often applied to roads that are within 300 feet of a stream or stream crossing as a mitigation measure to help prevent sedimentation from the fine sandstone. In 1999, several sites of concern for fisheries and water resources were identified in the analysis area. Some of these water quality concerns were related to OGM activity, and the District has been working with these operators to address the concerns. Other concerns identified on National Forest System roads will be analyzed in this document, and may be addressed in the Spring Creek EIS.

Issue 4 – Availability and Management of Pits

Stone pits are needed for the maintenance of existing roads and the building of new roads. The Spring Creek analysis area currently has 45 open pits, 23 depleted pits, 3 rehabilitated pits, and 15 potential pits. Consideration must be given to which roads will be needed for accessing current and future stone pits in the analysis area. The need for expanding existing pits or developing new pits will depend on road surfacing needs. Use of pits is an irreversible, irretrievable commitment of resources. Stone pits take acres out of the suitable land base for timber production, change land use, and tend to attract illegal activities such as littering and illegal ATV use.

Issue 5 – Unroaded Areas

In the roads analysis process, unroaded areas are defined as "areas that do not contain classified roads"(USDA-FS 1999, p. 11). Forest Service Road Management Policy further defined unroaded areas as "any area without the presence of a classified road, that is of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. Unroaded areas are distinct from and do not overlap with inventoried roadless areas." (Federal Register 2001b, p. 3229, Ch. 1920).

There are no inventoried roadless areas in the Spring Creek watershed. There are several areas within Spring Creek analysis area that do not have any classified roads. Guidelines for what constitutes an unroaded area were developed for the Spring Creek roads analysis process as discussed in Step 2.

Issue 6 – Impacts of Roads on Native Wildlife and Plants

Forest Fragmentation and Road Kills: The effects of forest fragmentation on terrestrial wildlife habitat can vary depending on the width of the road, length, level of construction (related to the ease with which a species can cross a road), the distribution of forested habitat, and the sensitivity of a particular species to roads. Dissecting a forest with roads may diminish its value as wildlife habitat, and there is evidence that roads may exacerbate the problem of forest fragmentation. One of the primary effects of forest habitat fragmentation by roads is the disturbance to wildlife by seeing traffic movement, in addition to the noise generated by passing vehicles.

Direct mortality from collisions with vehicles is well documented and few terrestrial species of animal are immune. In general, mortality increases on roads with higher traffic volume and speed (i.e., paved roads). All species are at risk and some species may be attracted to roadside vegetation, insects and dense cover established along the roadside. Some wildlife may be attracted to the road surface itself to collect seeds or gravel. Small mammals, birds and snakes aggregate on or near warm roads, increasing their risk of being hit by vehicles.

Total road density variation for all roads (i.e., including private, OGM, and Forest Service) in the Spring Creek analysis area ranges from 0-15.1 miles/square mile. The Sackett oil and gas field has one of the highest road densities on the forest. The roads within the Sackett area are low standard, private roads closed to public use. In addition, there are numerous pipelines, electric lines, and other corridors within the analysis area that can contribute to habitat fragmentation, but are beyond the scope of this analysis.

Non-native Species: Roads are potential corridors for the introduction of exotic plants, animals, insects, or diseases since these groups tend to be transported by human activity corridors. Whether the road is unrestricted, restricted, or closed plays a role in the probability of the introduction of the exotic. The road location can influence whether the exotic can be introduced into an acceptable habitat where it can become established. Examples are seed and insect (hemlock wooly adelgid or gypsy moth egg masses) or disease transported by vehicles. Roads also provide a means of dispersal for exotic species by providing suitable habitat, stressing or removing native species, and allowing easier movement by wild or human vectors.

Status of Current Data

The roads in the analysis area are in the GIS system. They were entered in the summer of 2000, and their condition/status is current as of the spring of 2001. Step 2 described the existing conditions of Forest Service system roads in the Spring Creek watershed. The road number, name, length, and other data are detailed in Step 2 and shown in Appendix B - Table 1a and 1b.

Step 4 Assessing benefits, problems, and risks

Purpose and Products

The purpose of this step is to:

- Assess the various benefits, problems, and risks of the current road system and whether the objectives of Forest Service policy reform and forest plans are being met

The products of this step are:

- A synthesis of the benefits, problems, and risks of the current road system,
- An assessment of the risks and benefits of entering any unroaded areas, and
- An assessment of the ability of the road system to meet management objectives

Current Road System Benefits, Problems, and Risks

Ecosystem Functions and Processes (EF)

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

Because of its inherent complexity, this question will be answered by addressing the following: define the unique ecological attributes of this region, identify the existing roadless areas on the ANF (a baseline, forest perspective), define criteria used to identify unroaded areas in the analysis area, identify unique ecological attributes of the analysis area, and describe the effects of roading current unroaded areas in the analysis area.

Regional Perspective – Unique Ecological Attributes

Based on the biophysical descriptions of the 6/94, USDA FS Eco-regions and Sub-regions of the United States, the ANF is part of Section 212G, the Northern Unglaciated Allegheny Plateau. The following is a description of the ecological attributes that distinguish the northern Unglaciated Allegheny plateau from other regions (McNab and Avers 1994, pg. 14-10 and 11).

<u>Geomorphology, Lithology, and Soil Taxa</u>

The Northern Unglaciated Allegheny Plateau is part of the Appalachian Plateau Geomorphic Province. It is characterized more so by its maturely dissected plateau with sharper ridge tops and narrower valleys than glaciated portions of the province. Soils consist of a veneer of unconsolidated materials overlaying bedrock. Residuum on flat and gently sloped uplands, colluvium on steep hillsides, and alluvium in narrow valley bottoms is characteristic. Bedrock is composed of sandstone, siltstone, shale, conglomerate and occasionally limestone or coal. Primary geomorphic processes operating include mass wasting, fluvial erosion, transport and deposition. Dominant soil orders include Alfisols, Entisols, Inceptisols, and Ultisols. Parent materials are residuum from sandstone, siltstone and shale. Elevation ranges from 1,000 to 2,000 feet.

Surface Water Characteristics and Climate

The northern Unglaciated Allegheny plateau has a prominently incised, dendritic drainage pattern. A high frequency of rapidly moving streams and rivers flow into the Allegheny and Susquehanna Rivers. Channels are bedrock controlled. Wetlands are formed on alluvial areas, benches, heads of drainages, and in depressions, with seeps and springs being numerous. Precipitation ranges from 40 to 50 inches, evenly distributed throughout the year, while snowfall averages from 50 to 100 inches. The temperature regime ranges from frigid at the summit of the plateau to mesic in the valleys. Mean annual temperature ranges from 46 to 48 degrees. The growing season lasts from 120 to 150 days.

Disturbance Regimes

Natural disturbance regimes on the plateau include tornadoes and windstorms that commonly cause catastrophic disturbances on sites ranging from ten to thousands of acres. Periodic outbreaks of insects (e.g., gypsy moth (*Lymantria dispar*), elm spanworm (*Ennomos subsignaria*), and cherry scallopshell moth (*Hydria prunivorata*) and diseases (e.g., beech bark disease and maple decline) may cause significant tree defoliation and mortality. Lightning is another important cause of tree mortality, and ice storms have caused large-scale tree crown dieback.

Potential Natural Vegetation

Potential natural vegetation types in Section 212G include northern hardwood forests and Appalachian oak forests (McNab and Avers 1994, pg. 14-10). Eastern hemlock and American beech-hemlock forests are common on moist sites while American beech-sugar maple forests are common on better-drained areas. Common associates include red maple, sweet birch, black cherry, white ash, yellow birch, eastern white pine, yellow poplar and cucumber-tree. Intensive human use of the land, including logging and oil/gas development, has altered the landscape for more than the past 100 years. Moderate to high deer populations over the last 70 years have caused significant changes in plant composition and structure of the forests.

Fauna

Large herbivores and carnivores on the plateau include the abundant white-tailed deer (*Odocoileus virginianus*) and the common black bear (*Ursus americanus*) . Other mammals include the bobcat (*Lynx rufus*), beaver (*Castor canadensis*), red (*Vulpes fulva*) and gray (*Urocyon cinereoargenteus*) foxes, raccoon (*Procyon lotor*), skunk (*Mephitis mephitis*), porcupine (*Erethizon dorsatum*), woodchuck (*Marmota monax*), coyote (*Canis latrans*), gray (*Sciurus carolinensis*) and red (*Tamiasciurus hudsonicus*) squirrels, mink (*Mustela vison*), muskrat (*Ondatra zibethica*) and two re-introduced species, the fisher (*Martes pennanti*) and the river otter (*Lutra canadensis*). A variety of birds such as the wild turkey (*Meleagris gallopavo*), ruffed grouse (*Bonasa umbellus*), wood duck (*Aix sponsa*), and various waterfowl are hunted. Woodland warblers (such as the chestnut-sided warbler (*Dendroica pensylvanica*), ovenbird (*Seiurus aurocapillus*), and black-throated green warbler (*Dendroica virens*), and woodland raptors (northern saw-whet owl (*Aegolius acadicus*), barred owl (*Strix varia*), northern goshawk (*Accipiter gentilis*) and red-shouldered hawk (*Buteo linnaeus*)) are found on the plateau. Salamanders include the redback (*Plethodon cinereus*), spotted (*Ambystoma maculatum*), and northern dusky (*Desmognathus fuscus fuscus*). Timber rattlesnake (*Crotalus horridus*), northern green frog (*Rana clamitans melanota*), wood turtle (*Clemmys insculpta*) and American toad (*Bufo americanus*) inhabit this section. Threatened and endangered species include the bald eagle (*Haliaeetus leucocephalus*), Indiana bat (*Myotis sodalis*), small whorled pogonia (*Isotria medeoloides*), northern riffleshell (*Epioblasma torulosa*) and clubshell mussels (*Pleurobema clava*).

Cultural Ecology

The cultural ecology of the plateau has changed throughout time. During the Paleo-Indian period, humans entered the area around 12,000-8,000 B.C. when the climate was cooler and the vegetation was dominated by spruce. During the Archaic Period (8,000 to 1,000 B.C.), humans adapted to a warmer climate that supported oak-hemlock forest and a plethora of fauna (e.g., deer, elk, turkey and passenger pigeon (*Ectopistes migratorius*). During the Transitional and Woodland Periods (1,000 to 1,600 AD), Native Americans sometimes lived in fortified villages. Woodland Period cultures practiced agriculture. After the Revolutionary War, Euro-Americans displaced many of the native inhabitants and cut the virgin white pine for markets downstream. Industrialization and a growing nation facilitated the extinction of some animals (e.g., passenger pigeon) and the extirpation of others (e.g. the wolf (*Canis lupus*)). Oil emerged as an important industry and access increased to reach these fields. From 1890 to 1930, facilitated by the use of narrow-gauge railroads and additional roads, the extensive and intensive logging practices of the chemical wood industry created conditions for the growth of the present Allegheny hardwoods forest (McNab and Avers 1994, pg. 14-10 and 11).

Based on this regional description, the ecological attributes found on the ANF closely match those found across the northern unglaciated Allegheny plateau. These attributes are recognized and protected by the 1986 Land and Resource Management Plan (Forest Plan) that directs the management of the ANF (USDA-FS 1986a). The goal of the Forest Plan, including its various land designations, is to provide management that reflects a mixture of activities that allows for the use and protection of national forest resources while fulfilling legislative requirements and addressing local, regional, and national issues.

Forest Perspective – Inventoried Roadless Areas and Other Specially Designated Areas

As recently as November 2000, the issue of conserving Inventoried Roadless Areas (IRAs) reached national attention (USDA-FS 2000a). As part of a national Environmental Impact Statement, 25,000 acres of IRAs were identified that were previously designated RARE II roadless areas back in the 1970's. Today, these parcels include large areas along the Clarion and Allegheny National Wild and Scenic Rivers (NWSR), the Allegheny National Recreation Area (NRA) bordering the Allegheny Reservoir, and part of the Minister Creek undeveloped area.

Other specially designated areas outside of IRAs include the Tionesta Research Natural Area, Hickory Creek Wilderness, Allegheny River Islands Wilderness, parts of the Allegheny NRA, and additional areas along the Clarion and Allegheny NWSR's (totaling 22,000 acres). These areas have various restrictions regarding road management. Together, these special designations and the IRA's represent nine percent of the forest. As part of this effort and along with a new Transportation Rule, the forest will define and identify unroaded areas in future landscape-scale projects and report this in the forest-wide road analysis report.

Analysis Area Perspective - Criteria Used to Identify Unroaded Areas

Unroaded areas in the analysis area may serve many of the ecological functions and possess most of the social values associated with the Inventoried Roadless Areas (USDA-FS 2000a) found on the forest. Social values may include one or more of the following:

- Provide a unique opportunity for dispersed recreation

- Provide sources of clean drinking water
- Provide a **large, undisturbed landscape** that offers privacy and seclusion
- Provide an opportunity for study, research and education

Ecological functions that an unroaded area may possess:

- Be a bulwark against the spread of invasive (exotic) species
- Support a diversity of habitats for native plants and animals
- Conserve an area's biodiversity

Specific values and characteristics of unroaded areas will vary but some of the common features are:

Ecological

- Areas serve as **relatively undisturbed reserves of soil, water and air** and could be used as measures to assess effects on water yield, sediment volumes, flood flows, soil loss, and water quality from various activities
- Areas provide **large, relatively undisturbed blocks of habitat** for a variety of terrestrial and aquatic wildlife and plants as well as threatened, endangered and sensitive species (TES)
- Areas function as **biological strongholds and refuges** for a number of species
- Areas may play key roles in **maintaining plant and animal communities and biodiversity** and as stated above, used as measures to assess effects to these features

Recreation

- Opportunities for visitors seeking semi-primitive experiences will remain high, in the analysis area
- Developed and road based recreation activities will not likely be expanded into unroaded areas
- Developed and road based recreation demands will more likely be met and concentrated where they are already available
- Trail construction and reconstruction will be permitted
- Existing motorized trail recreation will not be affected

Social - non-commodity, passive use, spiritual and aesthetics

- Provide areas for those valuing undisturbed scenic quality
- Provide opportunity for those desiring to experience solitude, personal renewal, or stress reduction in (rather) remote areas
- Preserve areas for those having a sense-of-place attachment to specific sites
- Provide for those who want to know that natural areas exist for their own sake (a response to decreasing open space and for an area's inherent "naturalness")
- Preserve opportunities to leave a legacy of natural areas for future generations

Since any unroaded acre of the forest can have one or more of the above characteristics and values, physical limits of unroaded areas within an analysis area must be established in order to assess potential sites. Criteria used to assess sites are based on current land use and technology, recreational and social values, and ecological factors.

- Considering soils and topography on the forest, decades of vegetation management has shown that with the current technology, operations such as log skidding occurring within ¼-mile of existing roads can be performed with limited environmental damage when following Forest Plan Standards and Guidelines. Within this distance, vegetation management operations are possible, and likely to occur, with little or no investment or development. Values and characteristics of unroaded areas strongly emphasize environments that exist beyond the range of human activities, such as tree harvesting and skidding, and the disturbance that they create.
- Considering vegetation and terrain on the ANF, recreation specialists recognize that forest road traffic is sufficiently screened by vegetation and disturbance such as vehicle noise, on forest roads, is significantly reduced once one travels beyond ¼-mile away from a road. Generally, a ¼-mile distance off a road is necessary for a visitor to begin to experience a remote, undisturbed and natural environment.

The threatened, endangered and sensitive species (TES) on the ANF do not specifically require unroaded areas as part of their recovery. However, the benefits of buffering TES species from roads and human disturbance are discussed in many recovery plans.

- Forest Plan Standards and Guidelines, adapted from the 1967 bald eagle recovery plan, recognize that disturbances within ¼ -mile of nesting **bald eagles** have the potential of adverse effects. Forest management activities within this distance are prohibited during the nesting period (USDA-FS 1986a). Bald eagles are generally not found in the analysis area, although, observations have been made at the Owls Nest ponds.
- In the Forest Plan, a "1/4-mile no disturbance guideline" was also applied to Forest Species of Concern (e.g., Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk, northern goshawk, sharp-shinned hawk (*Accipiter striatus*), great blue heron (*Ardea herodias*), and raven (*Corvus corax*) at existing nests during their nesting periods (USDA-FS 1986a). These species are known to occur within the analysis area.
- A major threat to **clubshell and northern riffleshell mussels** is siltation and pollutants carried by these sediments. Dirt roads near streams are a major source of siltation on the forest. Studies have indicated forest roads within 300 feet of streams have the potential of introducing sediment to these water courses. Roads within the analysis area will not affect these species because Spring Creek does not drain directly into the Allegheny River.
- Because of their mobility and adaptability, bats are able to be quite successful in roaded environments, but direct mortality is possible from vehicle collisions. Roads permanently remove potential roost trees for the **Indiana bat**, and noise from vehicles may cause roosting disturbance if roost trees are adjacent to roads, although this has not been documented. Roads provide access for firewood cutting, which may remove current and potential roost trees; however, roads provide travel corridors, solar exposure for existing roosts, and vertical stand diversity that may increase the diversity of prey for the species. Disturbance and vandalism of hibernating bats by humans are a major reason for the decline of the Indiana bat (USDI-FWS 1999). Preventing unwarranted entry into hibernacula by humans by blocking or obliterating roads is the best way to curtail disturbance at these sites. Maintaining the integrity of the hibernacula and the surrounding habitat as well as the biodiversity found in maternity ranges are one of several recommendations for recovery. Indiana bats have been detected within the Spring Creek watershed, however, there are no known hibernacula or maternity roost sites.

- Adverse effects of timber harvesting, road construction, herbicide use, and mineral developments were recognized in the Forest Plan as being detrimental to the **small-whorled pogonia**. Road construction can result in direct mortality to individuals and loss of habitat. Indirect effects of roads on this orchid include road dust and other pollutants. Should the species exist on the forest, unroaded areas could facilitate the natural expansion of colonies. However, unroaded areas may reduce hunting pressure at sites and that may increase deer browsing pressure on the species. There are no known documented occurrences of this species, however, suitable habitat exists with the analysis area.
- The Forest Plan gives special consideration to riparian zones, wetlands, spring/seeps and aquatic habitats regarding other resource activities. Riparian areas and areas within 100 feet of either side of perennial streams and other water bodies receive this consideration. These Standards and Guidelines help to ensure the protection of the **Region 9 Regional Forester Sensitive Species** (RFSS) associated with riparian and aquatic habitat. These features are common within the watershed.

Because they are a component of the forest landscape, the value of unroaded areas can increase depending on their size, shape and location. Factors that can increase the importance of an unroaded area include:

- Large size. Large blocks of unroaded areas are able to support a diverse number of wildlife species as well as larger populations of these species. This is due to the fact that large areas are generally represented by a wide range of habitats as well as an adequate food supply and other features needed to fulfill daily behavior. Another important attribute connected to larger size blocks is the distance into the perimeter that edge affects occur. A 200 foot buffer is generally thought to be adequate when considering the effects of wind, solar increases, nest predation and invasive plant species. If unroaded areas are over 500 acres, a larger area remains unsusceptible to edge effects after considering the buffer area.
- The area should be a “block” shape, rather than thin and linear. Block shaped sites create extensive remote, interior environments that are less likely to be influenced by activities on surrounding lands. Block shaped sites may facilitate the natural movement of organisms described in Question TW(1).
- Adjacency can be important when unroaded areas are located near other unroaded areas, wilderness areas, Tionesta Research Natural Area, inventoried roadless areas, and management areas (such as 6.1) that emphasize mature and over-mature forest conditions. The value of these unroaded areas increases because of their connectivity or proximity to similar environments.

Unique Ecological Attributes of the Spring Creek Watershed

The Spring Creek watershed has several physical, biological and cultural attributes that are unique to the northern unglaciated Allegheny plateau. Although a majority of the soils are moderately or well drained, poorly drained soils are abundant across the watershed, increasing the potential of supporting an aspen component. These clay-rich soils are ideal material in which to construct a complex of waterfowl impoundments. The Owls Nest waterfowl impoundments have documented occasional foraging by bald eagle and Indiana bat. The wide variation in soils and slopes provides ideal conditions for a wide variety of habitat types. Upland oaks, conifer, aspen, and bottomland hardwoods all are represented or have potential.

The widely scattered rock outcrops throughout the watershed may provide a number of suitable winter den and basking sites for the timber rattlesnake, if observation records are an indication.

Culturally, this area is unique because it was partially affected by the 1926 Bear Creek wildfire that burned 13,000+ acres. The mixed oak component in the southern section is also the product of historic and pre-historic fires. Semi-open, fire-influenced savannah/orchard habitat coupled with past vegetation management has provided suitable conditions for the whip-poor-will (*Caprimulgus vociferous*) and rough-legged hawk (*Buteo lagopus*), both uncommon visitors to the forest. Past fire restoration efforts have included dense conifer plantings making several areas ideal ruffed grouse and snowshoe hare habitat.

Several large unroaded areas with age classes between 70 and 110 years (SC2, SC3, SC4 and SC5) are present in the watershed (Appendix A - Map 8 & Map 9). Notable features of these areas include closed canopies, large size, and "block" shape rather than linear. SC3 and SC4 are in close proximity to each other and SC1. Together these three blocks contain around 4600 acres, although SC1 and SC3 are primarily outside of the Spring Creek watershed.

Effects of Roading Current Unroaded Areas in the Spring Creek watershed

Roading the larger blocks (SC2, SC3, SC4, SC5) of unroaded areas in the Spring Creek watershed will have several effects on ecological attributes. Roads will change the ratio of forest interior versus edge habitat available. Road density variation within the Spring Creek watershed ranges from 0 to 15.1 miles/square mile (Appendix A - Map 2a), with the highest road densities occurring in the Sackett oil and gas field. Although no direct studies show that roads directly affect forest interior species on the ANF (D. deCalesta pers. comm.), literature supports that roads or habitat fragmentation adversely affect these species (Noss 1984).

The presence of roads increase the opportunities for and economic efficiency of timber harvest. Vegetation management in SC2, which is primarily 70-110 years of age, may intersperse younger age classes that will introduce more edge habitat into this relatively unfragmented habitat. Given the high percentage of age classes under 30 years throughout the Spring Creek watershed, their wide distribution, and the older age classes found in these unroaded areas, the retention of this ecological feature may be important in providing a diversity of landscapes in the watershed.

Ecologically, it is clear that TES species and their habitats, especially sensitive habitats, benefit from buffer zones that limit human activity and reduce disturbance. Areas that are currently unroaded provide these buffers.

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

Introduction

Roads are potential corridors for the introduction of exotic plants, animals, insects or diseases since these groups tend to be transported by human activity corridors. Whether the road is unrestricted, restricted, or closed plays a role in the probability of the introduction of the exotic. The road location determines whether the exotic can be introduced into an acceptable habitat where it can become established. Examples are seed and insect (hemlock woolly adelgid or gypsy moth egg masses) or disease transported by vehicles.

The introduction of exotics to the ecosystem may lead to their domination of the site due to the lack of natural control mechanisms. Their domination may exclude natural species from their natural role, as a result the control of exotics needs to be determined.

General Perspective

Plants

For more than 50 years non-native plant and weed species have been introduced on sites across the forest to stabilize disturbed soils, reduce runoff and to improve wildlife habitat. Introduced species such as red (*Trifolium pratense*) and white clover (*Trifolium repens*), and birdsfoot trefoil (*Lotus corniculatus)* have been routinely used along roadsides to quickly stabilize road-cuts and banks as well as for aesthetics. These and many of the non-native wildflowers found along both paved and forest roads are now considered naturalized in Pennsylvania. High volume, paved roads with wide, open corridors appear most susceptible to infestations of weed species.

Depending on the level of development, forest road construction dissects the canopy allowing sunlight to reach the forest floor at greater levels, and may promote the invasion of non-native plants. These species are sometimes very aggressive in or along road corridors. The success of these plants is often to the detriment of other indigenous plants and their associated animal communities. Weeds have been known to invade wetlands and use roadside ditches to spread across the landscape. In the case of Spring Creek, some weed species have been introduced intentionally along roads and adjacent to the waterfowl impoundments for soil stabilization, wildlife forage, and aesthetics.

The degree to which a road system increases the introduction and spread of exotic plant species varies with the habitats involved and the ecology of the invading plant species. Generally, roadsides are the primary means of weed introduction into an area. Most weed species are adapted to open, dry, and disturbed early-succession substrates that roads provide. The movement of vehicles, humans and animals on these roads can act as major vectors of weed seeds.

Diseases

The construction of forest roads may have a direct influence on the spread of forest, mainly tree, diseases. Road construction is performed with heavy machinery causing exposure and injury of roots of trees within and adjacent to the new corridor. Individual tree decline or mortality may occur, however, the frequency of such occurrence does not appear to be widespread across the forest.

Insects

The spread of insect pests can be facilitated by increased road density and traffic volume. Forest pests such as the elm spanworm and gypsy moth have been accidentally transported into, throughout, and out of the forest to other parts of the state, and nation, on recreation vehicles as well as heavy vehicles used to transport forest products. Asphalt highways through the forest support Statewide and Interstate traffic that may serve as vectors of detrimental insects such as the wooly adelgid and beech bark nectria fungi and associated scale insect.

Wildlife

The brown-headed cowbird (*Molothrus ater*), common grackle (*Quiscalus quiscula*), and European starling (*Sturnus vulgaris*) are considered introduced pests that can have adverse impacts on wildlife. The introduction of these species can occur as a result of land use change or creation of openings in the forest. Thus, roads can indirectly facilitate the introduction of the cowbird into a region; for example, when roads provide access for development or conversion to agricultural systems. The effects of cowbirds in the analysis area are discussed under Question TW (1).

Analysis Area Perspective

Plants

Forest roads provide for the dispersal of exotic species by altering habitat conditions preferred by native species, making invasion more likely by stressing or removing native species, and by allowing easier movement by wild or human vectors.

Non-native plants do occur along roads in the analysis area, however, these species generally do not go beyond the road corridor and into interior habitats. The spread of weed species has not been identified as a problem in any reconnaissance surveys or field inventories.

There has not been a comprehensive survey for introduced plant species in the Spring Creek watershed. However, extensive plant surveys have been conducted in 1994, 1997 and 2000 as part of a wildlife habitat evaluation, as well as threatened, endangered and sensitive species and unique plant community surveys across the area. These examinations did not focus on roads or roadside habitats but did include them. Non-native species found along roadsides, oil and gas developments and the waterfowl impoundments in the Spring Creek watershed include: birdsfoot trefoil, red clover, white clover, coltsfoot (*Tussilago farfara*), ox-eye daisy (*Chrysanthemum leucanthemum*), orange hawkweed (*Hieracium aurantiacum*), musk mallow (*Malva moschata*), garlic mustard (*Alliaria officinalis*), common plantain (*Plantago major*), multiflora rose (*Rosa multiflora*), sheep sorel (*Rumex acetosella*), field sow thistle (*Sonchus arvensis*) and bull thistle (*Cirsium vulgare*). Although introduced, the majority of these wildflowers are considered naturalized in Pennsylvania and found along nearly every road in the state. Noxious species such as Japanese knotweed have been found in the area but no further attempt to identify other introduced species is planned at this time.

Generally, the introduced herbaceous species in the Spring Creek watershed tend to be confined to road corridors or waterfowl impoundments. The distribution and abundance of these plants tend to be dependent on the level of road development. The vast majority of roads in Spring Creek watershed are Level D and narrow OGM roads that are gated or signed closed for most of the year (Appendix A - Map 10). Consequently, these roads are not considered major vectors of weed species. Field observations indicate the small OGM and FS Level D roads have the least amount of canopy alteration, meaning a maximum amount of canopy closure, few turnouts, and a narrow running surface width. Even though the total miles and distribution of these roads easily surpass the amount of roads built to higher standards (Level C), they tend to support the least amount of introduced species. However, in some cases, the daily use of OGM roads provides a greater chance for vehicular movement of these plants. While narrower, they often receive greater and more regular use. Level C (open collector) roads, such as Forest Road (FR) 343, have disturbed a wider area of the forest floor during construction, typically have a more open or broken forest canopy, usually have a greater number of turn-outs, and handle a higher volume of traffic than lower level forest roads or small lease roads. In Spring Creek, open Level C roads have a greater potential for having and increasing the spread of non-native herbaceous species.

Insects and Disease

Historically, the Spring Creek watershed has experienced a variety of disturbances from various insects and disease. The transport and spread of insects, such as elm spanworm, was facilitated by the presence of roads. The extent to which the total infestation was a result of these roads would be impossible to determine. Other factors are more likely the primary cause in the severity and extent of the elm spanworm outbreak.

See AQ (13) for aquatic species.

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

Roads facilitate the recognition, sampling, monitoring, and ground-based treatment of insect and disease problems. In areas where there is no access, there would likely be a delay in outbreak recognition, sampling or monitoring for insect and disease infestation unless aerial detection is used. Ground based treatment methods would be limited by road access; however, aerial detection and treatment would not be affected by road access. Roads generally are not enough of a barrier to affect the spread of insect and disease outbreaks.

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

The primary natural ecological disturbance regimes on the ANF include wind, insects and disease, deer herbivory, and to a lesser extent fire and ice damage. The two largest human-caused ecological disturbances within the Spring Creek area are timber harvesting and oil and gas development on the ANF, both of which are facilitated by the road system.

The road system would not be expected to affect disturbances from insect and diseases or ice damage. The road system would not affect winds from tornados or severe straight-line winds, but blowdown from straight-line winds could have some concentrated localized effects, particularly when adjacent to new road corridors cut through standing timber. Trees along these new corridors have possibly received damage to root systems during construction causing them to be susceptible to blowdown. Trees develop wind firmness from surrounding trees as they grow, and after new road construction, will have some compensating root development over time to increase wind firmness.

Deer herbivory is a major ecological disturbance factor on the ANF. Vegetative composition and structure in understories have been greatly altered by deer browsing over the past 50 years. When other natural disturbances occur to existing overstory canopies the future vegetative composition has been predetermined by the conditions present in the understory, such as deer. The forest policy on road management has a significant influence on deer management. Road density allows easier entrance for hunters whether walking or by vehicle if the road is opened. Most roads in the restricted management category are opened for deer hunting season. The restricted road list is reviewed each year as a deer management tool. Thus, the road system is used in controlling deer herbivory on the ANF. Roads identified as being needed to manage deer are shown in Appendix A - Map 11.

Wildfire has a low occurrence on the forest and prescribed fire is limited by the narrow window of time when suitable conditions are present. As a result, less than 25 acres per year have been disturbed by fire over the past 5 years on the ANF. The road system increases access of people, by either vehicle or foot travel, into the forest. With the increased access comes the increase in the possibility of wildfire due to carelessness with campfires or cigarettes. The road system does allow for increased or improved access to contain, extinguish and minimize the damage of wildfires.

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

General Perspective

The effects of forest management practices can be either quantitative or qualitative. Qualitative effects, such as noise produced by an activity, are subjective, non-priced outputs, and are often monitored by public opinion. The effects of noise can only be valued by the importance each individual attaches to them (USDA-FS 1986b, pg. 4-3).

The majority of noise occurs during road construction, while road maintenance results in less disturbance. The use of forest roads depends on many factors, specifically on: the original purpose and need for the road, the ever-changing public need for access on any given day or season, current interest in an activity or destination, and condition of the road including the running surface and restrictions placed on access, meaning FS administrative decisions to restrict with signs or gates. Consequently, the level of noise expected from a particular road is dependent on its use at any given period of time.

Roads, as part of developed recreation areas, tend to concentrate people, vehicles, and activities that increase noise levels near sites and may displace some wildlife species such as wild turkey (USDA-FS 1986b, pg. 4-10). Roads provide access to dispersed recreation areas such as trailheads for OHVs, overlooks, visitor information services, and parking areas for activities such as hunting and fishing (USDA-FS 1986b, pg. 4-12). Increased noise levels result from many dispersed recreation activities such as OHV use that may displace some wildlife species.

Road construction for a timber sale project typically involves the clearing of trees and soil disturbance with heavy equipment. Noise from jackhammers, chain saws, log skidders, bulldozers, graders and heavy truck traffic occurs in the initial stages of a 3 to 5-year sale contract. This noise is generally of short duration, usually one construction season or less. Wildlife desiring a quiet environment will be displaced during this period. After construction, if the road is open to traffic, noise is generated by vehicular use on the road (USDA-FS 1986b , pg. 4-35). Roads that remain open (and the traffic noise generated) can negatively affect wildlife due to easy access provided to the public (USDA-FS 1986b, pg. 4-36).

Road maintenance with heavy equipment occurs periodically throughout a sale contract as roads receive heavy equipment use or are brought up to specifications before the contract is complete. Noise levels may vary slightly by the size of equipment used and the number of machines running at any one time. Whether road construction or maintenance, the noise is local and short term but may displace some wildlife species (USDA-FS 1986b, pg. 4-21).

The effects of road construction and use on oil/gas leases are similar to that of timber sales with several exceptions. The noise produced on an oil lease is often increased during construction periods as road construction in water flood developments build roads that are only 500 feet apart. Roads in oil leases facilitate the operation of drilling rigs and hydro-fracturing equipment which produce high intensity, high volume noise for a short duration. Generally, noise produced by well jacks on an oil lease is low intensity and intermittent but of long duration (USDA-FS 1986b, pg. 4-51). When production is peaking, road traffic and associated vehicle noise on water flood lease roads by company employees can equal or surpass public use levels on open forest roads.

On the ANF, pit development is an associated activity of road construction. Concentrated truck traffic, excavation, blasting and crushing create high intensity noise in the local area of a rock pit. This noise is typically intermittent, but of a long duration at sites scattered across the forest. Sites change as old pits are closed and new ones are opened. Wildlife requiring a quiet environment will be displaced.

Road construction during the breeding season is particularly disturbing to avian species. Nest abandonment during incubation or when young are in the nest occurs when construction activities and associated noise are near the nest (USDA-FS 1986b, pg. 4-53). Noise associated with road construction, maintenance, and use may modify an animal's behavior, causing altered movement patterns. Adverse effects on wildlife varies with the intensity and duration of the disturbance and can range from short term avoidance of the area during construction and maintenance activities, to long term impacts such as shifts in home range and altered reproductive success. Long-term impacts are more likely to be associated with new road construction in relatively unroaded areas or along highways with heavy traffic. Noise produced by road improvement work, maintenance activities, or increases in traffic volume may have a greater adverse effect on wildlife on roads that are normally closed or gated. Many wildlife species have or are able to adapt and tolerate noise along open forest roads and major highways.

Analysis Area Perspective

The effects of noise associated with road construction, improvement, maintenance and use is dependent on the amount and distribution and the current service level of roads. In addition, noise levels will vary depending on whether there are changes in service levels or road use as a result of project decisions. Low Level D forest roads and OGM roads are the most abundant and widely distributed roads in the analysis area. The majority of these roads are signed or gated closed to the public. Roads in the Sackett oil and gas field are the most concentrated.

For the Spring Creek watershed, the greatest increase in levels of road-related noise will occur where new roads are constructed, where the traffic service level of a road is improved and will facilitate the use of heavy equipment related to the proposed timber sale, where the amount and distribution of road improvement and maintenance is greatest, where the improved road conditions will facilitate a timber sale project of the greatest amount, distribution and duration (sale period) than other alternatives, additional maintenance will be required if traffic service levels increase, and where specific OGM management requires high density road systems for daily use. Even with no activities proposed in the analysis area, the potential for road-related noise exists because of the possibility of OGM lease expansion, including road construction and maintenance, by mineral owners. Road decommissioning, gating, and signs restricting access temporarily or permanently will have a long-term effect by reducing road-related noise.

Within the watershed, there are areas where road noise appears to be moderate to high due to the high development of OGM roads and recreational destinations. Species that previously inhabited areas directly adjacent to roads in the Sackett oil and gas field most likely have experienced the greatest affects due to the high density of roads located here. Most likely, species in that area have experienced home range shifts, habitat abandonment, and habitat avoidance.

The analysis area consists of Management Areas 1.0, 3.0, 6.1, and 6.3. The Recreation Opportunity Spectrum (ROS) objective for MAs 1.0 and 3.0 is Roaded Natural (USDA-FS 1986d). This ROS class emphasizes moderate evidence of the sights and sounds of humans with recreational opportunities associated with developed road systems. Recreation use in this area is traditionally centered on the use of motor vehicles. The ROS objective for MAs 6.1 and 6.3 is Semi-primitive Motorized. This ROS class provides a medium probability of experiencing isolation and challenge, in an environment where evidence of humans is present. Recreation use in this area is traditionally centered on undeveloped or low development recreation activities in a small group setting. The use and maintenance of roads is consistent with the way these areas have been managed and used by the recreating public.

Aquatic, Riparian Zone, and Water Quality (AQ)

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

The roads with the highest potential for intercepting, concentrating, and diverting flows from their natural flowpaths and directing them to streams, are those roads within 300' of a stream course (Table 7, and Appendix A - Map 12). Within the Spring Creek watershed, there are 72.5 miles of these roads, of which 17.8 miles are managed by the Forest Service. Some of these sections are very short, and may not contribute runoff to streams. A large number of the roads are associated with oil and gas, and are primarily within the Sackett lease area.

Table 7. Miles of roads and surface type within 300 feet of a stream in the Spring Creek watershed, Marienville Ranger District, 2002.

Surfacing	All Roads (miles)	Forest Service (miles)
Bituminous	4.0	0
Limestone	2.9	1.2
Aggregate	0	0
Pit-run	51.1	16.5
Native	14.5	0.1
Total	72.5	17.8

In addition, sometimes springs intercepted by roads are directed into the ditch line and routed to the next cross-drain, causing a concentration of flow. An example of this occurring is at Forest Service road 335B.5. A pipe should be placed here for the spring to cross.

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

The roads with the highest potential for contributing sediment runoff to streams are those dirt roads (native material) or roads surfaced with gravel (e.g. pit run, aggregate, limestone) located within 300' of a stream course (Table 7 and Appendix A - Map 5 & Map 12). Within the Spring Creek watershed there are 68.5 miles of these roads. The Forest Service manages 17.8 miles of these roads, 16.5 miles of which are currently surfaced with pit run. Some of these sections are very short, and may not be contributing runoff to streams. Native and pit-run surfaces have the potential to generate the most surface erosion since these are the least hard surfacing material.

In addition to the road sections, there are 140 stream crossings (Table 8). These crossings are both Forest Service and non-Forest Service. The survey that was completed for this roads analysis looked at 98 stream crossings on both system and non-system roads (Appendix A - Map 13).

Table 8. Number of stream crossings by ownership and type of road surfacing surveyed in the Spring Creek watershed, Marienville Ranger District, 2002.

Surfacing Type @ X-ings	Forest Service	Non-FS
Pit-run	44	2
Limestone	3	0
Aggregate	6	7

Surfacing Type @ X-ings	Forest Service	Non-FS
Bituminous	0	6
Unknown	40	32
Total	93	47

In addition, the rutting and concentration of water for long distances on primarily non-Forest Service roads cause surface erosion to occur, and can ultimately be carried into a stream. Roads that are also entrenched have little to no ability to shed water, and as a result concentrate surface flow on the road leading to surface erosion.

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

There are 19 known historic mass wasting (landslide) areas within this analysis area (Appendix A - Map 14). These historic landslide areas have not been field verified. These old landslides were identified on maps of Landslides and Related Features by John S. Pomeroy (1981). The generic description for these old landslides from this publication is:

> Area of extensive hummocky ground caused by earthflow and earth and rock slump. Lacks clear evidence of active sliding. Relatively stable in natural, undisturbed state, generally not affected by small structures properly sited in areas away from the edge of the toe; can be reactivated by extensive, rapid excavation, loading, and changes in ground water and surface water conditions. Area of old landslide probably includes recent ones not identified from field evidence or otherwise documented. Upslope boundary of landslide generally defined by modified scarp, but downslope (toe) may be gradational and not well defined.

- FR 337B crosses historic landslide area 419.
- FR 337A crosses historic landslide area 410.
- FR 584 crosses historic landslide area 404 and 405.
- FR 403 crosses historic landslide area 460.
- FR 404 crosses historic landslide area 468.
- There are existing trails, OGM and non-system roads within historic landslide areas 410, 405, 430, 431, 433, 441, 438, 468, and 481.
- The following historic landslide areas are completely or partially on private land: 427, 430, 433, 431, 438, and 477.
- The potential for new road construction by the FS occurs on historic landslide areas 470 and 481.

During deferred maintenance road surveys completed on all Forest Service roads within the analysis area, no active landslides were found. With proper road construction and maintenance techniques no evidence exists that mass wasting would be a concern in this analysis area.

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

Numerous Forest Service stream crossings were surveyed for culvert size and if they met the estimated 50-year flood events (USDA-FS 1994, Ch. 1, pg.8). Proper culvert size is critical to preventing roads from being washed out and introducing sediment to the stream from a failure. Table 9 and Appendix A - Map 13 displays culvert sizing primarily for Forest Service road-stream crossings. The 50-year round culvert size in Table 9 is based on a Headwater/Depth (HW/D) Ratio of 1.5 (described later). Although four non-system road-stream crossings are listed, this table is not inclusive of all non-system road-stream crossings.

Table 9. Existing and 50-year culvert sizes for Forest Service roads (including four non-system roads) in the Spring Creek watershed, Marienville Ranger District, 2002.

Road #	Site # (on Map 13)	Drainage Area (Acres)	Existing Culvert (in.)	50-Year Round Culvert Size (in.)	50-Year Squashed Culvert (in.)
124	DD	266	24	54	71x47
124	EE	277	36	54	71x47
125	D	155	24	48	64x43
125	E	490	48	72	77x52
EHI322	KK	90	12	42	57x38
130	H	159	24	48	64x43
130	J	570	60	72	83x57
130	S	606	48	72	83x57
130E	10	189	None	48	64x43
130E	I	144	36	48	64x43
131	G	549	18	72	83x57
131	L	255	36	54	71x47
131	X	577	36x2	72	83x57
131	Y	1025	84	108	16'7"x10'1"
226	Z	96	24	42	57x38
232	1	33	?	36	42x29
232	2	42	24	36	42x29
NS13330	3	47	?	36	49x33
232A	1	118	22	48	57x38
335	6	110	30	48	57x38
NS22132	RR	273	?	54	71x47
338B	1	27	28	30	42x29
338B	2	8	12	24	28x20
338B	3	36	30	36	42x29 or 49x33
338B	4	8	30	24	28x20
338B	5	192	N/a	54	64x43
338B	6	66	30	42	49x33
381	BB	379	None	60	77x52
403	GG	306	48	60	77x52
403	XX	158	48	48	64x43
404	9	237	24x42	54	71x47
NS22901	UU	271	48	54	71x47
491	1	460	31	72	77x52
502	7	134	36	48	64x43
502	8	36	18	36	42x29 or 49x33
502	MM	26	?	30	42x29
580	4	333	60	60	77x52
580	5	75	22	42	49x33
580	F	218	36	54	71x47
661	LL	243	36	54	71x47
774	K	105	36	42	57x38

Thirty-one Forest Service road crossings have culverts, which are undersized to meet a 50-year flood event. Crossings on 403.XX, 580.4 and 338B.4 do meet the 50-year flood standard. As several crossings were not measured, it is unknown whether they will meet the 50-year standard for pipe size.

Five Forest Service and five OGM crossings were noted to have pipes that were too short, resulting in reduced filtering ability of road runoff. These include: 491.1, 338B.4, 338B.2, 338B.1, 338B.6, NS24963.1, NS24953.2, NS24953.1, NS24715.1, and NS22217.1. In some cases the road was almost overtopping the culvert. Six crossings, including two where pipes are short, were documented to have sparse vegetation that would limit the amount of sediment being filtered. These include: NS21555, 338B.4, NS24963.1, NS22135.1, NS24959.1, and ASL snowmobile trail # 15 between FR404 and FR 108. Three fords were documented: on Big Run (NS24899), on a tributary to Big Run (NS24133), and on Little Run (NS24606). See photos of these crossings in Appendix C - Figures 1 & 2.

Road surfacing is another factor that can lead to effects on water quality. Surfacing material, such as pit run, breaks down much quicker into finer material that is washed off the road more often, and potentially runs into streams. Limestone, a much harder stone, does not break down as easily, and thus reduces the amount of fine material entering streams. Similar to the table in AQ(2), the results of the road survey for this analysis showed a high percentage of stream crossings surfaced with pit run, some were paved, and seven had limestone.

Culvert diameter and height of fill over the culvert were determined at 41 sites during the Spring Creek Roads Analysis survey. The fill height (HW) divided by the culvert diameter (D) at the site gives the Headwater/Depth (HW/D) Ratio. Where the HW/D ratio of the crossing is greater than 1.5 the assumption is made that there exists an increased risk of site failure due to potential saturation and erosion of the road fill into the stream channel. However, the lower the ratio the greater the likelihood of stream flow overtopping the road fill, particularly where the culvert is not sized to pass a 50 to 100-year flood events. In such cases where the crossing is prone to erosion and/or diversion, overtopping of the road fill often increases the risk of site failure and sediment introduction into the stream channel due to washout and/or diversion of flow down the road surface. On the other hand, there can be a benefit to getting water off the road fill. In cases where the crossing is stable and not prone to erosion, and where flow diversion down the road surface cannot occur, the risk of site failure and sedimentation is decreased. In this case, high flows go over the road surface and back down into the channel on the culvert outlet side of the road entraining only small amounts of road sediment.

Fifty-four percent of the culverts surveyed have a HW/D ratio greater than 1.5, and therefore have an increased risk of potential failure. The potential for diversion of flow down the road surface, of any length, was found at 52 percent of the sites. An important factor contributing to crossing failure is an under-sized culvert. Of the culverts surveyed most did not meet the minimum size requirement to pass the 50-year flood event, and therefore have an increased risk of failure. The desired condition at each culvert crossing is to have an adequately sized culvert designed to pass the 50-year event for that drainage, resulting in an HW/D of 1.0 at the crossing for that design flow. Designing culvert crossings in this way would allow efficient transfer of flow through the pipe and reduce the risk of fill failure. Since culverts can plug due to sediment and debris blocking the inlet, the fill should be kept to a minimum, thus resulting in a HW/D ratio at the site of less than or equal to 1.5. At such a HW/D the risk of overtopping would increase, however the risk of road saturation and erosion would decrease. Two things need to be considered to account for the increased risk in overtopping. The first is that road fill material would need to be stable enough to resist erosion when overtopping occurs. This could be accomplished with a running surface composed of limestone rock, thus minimizing breakdown into fine sediments. The second point is that the opportunity for diversion would need to be eliminated. By doing so, the road prism would be minimally disturbed when overtopped and that which does erode into the stream channel would have less of an adverse impact on aquatic organisms.

The Fisheries amendment to the Land Management Plan (USDA-FS 1997, page 4-27) recommends a high quality surfacing material be used at perennial and intermittent stream crossings in order to reduce sediment delivery to stream courses. Limestone or other armoring surface application should be applied at FS road crossings that are open year-round, as well as on some closed or restricted roads, if site evaluation and planned long term haul activity make such mitigation measures necessary. Refer to the LMP Fisheries Amendment guidelines for approach distance for surfacing application at stream crossings. This will vary with grade, location of first ditch crossdrain, or other road template features, such as vertical crest (USDA-FS 1997).

All road construction and reconstruction activity at perennial and intermittent stream crossings and areas that could affect water quality will require appropriate interim erosion control and stabilization measures during construction activity. These measures could include filter fence installation, biodegradable erosion control and sediment filter matting where needed, as well as seeding and mulching to mitigate sediment discharge.

The following system roads are open to year-round use. Perennial and intermittent stream crossings on Spring Creek, Bank Run, Wolf Run, and their tributaries are areas of concern. Limestone surface armoring as well as other sediment filtering measures specific to the site application (i.e., crossdrains, lead-off ditches, and settling basins) are recommended mitigation measures for the following forest road stream crossings:

- FR 403, 124, and 108.
- FR 184 is a closed system road that crosses McClelland Run. Any proposed haul activity over this culvert should have the above mitigations and improvements applied as well, due to its location in a zone of Group 3 soils.
- System road FR 381 in Lappin Run is a low standard, closed road with two OGM spurs that utilize primitive and substandard low water crossings on upper Lappin Run. A segment of this road is also located next to a spring seep with no free flow of water.
- At a minimum FR 381 should have surface armoring at the low water crossing spurs as well as throughout. Another option to pursue would be to decommission the lower segments of FR381 where there are no adequate filter strips into Lappin Run. The status of OGM facilities along this road would need to be verified with realignment proposals offered as an alternative means of access to facilities.

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

Pollutants, such as chemical spills, oils, de-icing salts, herbicides, and others, have the potential to enter streams wherever the road system is "hydrologically" connected to the stream. This may occur at any road crossings and areas within 300 feet of a stream course, springs, seeps, or wetlands (Appendix A - Map 12 & Map 15). Map 12, Appendix A, indicates sections of roads that are "hydrologically connected" to streams in the Spring Creek watershed. Spills of incidental nature could occur at these sections from vehicular traffic and affect these areas.

There are township and state roads within the watershed where oils, salts (brine), or other materials might be used for the control of dust abatement, and which could potentially run off and into a waterway if hydrologically connected. There are also some paved roads that can have oils that wash off and into a nearby stream course.

De-icing salts:

These salts are used routinely on State and Township roads (Appendix A - Map 3) to reduce the risks involved with winter driving. These have the potential for entering waterways, but some studies have found that the runoff is not a concern to streams. Forest Service roads are not treated with de-icing salts.

Herbicides:

These may be used under very strict guidelines for brush control along roadways under State or Township maintenance jurisdiction (Appendix A - Map 3) for visibility and safety. Herbicides are not used along Forest Service roads for brush control. However, herbicides may be used in timber stand reforestation treatments adjacent to road corridors. The spray buffer near roads is delineated to prevent or reduce any potential runoff from entering ditch lines that are connected to stream courses.

OGM:

Activities associated with OGM production could result in accidental spills or discharges. If this occurs where the road system is hydrologically connected to the stream courses, it may affect water quality and related flora and fauna. See Appendix A - Map 16, for roads where this could potentially occur.

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

[*See also AQ (1), AQ (2), and AQ (5)*]

As stated in AQ (1) and AQ (2), there are 72.6 miles of roads that have the potential for being hydrologically connected, of which 68.6 miles are dirt and gravel roads and have the potential for contributing sediment into streams (Appendix A - Map 5 & Map 12). There are numerous non-Forest Service roads (primarily OGM) that are hydrologically connected, due to location, interception of springs, and poorly maintained roads (rutted) that are concentrating water and delivering it to stream channels (Appendix A - Map 3 & Map 16).

Filter strip effectiveness surveys have indicated that roads within 300' of a stream are potentially hydrologically connected and have the potential to affect a stream over a period of time. The fisheries amendment addressed the potential impact of sediment by recommending a higher standard of surfacing, using limestone, for any road in close proximity to a stream, in addition to other alternatives.

A variety of developments can alter the timing and amount of runoff into stream courses. The largest source is runoff from roads and motorized trails, or those surfaces that are impervious to rainfall and snowmelt. Roads are one of these impervious surfaces. A criterion has been suggested in Verry (2000) that ditched roads should be less than 15% of the watershed. Forest Service and non-Forest Service ditched roads are estimated to occupy 1,119 acres of the Spring Creek watershed, or two percent. The ditched roads, while well below the threshold, can still influence runoff into stream channels by their location in the watershed. The ditched road acreage was calculated using a variety of widths depending on the surfacing of the road. Forest roads have narrower surfaces, whereas paved municipal roads have a wider running surface.

FR 381, noted above, is a low standard, closed system road with little or no sediment filter strips (some steeper segments [milepost (m.p.) 17+65 to 24+00] are only as few as 12 feet from Lappin Run). It has no surface armoring and no effective drainage structures. Also, as noted above, two OGM spurs off of FR 381 cross Lappin Run via primitive low water crossings. Gate closure of this road has helped minimize its potential impacts. However, occasional OGM use and some illegal access through broken locks have created rutting and erosion. An active spring at the edge of this road is partially impounded and restricted from free flow into Lappin Run, it tends to run down any road ruts that occur and adds road derived sediment to the spring.

On several segments of open system road, inboard ditches with no crossdrain or lead-off interception discharge road generated sediments directly into perennial streams and tributaries. This occurs on the following open system roads: FR 124, 403, 227 – 1) FR124 at m.p.'s 0.215, 0.234, 0.982, 1.081, and 1.175; 2) FR 403 at m.p.'s 0.870, 0.936, 1.764, 1.780; and 3)FR 227 at m.p.'s 1.34, 2.805, 3.479, 3.80, 3.93, 4.26, 4.27, 4.60, 5.176, 5.266, and 5.517.

Along with inboard ditches, some open system roads become "entrenched" through periodic surface blading that tends to leave "berms" on the outside shoulders. This causes surface run-off, which should flow off the shoulder and filter into the vegetation in a normally maintained road template, to instead, generate concentrated surface sheet erosion. These entrenched sediments eventually flow into a crossdrain or stream rather than filtering into the forest floor. Periodic maintenance contracts on several of these roads (e.g. FR 124 and 403) have provided additional lead-off ditch construction to intercept and dissipate any entrenched run-off. Maintenance practices that generate outside berms should be avoided if possible and propose additional maintenance contracts, if necessary, that are specifically targeted to mitigating road template entrenchment problems.

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

The PA-DEP, in Chapter 93 Water Quality Standards, identifies "protected uses" for waterways of the state. Spring Creek and all its tributaries are listed in the current publication as having a protected use of high-quality, cold-water fishery (HQ-CWF) (PA-DEP 2001). Spring Creek is a tributary to the Clarion River, which is in the federally designated Wild and Scenic River program.   The Clarion River is designated a cold-water fishery (CWF). Water quality in the Clarion River has been slowly getting better since the turn-of-the century, to the point where the river supports an excellent wild brown trout (*Salmo trutta*) population in the area where Spring Creek flows into the river.

Any new oil and gas activity could create additional sediment sources. In addition, any heavy truck traffic, such as timber hauling, can increase the amount of fine sedimentation on the road surface that can run off into stream courses during a rain event. The extensive motorized ATV trail system in this watershed is heavily used and requires continual maintenance to minimize, as much as possible, the amount of sediment entering stream courses. These sediment sources could affect the "maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold-water habitat", as defined by the CWF designation in Chapter 93 (PA-DEP 2001, pg. 93-7). None of the streams in the Spring Creek watershed are currently listed as impaired in the State's, 1998 303(d) report (PA-DEP 1998).

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

The wetlands considered are part of the National Wetlands Inventory (USDI-FWS 1977, 1983), and others found during field reconnaissance. Appendix A - Map 15 displays the road network relative to the stream network and riparian areas including wetlands. The road system may affect wetlands in a number of ways including direct encroachment and changes in the hydrology. A road that acts as a partial dam can alter the water table in a wet area. This action makes a wetland or riparian area wetter than normal upstream of the road and drier below. This has occurred with FR 227 and 403 at the points where they are parallel and closest to Spring Creek. These roads have increased the water table and pooled it above the road, thus enhancing the wetland. These wetlands have created open, water habitat for a diversity of wildlife species in addition to creating snags for cavity nesters and dense vegetation for nesting birds. The effects on the wetland below the road appear to be minimal because it is within the flood plain of Spring Creek and continues to maintain adequate moisture. Two other roads have intersected wetlands, FR 131 by Lamonaville and an OGM road near State Game Lands 28. The OGM road has been abandoned, and beaver have dammed the area causing flooding which has enhanced the wetland with no adverse effects. FR 131, however, is regularly used and needed for access to privately owned land. Beaver began flooding the road, which subsequently degraded the road surface. A culvert has been placed, which has been effective in the interim, but another design should be considered for long-term use.

Another effect of roads intersecting wetlands is a change in landscape occurrence and distribution. Historic records may be useful to establish if change has occurred, and for future road management.

Wetland vegetation may increase by a road system due to the addition of moist or wet ditch areas that will fill with native or introduced obligate or facultative wetland plant species. Also, old abandoned roads may act as water catchment basins due to their flat compacted surfaces. These often provide substrates for communities of wet or moist plant communities in later years.

The activities of vehicles, particularly ATVs, may disturb the ground surface in wetland or riparian areas. In extreme cases water tables can be altered on a small scale and the plant communities would change accordingly. Also, these vehicles are common vectors for weed species that may impact wetland or riparian plant communities. The disturbed surface often left by these vehicles only increases the establishment of these alien plants. A portion of the Spring Creek watershed is a designated intensive use area with about 83 miles of snowmobile and ATV/trailbike trails. Field reconnaissance, thus far, found that there are no locations where the trail system is affecting wetland conditions or functions. There is some illegal ATV use in this watershed that may have adverse effects (Appendix A - Map 17).

Future assessments needed:

- An assessment of the degree of encroachment and closeness of roads to wetland areas and the associated impacts
- A complete documentation of the location of wetlands throughout the Spring Creek watershed and the presence or absence of exotic plant species and the potential for them to spread by the road system

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?

During the road survey, a note about restoring the stream channel configuration at the crossing by NS24964 was made. The physical channel dynamics have been altered in segment NS24899, which "fords" Big Run. This OGM road and "ford" has caused the stream channel to alter its course slightly. Some surface erosion is occurring here, but aquatic migration is not impeded (Appendix C - Figure 3).

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?

None of the crossings that are elevated above the stream channel are on streams known to contain fish.

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

The road system does not significantly affect any of these elements.

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

There are no aquatic TES or RFSS known to reside in the waters of Spring Creek or its tributaries. The mountain brook lamprey (*Ichthyomyzon greeleyi*) was collected in the 1960's, but has not been documented since that time. Should the species still be present, fishing or poaching do not pose a threat. There is no known direct habitat loss from the road system.

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

Non-native fish being introduced into Spring Creek are brown trout and rainbow trout (*Oncorhynchus mykiss*). Brown trout are naturally reproducing across Pennsylvania, including the ANF, and are a desired non-native species. Rainbow trout are not reproducing naturally. Both are stocked annually as catchable trout. Roads used for stocking are FR124, FR130, and FR131 along Spring Creek.

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

The Spring Creek watershed does not have exceptionally high aquatic diversity or productivity. However, portions of the watershed have shown the ability to produce rather robust populations of brown trout. Because there is a high number of dirt and gravel roads near streams, proper maintenance and surfacing are important to maintain high quality aquatic habitat. As mentioned previously in AQ12, the mountain brook lamprey was documented in the 1960's, but has not been collected since that time.

Terrestrial Wildlife (TW)

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

General Perspective

General

The construction of a road directly affects terrestrial species habitat by altering the physical and chemical environment on and adjacent to it and creating effects that extend far beyond the time of its construction. Roads also provide one of the means of dispersal for exotic species by providing suitable habitat, stressing or removing native species, and allowing easier movement by wild or human vectors [*See EF (2)*]. Roads built to higher standards and open to the public have a greater potential to produce these effects than roads built to accommodate a specific function(s), generally built to lesser standards, and closed or restricted to the public.

Eight physical characteristics of the environment are altered by roads; soil density, temperature, soil moisture, light, dust, surface water flow, pattern of runoff, and sedimentation. Long-term road use leads to soil compaction that can persist for decades even after use is discontinued. With water vapor transport reduced on a road with a hard surface, compared to bare soil, temperature increases occur. Heat stored on the road surface is released at night, creating heat islands around roads. Moisture content of soils under roads declines in response to changes in soil porosity. Roads increase the amount of light reaching the forest floor. The amount of light depends on how much of the original canopy and lower strata remain as well as the road width. Early-succession, disturbance adapted, higher light level preferring species may take advantage of these conditions (Trombulak and Frissell 2000, pg. 21).

Road traffic mobilizes and spreads dust that can block photosynthesis, respiration, transpiration and cause physical injuries to plants. Dust can serve as a source of fine sediments, nutrients and contaminants to aquatic ecosystems. Roads and bridges can alter the development of shorelines, stream channels, floodplains, and wetlands. Roads on floodplains can redirect water, sediment and nutrients between streams and wetlands and their riparian ecosystems. Along rivers with forested floodplains roads can impair natural habitat development and woody debris dynamics. Improperly constructed road crossings can act as barriers to the movement of fish and other aquatic organisms. Alteration of migratory travel can reduce the distribution and productivity of fish populations. These barriers not only disrupt migratory movements but also cause movements of fish into floodplain wetlands and tributaries to escape the stresses of main-channel flow flood flows (Trombulak and Frissell 2000, pg. 22).

Roads can directly change the hydrology of slopes and stream channels. Intercepting shallow groundwater flow paths, diverting water along a roadway, and routing it efficiently to surface-water systems can cause or contribute to changes in the timing and routing of runoff. This effect is more evident in smaller streams than in larger rivers and may persist as long as the road remains. Roads can concentrate surface runoff and trigger erosion through channel cutting, new gully initiation, slumping, and debris flows. Although occurring infrequently, intense storms often trigger catastrophic responses.

A chronic effect of unpaved roads includes routing fine sediments into streams, lakes, and wetlands that can increase turbidity and reduce the productivity, survival, or growth of fish (Trombulak and Frissell 2000, pg. 22). Sediments can result from road construction, improvement, and maintenance. Another chronic source of sediment comes from road crossings and drainage systems near waterways. Road maintenance activities such as culvert replacement and ditch line cleaning result in short-term effects, whereas long-term sedimentation effects are more likely to result from lower standard roads, roads that cross streams, roads that occur in floodplains or riparian areas, and from roads on steep slopes. The Forest Plan Standards and Guidelines and 1997 Fisheries Amendment provide direction on surfacing materials and establish buffer zone guidelines or distances from streams (USDA-FS 1986a & 1997). Implementation of existing Forest Plan standards and guides are expected to keep sedimentation of Forest Service system roads below levels that would significantly affect wildlife habitat.

Road related sedimentation affecting wildlife habitat is more likely to occur on non-system roads. Many of these roads are currently in use, occur on steep slopes, or are in close proximity of streams. These roads were often established before state standards and require monitoring. Restricting access to lower standard (lease) roads helps to curb sedimentation but additional investments must be considered to maintain or improve these roads to ultimately reduce the potential of long-term sediment loading. The consequences of past sediment delivery are often long lasting and cumulative and may cause impacts to habitat used by sensitive species of the forest such as the northern water shrew (*Sorex palustris*) and nine dragonflies.

By altering surface flows, roads can create or damage wetlands (Trombulak and Frissell 2000, pg. 22). Full effects of road construction on wetland biodiversity may be unpredictable in some taxa for decades. Such a lag in response to changes has important implications in land use planning and environmental assessment (Hassinger 2000).

Five chemical effects of roads on the environment/wildlife habitat

Maintenance and use of roads can contribute at least five chemical groups to the environment including: heavy metals, salt, organic molecules, ozone and nutrients. Heavy metals are derived from gasoline additives. Heavy metal contaminations in forest environments are directly related to the amount of traffic. The heaviest concentrations of heavy metals occur in soils, plants, and animals closest to the road. Heavy metal accumulations are usually localized in the soil, although concentrations in soils have declined over time with the reduction of leaded gasoline and runoff has transported metals away. Also, metals can accumulate in the tissues of plants. Deicing salts contribute ions to the soil, altering pH and the soil composition. Organic pollutants such as dioxins and polychlorinated biphenyls are present in higher concentrations along roads. Vehicles produce ozone, concentrated particularly in areas where exhaust accumulates. Water moving on and along roadsides can be charged with high levels of dissolved nitrogen, and sediment carries a phosphorus subsidy when it reaches surface waters. Deicing salts are an additional source of phosphorus. Alteration in the chemical environment along roads results in; changes in the chemical composition of some woody plants in response to pollution, organisms possibly will be killed or displaced by a chemical exposure, growth and health of plants possibly being depressed often resulting in decreased resistance to pathogens, plants could accumulate toxins that pose a threat to consuming organisms, and increased concentrations of some pollutants, such as salt, often attract mammals, putting them more at risk of being killed by vehicles (Trombulak and Frissell 2000, pg. 23-24).

Replacement of habitat, a direct effect

Roads directly affect terrestrial species habitat by replacing the existing physical habitat with a linear, non-forest condition. Road construction kills any sessile or slow-moving organism in the path and often immediate to the path of the road (Trombulak and Frissell 2000, pg. 19). New construction removes wooded habitat and native ground vegetation, fragments present forest canopy, and creates edge habitat. Lost wooded habitat can contain mast producing trees, conifer cover, brood habitat, den trees and snags. Indigo bunting (*Passerina cyanea*) and song sparrow (*Melospiza melodia*) are a few species that benefit from the edge habitat created by roads. The planting of introduced grasses and legumes on a newly constructed road cannot compare in wildlife value to the amount of biomass lost when trees are removed (USDA-FS 1986b, pg. 4-36).

Principles of organism movement, related information

Organisms move at many different scales including; home range movements (within one area), seasonal migration back and forth between two areas, dispersal, or the movement of young organisms out of their natal area, and geographic range shifts are long-term population responses to environmental change (Hunter 1997, pg. 59). Movement may be the one-time passage of a young garter snake (*Thamnopnis sirtalis sirtalis*) dispersing from its birthplace or it may be the daily to-and-fro of a gray fox or blue jay (*Cyanocitta cristata*) patrolling its territory (Hunter 1990, pg. 129). The viability of organisms depends on whether they can move freely over a large enough area to find needed resources, whether they can migrate freely between seasonal ranges, whether organisms can disperse among subpopulations and habitat patches, and whether organisms are free to shift their geographic ranges as needed (Hunter 1997, pg. 59-60). Roads undoubtedly expedite the travels of some species (Hunter 1990, pg. 129).

Effects of roads on the movement of organisms

Roads may also facilitate movement of species by providing clear corridors for travel. This can result in the increase of predators into an area, as well as, expedite the travel of species such as opossum (*Didelphis marsupialis*). Roads increase and focus movement of deer, coyote, and turkey. Spatial relationships of species movement are altered by the presence of roads. Acting as barriers and corridors, they change predator prey relationships, browse pressure, and intra–species movements.

Establishment of a road in a forest environment can directly affect wildlife habitat by creating a linear feature that constitutes a barrier to movement. Barriers occur at different levels. Depending on its level of construction, including the establishment of dense herbaceous roadside vegetation, a road may be an absolute physical barrier stopping the movement of less mobile animals such as migratory amphibians. Roads may constitute a psychological barrier to small animals and insects in that even though they are physically capable of crossing the road in a few seconds, they are unwilling to do so. In Hunter (1997, pg. 62) studies found that a forest road inhibited the movement of small mammals even though the road was only three meters wide and closed to traffic. These animals might experience some consequences of isolation (Hunter 1990, pg. 131). In Australia even an overgrown, unused road inhibited small mammal movement (Hunter 1990, pg. 132). At times, linear features constitute a filter, not an absolute barrier. Some members of a species will cross a road while other individuals will not. Human hunters and trappers who use roads to access remote areas can also exert a filtering effect on animals attempting to cross a road (Hunter 1997, pg. 62-63).

Effects of roads fragmenting forested habitat

Road construction can fragment a forest environment. Research suggests that even relatively narrow roads through forests can produce marked edge effects that have negative consequences for the function and diversity of the forest ecosystem (Hassinger 2000). The effects of forest fragmentation on terrestrial wildlife habitat can vary depending on; the width of the road, length, level of construction (related to the ease with which a species can cross a road), the distribution of forested habitat, and the sensitivity of a particular species to roads. The level of use, the season of use, and the width of the corridor cleared of vegetation influence the extent of this effect. It is believed the effects of fragmentation by roads is greatest when a road cuts through an intact forest patch where there is little existing edge habitat, when available interior habitat is significantly reduced, or when populations or critical habitat of less mobile species becomes isolated due to roads.

Declining interior songbirds are a group of species considered at risk from fragmentation directly associated with roads. Considering this, the ANF set up four breeding bird monitoring transects in areas that have been intensively developed for oil and gas. These sites were characterized by very high road densities, a high density of openings and are considered some of the most fragmented areas on the forest. These sites are somewhat comparable to the road density of the Sackett oil and gas field, located in the Spring Creek watershed. Since 1993 data has been collected at these sites, as well as 49 other sites across the forest also within ¼ mile of roads . Based on species diversity and abundance data, in addition to comparing available habitat, there is no evidence that the present road system significantly affects breeding bird habitat. This is due primarily to the predominantly forested nature of the analysis area, which helps reduce edge related effects and allows for the continued availability of interior bird habitat. Other studies regarding forest interior bird species, such as the worm-eating warbler, ovenbird, and black and white warbler, indicate that these species avoid habitat edges for breeding habitat (Kroodsma 1984).

In addition, nest parasitism by the brown-headed cowbird, which invades fragmented forests from adjacent farmland or other non-forested habitat, is a well-documented effect of fragmentation associated with roads. However out of over 8,000 breeding bird observations on the forest since 1993, fewer than 15 cowbirds have been documented (D. deCalesta, pers. comm.). Since the Spring Creek watershed is over 96 percent forested and based upon breeding bird data collected on the forest from similarly fragmented areas, the presence of the existing road system is not expected to result in increased numbers of cowbirds or nest parasitism. This is supported by other research in the Northeast (Giocomo et al.1998), which indicates that effects of fragmentation such as brood parasitism and nest predation may not occur or may be reduced in forested areas when compared to landscapes that are not predominantly forested. Hartzler's et al. (1998) study compared bird abundance and species composition patterns among different types of forest fragmentation. Their study found that avian composition was not found to vary markedly between habitats of differing fragmentation. Two different widths of gas pipeline corridors that were similar to roads, well-site openings and forest edges as well as interior forest were compared.

Effects of habitat fragmentation by roads on other wildlife on the ANF

Although not formally analyzed, during the late decade, relationships between forest roads and small mammals, reptiles, and amphibians on the ANF have been studied in habitats ranging from early succession, managed second growth, and old growth. It should be noted that reptile information gathered was not adequate enough to form reasonable conclusions. All study sites are in close proximity to roads (none more than ¼ mile), and most are adjacent to roads, including old growth habitats. Studies have revealed few differences in species or in the abundance of individuals among sites. Researchers have found all of the historically noted songbirds, amphibians, and small mammals on nearly all sites, regardless of the presence of roads. The opinion of the researcher is that songbird, small mammal, and amphibian populations on the ANF are not threatened by roads (D. deCalesta, pers. comm.). Published data from other areas reaches different conclusions than deCalesta's work.

General beneficial effects of roads on forested environments

Although they directly alter wildlife habitat, roads constructed in forest environments can have beneficial effects. Roads can provide access for wildlife management activities (Appendix A - Map 18). Species that utilize the herbaceous vegetation established along rights-of-way, or in the case of low-standard re-vegetated roads on the roadbed itself, benefit from road construction. This can be especially important in settings that have a scarcity of openings. For example, wild turkey hens in North Carolina nest near closed and gated logging roads and use them extensively in all stages of brood development (Davis 1992).

Beneficial wildlife uses of road surfaces and materials

Sources of moisture and minerals provided by the surface of forest roads meets the needs of many organisms, including insects such as the red spotted purple (*Limenitis arthemis astyanax*), tiger swallowtail (*Papilio glaucus*) and spring azure (*Lycaenopsis argiolus pseudargiolus*). These sites also serve as areas of species interaction. Song sparrows and robins (*Turdus migratorius*) use the wet and dry areas of forest roads for grooming, i.e., bathing and dusting. Roads not only provide habitat for bugging (collecting food), but road material, such as grit, aid some species like the ruffed grouse and wild turkey in digestion. As previously mentioned, roads are often sources of salts and minerals desired by mammals such as white-tailed deer and porcupine.

Beneficial uses of forest roads by wildlife

Forest roads play important roles in the life cycles of many organisms. Ruffed grouse have been observed using forest roads to establish territorial boundaries. Porcupine and red fox use roads to escape from danger or provide easy movement throughout their territory. The ditches and catch basins of roads provide reproductive habitat for amphibians such as the green frog, wood frog (*Rana sylvatica*) and red-spotted newt (*Notophthalmus viridescens viridescen*). Materials, such as topsoil, stumps, and other large woody debris cleared during road construction, are utilized by ground nesting birds like the dark-eyed junco (*Junco hyemalis*) and by another common terrestrial species, the redback salamander. Running surfaces of forest roads provide the foraging habitat of insects, like the tiger beetle (Family Cicindelidae), band-winged grasshopper (Subfamily Oedipodinae), and antlions (Family Myrmeleontidae). Heat from road surfaces become attractive basking areas for the eastern garter snake and wood turtle. Black bear often use the cool, moist, herbaceous vegetation growing on forest roads as resting sites, but are able to remain alert to danger by taking advantage of breezes funneled through road corridors. Limestone gravel forest roads near ANF waterfowl impoundments have been successfully used as nesting habitat by killdeer (*Charadrius vociferous*).

Wildlife food sources provided by roads

Scavenger species, like the raven, crow (*Corvus brachyrhynchos*) and turkey vulture (*Cathartes aura*), have adapted to and become dependent on road corridors for sources of food. With their abundance of perching sites, raptors such as the broad-winged hawk (*Buteo platypterus*) use road corridors as foraging areas. Forest edge habitat created by forest roads provides habitat for the insect prey sought after by song sparrows, indigo buntings and a variety of bats including the Indiana bat and northern long-eared bat (*Myotis septentrionalis*).

Wildlife structures provided by roads

Bridges and other structures commonly associated with roads provide roosting cover and nesting habitat for bats and swallows. Culvert pipes provide escape routes for mammals like the woodchuck and raccoon. Beaver frequently create wetland habitat by plugging road drainage structures.

Analysis Area Perspective

Physical effects; soil density, temperature, soil moisture, light, dust, surface water flow, pattern of runoff and sedimentation

Traffic Service Level C roads have the greatest potential to affect the eight physical characteristics of the environment for terrestrial species habitat. Compared to other roads in the SCW, these roads have opened the forest canopy, permitting sunlight to reach more of the forest floor. These roads have the greatest potential to spread exotic species due to having a more open corridor in addition to public access. They handle the bulk of the traffic within the analysis area resulting in the highest risk of mobilizing and spreading dust into the environment. All other roads in the analysis area have more forest canopy overhead, to provide shade, which slows moisture evaporation. Forest Service system and private lease roads have altered patterns of runoff throughout the analysis area, although less so on Forest Service roads. Forest Service system roads have had a minimal effect on the patterns of runoff because they are generally located on well-drained soils and plateau tops. Lease roads within or near riparian areas have had the greatest influence. OGM roads that cross, parallel, or lead to well pads adjacent to riparian corridors contribute to siltation of the watershed. Road improvements are expected to reduce or eliminate chronic silt loading where roads cross streams, as well as altering existing runoff patterns. These adjustments are expected to direct more runoff across the forest floor and away from waterways.

Within the SCW, existing lease roads have a greater potential risk for sedimentation as one of these roads fords a creek, several lease roads cross streams, others parallel streams and are located within riparian areas. On the other hand, having been constructed using minimum one lane road widths, most lease roads have disturbed the least amount of soil. Generally, road bases are shallow and the shoulders of these roads as well as some of the running surfaces support dense vegetation that holds soil in place. Since these roads are closed to the public and receive very limited use, roadside vegetation tends to persist. Even though lease roads meet State guidelines, chronic sources of sedimentation persist in various locations across the analysis area. Historically, major precipitation events have caused isolated sections of lease roads to experience surface rutting and culvert washouts.

Chemical effects

Vehicles on Level C roads have the greatest potential of adding chemicals to the environment due to being open to the public, dissecting the analysis area, and carrying the majority of the traffic volume in the watershed. Closed system and lease roads have the least potential of changing the chemical environment within the SCW.

Direct replacement of habitat

Any new road construction will directly affect wildlife habitat by replacing a forested environment with open corridor and creating “edge” conditions. Potential adverse effects may be greatest if the road is constructed in an unroaded portion of the analysis area. Although the disturbance produced by road construction is short-lived, the change in habitat will be long lasting. The acreage directly affected by road construction is expected to be relatively small compared to the overall size of the watershed area. However, given the high density of roads present in some areas of the watershed, such as the Sackett oil and gas field, the additional roads will have a cumulative effect on fragmenting the watershed.

Effect on movements of wildlife

Roads may be physical barriers to less mobile species like amphibians. System roads in the SCW are built to higher standards, such as greater widths and higher road bases, than lease roads and may present a barrier to some species or individuals. Lease roads that are near, parallel, or within riparian areas may have a greater risk of affecting the movement of amphibians. However these roads are generally shallow-based, narrow and vegetated, which may negate any potentially adverse effects to the movement of amphibians.

Effect on fragmenting habitat

Level C roads result in the most notable dissection of forested habitat because they are built to a higher standard with a width great enough to permit the passage of two vehicles. Other system roads are Traffic Level D and have been built to lower standards resulting in minimal fragmentation of the forest canopy.

One of the primary effects of forest habitat fragmentation by roads is the disturbance to wildlife by seeing traffic movement, in addition to the noise generated by passing vehicles. In the Spring Creek watershed, these effects are greatest along roads open to the public. Increasing songbird nest parasitism by cowbirds is another effect attributed to the fragmentation of forest habitat by final harvest timber cutting and roads in agricultural areas. The SCW is not located in, but is adjacent to, limited agricultural land; consequently nest parasitism is not a significant factor. In addition, the watershed contains large patches of interior forest that continue to provide suitable range for those songbirds preferring this habitat.

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

General Perspective

Increased human use, facilitated by roads, may result in diverse and persistent ecological effects. Historically roads have opened the way to settlement and the conversion of forests to agricultural lands (Hunter 1990; pg. 257-258). New roads increase the ease of human access into formerly remote areas. As a result, roads increase the efficiency with which natural resources can be exported and may increase changes in the use of land and water. Roads built into areas have promoted logging, agriculture, mining and the development of homes, industry or commercial projects. Such changes in wildlife habitat can have major and persistent adverse effects on native flora and fauna of terrestrial systems and freshwater ecosystems. Studies across the US have correlated the declines in stream health, status or abundance of fish populations, and declines in wetland species diversity to increasing road densities and their cumulative effects. It appears roads can serve as an indicator of the magnitude of land-use changes (Trombulak and Frissell, 2000, pg. 24-25).

Patterns of development and land use change that have occurred historically do not necessarily reflect the pattern of change or activity that occurs now on the Allegheny National Forest. The ANF Land and Resource Management Plan determines the timing, frequency, and intensity of management actions through the designation of management areas. Transportation management generally plays a supporting role to the completion of land management objectives rather than determining when or where an action will occur. Roads can be a factor in determining the site specific placement of projects that require long-term maintenance (e.g. mowed grass opening). Subsequent use of an area by the public is more often influenced by the existence of roads and road management practices (i.e. managing roads as open, closed, and restricted).

Analysis Area Perspective

Within the Spring Creek watershed, the existing road system facilitates oil and gas development and maintenance, vegetation manipulation (timber harvesting and management), legal and illegal OHV use, and dispersed recreation in the form of camping, hunting, fishing and firewood collecting. Effects of these activities on wildlife habitat include: the direct conversion of forest habitat to openings from oil and gas development, changes in wildlife habitat conditions resulting from vegetation manipulation, increased sedimentation due to road and OHV use, and maintenance, and the loss of standing and downed woody debris due to firewood collection. In addition, the existing road system will influence the location of new road construction. Similar to oil and gas developments, new road construction will result in the conversion of forest habitat into road corridor.

Sedimentation resulting from the use and maintenance of lease and system roads is discussed under TW (1) and AQ (1). To a lesser degree, the same potential risk of sedimentation exists where the ATV trails cross streams. While the current road system allows the collection of firewood, some loss of habitat, in the form of snags and down logs, occurs due to the taking of large woody debris. This loss is considered minor because firewood is only removed within 150 feet of a road, and there appears to be an adequate amount and distribution of dead and down woody material across the watershed due to scattered mortality, blowdown, and a variety of slash from past vegetation manipulation.

In the SCW, timber harvesting has the greatest potential to alter wildlife habitat. Since 1986, all timber harvesting on the ANF has been directed by Forest Plan objectives, and outlined by management areas that include providing a mix of habitats designed to meet the needs of a wide variety of wildlife, as well as standards and guidelines to protect or enhance unique and sensitive habitats (USDA-FS 1986a). As a result, there are effects on wildlife habitat resulting from timber harvesting within the watershed. Age classes have been changed throughout the watershed resulting in interspersed stands with age classes less than 30 years. This young early successional habitat is well represented in the watershed. Timber harvests will strive to meet forest age class recommendations as well as create roosting and foraging conditions considered optimal for forest bats. Roads will also be used to access sites proposed for wildlife habitat improvements, as well as habitat enhancement and maintenance (Appendix A - Map 18).

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

General Perspective

Roads of all kinds affect terrestrial wildlife and aquatic ecosystems by increasing mortality from road construction, increasing mortality from collisions with vehicles, and increasing the use of habitat by humans. Roads may fragment populations through road kill and road avoidance (Trombulak and Frissell 2000, pg.19).

Road construction

Road construction can kill any sessile or slow-moving organism in the path of the road. The extent to which road construction contributes to direct mortality has not been estimated. If considering all highway construction done on a yearly basis, the magnitude of this effect nation-wide is not trivial. Construction may physically injure organisms adjacent to the construction corridor. Direct effects can also include those where high concentrations of suspended sediment, immediate to the construction site, may directly kill aquatic organisms and impair aquatic productivity (Trombulak and Frissell, 2000 pg.19).

Direct mortality from collisions with vehicles is well documented and few terrestrial species of animal are immune. Road kill is often non-specific with respect to age, sex and condition of the individual animal (Trombulak and Frissell, 2000, pg.20). In general, mortality increases on roads with higher traffic volume and speed (i.e., paved roads). This is particularly noticeable when roadsides offer spring herbaceous vegetation that is yet unavailable in interior forest environments and during the reproductive period of some species (e.g. white-tailed deer rut). All species are at risk and some species may be attracted to roadside vegetation, insects and dense cover established along the roadside. Some wildlife may be attracted to the road surface itself to collect seeds or gravel (Trombulak and Frissell, 2000, pg.20). In addition, animals often respond to the heat islands produced by roads. Small mammals, birds and snakes aggregate on or near warm roads, increasing their risk of being hit by vehicles (Trombulak and Frissell 2000, pg.21).

Mortality from collisions can have effects on a population's demography. The incidence of road kill relative to species abundance is greater on high traffic roads. Wildlife populations can become fragmented or depressed from cumulative road mortality and continue to suffer higher proportionate rates of mortality in high traffic areas. Mitigation measures to reduce highway mortality have been employed in different locations across the country for a variety of species with varying degrees of success. Some species are less likely to be killed in collisions along high-speed, high volume roadways because of fencing and the clearing of vegetation back from the shoulder of the road (Trombulak and Frissell 2000, pg.20).

Mortality from collisions may increase when a road traverses a species' home range or isolates critical or specialized habitat used by a species. Often times, the increased disturbance from traffic is enough to displace a species or alter an animal's behavior. Many species on the ANF have small to average home ranges (smaller than 20-acres) and have little need to cross roads unless their territory includes or borders a road (D. deCalesta, pers. comm.). Other species traverse large ranges and the size and type of road as well as the season of the year can affect animal behavior and ultimately the risk of collision. A study of black bears showed that bears almost never cross interstate highways but cross roads with little traffic more frequently than those with high traffic volumes (Brody and Pelton 1989). Paved state highways through the forest may deter some individuals, but black bear mortality does occur. Bears, especially accustomed to human populations, are frequently seen crossing highways and these roads do not appear to significantly alter the behavior of large predators such as the black bear. Due to their limited width(s) and daily use, forest roads are expected to have an insignificant effect on the behavior of large predators.

Migrating amphibians may be especially vulnerable to road kill because their life histories often involve migration between wetland and upland habitats, and individuals are inconspicuous and sometimes slow-moving (Trombulak and Frissell 2000, pg.20). Oftentimes, these species are even more attracted to roads and highways because of their warmer temperature and the water they retain during or after a rain. Notably, the spotted salamander and green frogs are frequent victims of collisions on highways and forest roads (D. deCalesta, pers. comm.). Other small or somewhat slow-moving mammals that are often victims of passing vehicles on forest roads include porcupine, opossum, skunks, raccoon, chipmunk (*Tamias striatus*), and red squirrel. Because of their tendency to escape traffic by running along or parallel with a road rather than across it, the porcupine is a very frequent victim. In addition, ruffed grouse occasionally collide with vehicles. Based on current information and observation, local Forest Service scientists have not uncovered any evidence to suggest that forest roads threaten the populations of birds, small mammals, or amphibians found on the ANF (D. deCalesta, per. comm.)

Direct mortality (road kills) can have a filtering effect on wildlife populations. The presence of roads or the disturbance produced by vehicle use will turn back some individuals while others may die trying to cross. Human hunters and trappers (legal and illegal) who use roads to access remote areas can also exert a filtering effect on animals attempting to cross roads (Hunter 1997, pg. 63).

<u>Hunting, trapping, poaching, and illegal kill levels</u>

Road systems can also facilitate activities such as hunting, trapping, poaching, and illegal taking of species that result in direct mortality to wildlife. Roads open to the public may facilitate over-hunting and disturbance in general (Hunter 1990, pg. 258). Roads opened during the hunting season can have a positive or negative effect on wildlife. Positive effects include easier access for hunters to harvest surplus animals, especially white-tailed deer. Populations are thereby kept in balance with available habitat. Maintaining a road system that maximizes deer hunter access is essential to reducing and maintaining deer populations to allow for the recovery of the range (including a forest shrub component). On the other hand, a high degree of accessibility can result in the over-harvesting of some species, especially wild turkey and black bear, resulting in decreased production in succeeding years (USDA-FS 1986b, pg. 4-36).

Hunting from a moving motor vehicle, an illegal activity, is an all too common problem on the road system throughout the ANF. Law enforcement has been able to apprehend large numbers of violators throughout the years, especially during deer season. The most common complaint about hunting from moving vehicles, outside of deer season, is the spring and fall turkey seasons (S. Burd, pers. comm.).

Harassment and disturbance

Roads that remain open can negatively affect wildlife due to the easy access provided to the public. Human activity can negatively impact wildlife during the breeding, nesting, young rearing season, and during adverse winter weather periods. Nest abandonment by wild turkey, ruffed grouse, raptors, waterfowl, and the displacement of wild turkey from brood habitat can occur. Severe winter weather is particularly stressful on white-tailed deer and wild turkey. Mortality can increase during these periods due to harassment by motorized human activities, which can have a long-term effect by decreasing future reproduction (USDA-FS 1986b, pg. 4-36).

The 1986 Forest Plan recognized the effects of road-related disturbance on wildlife and included some standards and guidelines to reduce these effects. Species most at risk from disturbance associated with roads include Forest Species of Special Concern (great blue heron, red-shouldered hawk, goshawk and coopers hawk) and Management Indicator Species (timber rattlesnake and pileated woodpecker (*Dryocopus pileatus*)). Based on 10-years of monitoring data on the forest, habitat and population trends have shown that the Forest Plan Standards and Guidelines have been valuable in reducing road related impacts on these species.

Analysis Area Perspective

Road construction

Any road construction proposed in the analysis area has the potential to kill or injure sessile or slow-moving individuals during construction. If the construction is limited to upland plateau habitat significant adverse impacts to local populations of slow-moving species, such as migrating amphibians, is not expected. New roads will be evaluated to determine whether they traverse or isolate critical or specialized habitats. Direct effects to wildlife are expected to be low, if construction activities occur on a closed road and a low traffic service level is maintained.

Road kills

The SCW has limited high volume, high speed, paved roads that put wildlife species at the greatest risk of collision. State Routes 66 and 948 border the watershed and have the greatest impacts to species mortality. These roads border wetlands and cross several creeks. Other roads within the watershed may facilitate wildlife collisions, however, limited daily use and slow speeds required on these roads make the risk of collision very minimal. The timber rattlesnake may remain at higher levels of risk of collisions on open and closed roads, especially on southern exposures, because of their higher than average populations throughout this region, their large dispersal ranges of up to two miles, and their tendency to use roads for basking. This is particularly true during the spring and fall when this species is moving to or from winter den sites.

Hunting, trapping, poaching, and illegal kill levels

In terms of access, the open road system within the SCW has not changed significantly over the last two decades. Several roads that are used for administrative use only are opened during hunting season to allow access for deer hunters (Appendix A - Map 11). During these time periods, increased human influence is present in systems that normally are not affected by people. Attempts to regulate and lower deer populations within the watershed dictate the opening of these roads and appear to be helping limit the deer populations, harvest levels of other high interest game species such as wild turkey and black bear fluctuate across the forest from year to year, harvest records indicate populations of these species have remained relatively unchanged on the forest. Except for isolated road damage during wet seasons, there are no known adverse impacts from the hunting of game species in the analysis area.

Populations of furbearers within the watershed, such as beaver, appear to be stable or increasing. The watershed has no history of higher than average incidences of road-hunting, poaching or illegal kills (R. Bodenhorn, pers. comm.). The direct mortality to wildlife resulting from poaching or trapping within the analysis area is not expected to change. Because of higher than average population levels however, one may suspect a higher than average risk of accidental or illegal kills of the timber rattlesnake.

Harassment and disturbance

Since the open or closed road system found in the watershed has not changed significantly in the last two decades, the level of harassment or disturbance to wildlife has remained unchanged. Considering the amount of road use in the watershed, little change in the disturbance of wildlife is expected in the long-term. Road construction and improvements have the potential to create a short-term disturbance to wildlife nearby during the brief work period(s). Roads that are improved to accommodate timber hauling are also expected to increase disturbance to local wildlife for the short-term. The closing and obliteration of roads across the watershed is expected to decrease disturbance levels on wildlife as this work will further limit where vehicles will be able to travel.

Any proposed road construction will be evaluated to determine whether important, specialized or critical habitat of Management Indicator Species or Forest Species of Concern will be impacted. The current Forest Service road densities or road use in the analysis area do not appear to be having an adverse impact on these species.

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

General Perspective

Roads may have both direct and indirect effects on rare communities and special habitat features. For example, an indirect impact to a riparian zone (a unique community) may involve weed invasion facilitated by vehicle traffic on a nearby road or through road ditches. Special features may include rock outcrops, caves, vernal pools, spring seeps and raptor nest sites. They also include maternity roosts of threatened or endangered species. A unique community or special feature on the landscape can be as small as a patch of woodland orchids or a single breeding pond for a local population of salamanders. Even though small in size and ephemeral, salamanders will travel long distances and cross roads to reach breeding pools necessary for their survival (D. deCalesta, pers. comm.).

Some sites are so sensitive to disturbance that one needs to carefully weigh the idea of removing timber from them or building roads. In areas characterized by wet soils, riparian zones and other fragile features, road building can cause severe damage to a site. Sometimes the damage is virtually irreparable, degrading an ecosystem's productivity for decades, even centuries (Hunter 1990, pg. 258).

Although lands with special features or rare communities make up only a small portion of an area, these sites and habitats often receive a disproportionate amount of wildlife use. Many times these areas are tied to a species' specialized requirements. Consequently, protecting rare communities or special habitat features is essential in maintaining the viability of local populations.

The Forest Plan and its amendments recognized the importance of unique wildlife communities and special features such as wetlands, riparian zones and floodplains These resources are given preferential consideration to other resources. Unique plant communities are recognized and protected wherever they occur and their location will be identified on a compartment map for coordination purposes. The Forest Plan includes Standards and Guidelines that allow for the protection of special features such as spring seeps, rock ledges, key wildlife habitat (turkey brood and deer and turkey wintering areas), rocky areas for snake dens, and caves and rock outcrops for bats. Access on forest roads will be managed to provide additional protection for the bobcat, timber rattlesnake, Threatened and Endangered Species, Forest Species of Concern and Species of Special Concern in Pennsylvania. Management Area Guidelines call for additional measures protecting turkey brood habitat and wintering areas for turkey and deer (USDA-FS 1986a, pg. 4-6, 19, 20, 31, 33, 37, 38, 40, 93).

Analysis Area Perspective

The SCW has several physical features and unique communities that are widely distributed across the area. The physical features include wetlands constructed by beavers, waterfowl impoundments, and dozens of small rock outcrops. Special features also include vernal pools (wetland), raptor nests (Forest Species of Concern), and numerous timber rattlesnake foraging locations or observations. Other unique communities include sites that support small populations of pink lady's-slipper (*Cypripedium acaule*) and areas where sassafras (*Sassafras albidum*) and wild grape (*Vitis* spp.) are found.

Following Forest Plan guidelines, there are no known unique communities or special features that are directly affected by the existing Forest Service road network in the SCW. Indirectly, these roads may be affecting the potential expansion of these communities or the wildlife that inhabit these unique communities. Restriction of species daily and annual movements can lead to localized extinction and restrict genetic transfer and habitat use. For example, species using wetlands adjacent to SR 948 may avoid dispersal routes that cross this highway. Wetlands that are expanding due to increased beaver activity may be limited or reduced if those wetlands begin to threaten a road. Often maintenance crews pull beaver dams or concentrate trappers around these problem areas.

Several non-system roads within the watershed directly and indirectly affect some existing wetlands, riparian areas and rock outcrops. Because all private lease roads are constructed to a low standard, are closed to the general public, and receive very limited use by the lease holder, many of the physical effects and disturbances produced by use of these roads are considered minimal. Step 5 of the analysis identifies how and where these effects can be further reduced.

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?

Table 10 displays the direct costs associated with the Forest Service road system in the Spring Creek analysis area. Costs are based on the entire road length, including the length outside the Spring Creek analysis area. Separating out the costs only within the Spring Creek analysis area is not feasible. The amount of a specific road outside the Spring Creek analysis area included within this table can be determined by comparing the column titled " total length" and the column titled "length within Spring Creek". As an example, FR 118 has a total length of 1.23 miles, but only .315 miles of it are within Spring Creek analysis area. There are 110.876 miles of Forest Service roads within the analysis area. There are an additional 44.475 miles of road outside the analysis area with their costs reflected in this table. The Forest Service divides road maintenance two categories: annual and deferred. Annual maintenance includes items such as grading, opening/closing gates, and spot surfacing. Deferred maintenance includes items that are not done on an annual basis such as culvert replacement, surfacing replacement, gate repairs, and brush removal. The total estimated annual road maintenance needs for Forest Service roads is $460,980. The total estimated deferred road maintenance needs for Forest Service roads is $2,937,527. Annual and deferred maintenance costs were projected from road maintenance surveys and standardized cost guides included within INFRA (a Forest Service database). Appendix A - Map 19 & Map 20 indicate the annual and deferred maintenance needs in a map format.

The road system increases the FS direct costs. The affect on direct revenues will be analyzed under the Spring Creek EIS. Generally, the cost of maintaining roads to the Forest Plan Standards and Guidelines translates into higher product values for timber sold. Better road conditions reduce hauling time and extend the available time for logging operations in an area. OGM and special use traffic are intended to pay commensurate maintenance costs for their use.

Closing and/or decommissioning roads will reduce the direct costs. The affect on direct revenues will be analyzed under the Spring Creek EIS.

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

Roads provide access for a variety of reasons: resource management by Forest Service personnel, resource extraction (mostly likely for timber sales or oil & gas), or other commercial access like recreation (including dispersed camping, wildlife viewing, hunting, photography etc). A good road system increases the value of both priced and non-priced commodities, because in general without access these things have less value. The most notable exception to this are commodities that are intrinsically valuable simply because they have less access, such as wilderness or roadless areas which are only accessible by individuals who can walk long distances with supplies.

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

The ANF has been actively managing its road system for the past 20 years, and today the system in the Spring Creek area is 37% open, 34% restricted (open seasonally only), and 29% closed (Figure 3, pg. 16). The ANF has closed many roads in this area. The Spring Creek area currently has more open and restricted roads and less roads that are closed than is recommended in the Forest Plan (USDA-FS 1986c, pg. 21).

The ANF Forest Plan calls for a ratio of 20:20:60 (open, restricted, and closed). This standard is the goal to be reached by the fifth decade of Forest Plan implementation. The ANF has not reached its goals for road management due to two reasons. First, one of the underlying assumptions in this ratio is that by the fifth decade, there will be over 1600 miles of road on the Forest Service system (USDA-FS 1986c). It was predicted that the majority of the roads constructed during the first five decades of the plan would be closed to public traffic, thus increasing the percentage of closed roads. The current rate of new construction coupled with the decommissioning of existing Forest Service system roads, would indicate that a road system of 1600 miles may not be realistic. The result of this is that the percentages of open, restricted, and closed may need to be readjusted. Second, in order to reduce the deer herd, more roads are being opened for hunting season (restricted) than were predicted. Reducing the deer herd to acceptable levels may result in not meeting the guideline for open, restricted, and closed in the near future.

Closed roads limit or eliminate access to individuals who are unable or unwilling to walk long distances and/or to resource extraction, which generally needs motorized equipment for hauling. In turn, this could have economic repercussions for the local communities, which may depend on having access for employment opportunities. To date, it has been demonstrated that there is limited interest in the Allegheny area for commercial backpacking or backcountry guiding experiences. The largest recreation demand is for motorized access, such as “driving for pleasure”, and one of the fastest growing recreational pursuits of ATV riding.

Table 10. Annual and deferred maintenance costs for Forest Service system roads in the Spring Creek watershed, Marienville Ranger District, 2002.

Road Number	Road Name	Length within SCW	Total Length	Annual Cost	Annual cost/mile	Deferred Cost	Deferred cost/mile
FR108	Kelly Pines	0.207		550	$2,657	15000	$72,464
FR118	Nansen	0.315	1.23	1350	$1,098	4000	$3,252
FR124	Sackett	3.912		13575	$3,470	54000	$13,804
FR124B	Sackett - B	0.281		1914	$6,811	8819	$31,384
FR124F	Sackett - F	0.666		2368	$3,556	2606	$3,913
FR124G	Sackett - G	0.152		763	$5,020	2483	$16,336
FR125A	Corduroy - A	1.403		3530	$2,516	172719	$123,107
FR130	Lamonaville	3.393		9300	$2,741	74000	$21,810
FR130A	Lamonaville - A	0.928		1503	$1,620	8204	$8,841
FR130B	Lamonaville - B	0.886		2024	$2,284	0	$0
FR130E	Lamonaville - E	0.476		988	$2,076	50	$105
FR131	Loleta Grade	3.273	11.568	30275	$2,617	181000	$15,647
FR136	Owls Nest	1.422	4.584	16700	$3,643	107000	$23,342
FR136J	Owls Nest - J	0.011	0.387	1130	$2,920	4758	$12,295
FR152	Windy City	0.025	4.365	12000	$2,749	151000	$34,593
FR157	Buzzard Swamp	0.588	6.368	7250	$1,139	24000	$3,769
FR164	Chaffee	0.876		1299	$1,483	11012	$12,571
FR167	Game Lands	0.43	0.529	1325	$2,505	5000	$9,452
FR184	McClellan Run	2.319		11902	$5,132	61778	$26,640
FR184A	McClellan Run - A	0.248		228	$919	50	$202
FR224	Warner Run	1.716		6615	$3,855	7190	$4,190
FR224A	Warner Run - A	0.437		355	$812	4373	$10,007
FR225	Rest Area	0.617		675	$1,094	26100	$42,301
FR225A	Rest Area	0.108		0	$0	0	$0
FR225AA	Rest Area - A	0.039		0	$0	0	$0
FR226	Goat Farm	2.016	4.326	16630	$3,844	186467	$43,104
FR227	Little Hunter	6.193		15025	$2,426	91000	$14,694
FR227C	Little Hunter - C	0.677		1565	$2,312	71954	$106,284

Table 10. Annual and deferred maintenance costs for Forest Service system roads in the Spring Creek watershed, Marienville Ranger District, 2002.

Road Number	Road Name	Length within SCW	Total Length	Annual Cost	Annual cost/mile	Deferred Cost	Deferred cost/mile
FR227D	Little Hunter - D	0.516		1845	$3,576	320	$620
FR227Da	Little Hunter - Da	0.139		568	$4,086	0	$0
FR228	Zimmerman Tower	1.102	5.187	12975	$2,501	58000	$11,182
FR228B	Zimmerman Tower - B	0.777		2925	$3,764	27503	$35,396
FR230	Hunter Run	2.298		6262	$2,725	3696	$1,608
FR231	Ridgway 63	0.095	0.122	60	$492	355	$2,910
FR232	Highland	2.351		5850	$2,488	15000	$6,380
FR232A	Highland - A	0.779		5122	$6,575	6716	$8,621
FR232B	Highland - B	0.539		1537	$2,852	9450	$17,532
FR232C	Highland - C	0.613		2341	$3,819	3895	$6,354
FR232D	Highland - D	0.135		818	$6,059	0	$0
FR233	Hanley	0.257		650	$2,529	5100	$19,844
FR236	East Branch	1.828		3441	$1,882	13099	$7,166
FR236A	East Branch - A	0.362		1279	$3,533	10910	$30,138
FR329	Twin Pines	0.449	3.702	2200	$594	3200	$864
FR335.1	Smathers	0.329		643	$1,954	820	$2,492
FR335.2	Smathers	1.225		8087	$6,602	41944	$34,240
FR336	Three Mile OGM	0.958		4271	$4,458	18977	$19,809
FR337	Vista	1.525		3825	$2,508	7000	$4,590
FR337A	Vista - A	1.202		3000	$2,496	47000	$39,101
FR337B	Vista - B	0.981		2475	$2,523	3400	$3,466
FR338	Middletown	1.91	2.016	5025	$2,493	5200	$2,579
FR338A	Middletown - A	0.734		1825	$2,486	6000	$8,174
FR338B	Middletown - B	1.285		3225	$2,510	19000	$14,786
FR339	Red Lick	0.107	5.119	12800	$2,500	18000	$3,516
FR342	Durnell	0.609		1325	$2,176	8500	$13,957
FR343	Irwin Run	1.076	3.201	8025	$2,507	99000	$30,928
FR343C	Irwin Run - C	0.081	0.229	185	$808	50	$218
FR343F	Irwin Run - F	0.247		877	$3,551	50	$202
FR343G	Irwin Run - G	0.278		536	$1,928	3140	$11,295

Table 10. Annual and deferred maintenance costs for Forest Service system roads in the Spring Creek watershed, Marienville Ranger District, 2002.

Road Number	Road Name	Length within SCW	Total Length	Annual Cost	Annual cost/mile	Deferred Cost	Deferred cost/mile
FR343H	Irwin Run - H	0.341		727	$2,132	3550	$10,411
FR355	Chaffee Spur	0.171		0	$0	0	$0
FR356	Three Point	0.44		1125	$2,557	15200	$34,545
FR381	Lappin Run	0.876		7479	$8,538	128113	$146,248
FR389	Watsontown Run	0.007	0.189	475	$2,513	4000	$21,164
FR393	Pole Road Run	0.454	1.137	4266	$3,752	20348	$17,896
FR394	Watson Branch	1.869		6873	$3,677	55841	$29,877
FR395	Pipeline	3.407		10609	$3,114	117196	$34,399
FR395A	Pipeline - A	1.24		1196	$965	9358	$7,547
FR395B	Pipeline - B	0.438		1403	$3,203	1151	$2,628
FR395C	Pipeline - C	0.93		2350	$2,527	1500	$1,613
FR395D	Pipeline - D	0.375		1251	$3,336	12415	$33,107
FR396	Horse Trail	1.516		7194	$4,745	64602	$42,613
FR396A	Horse Trail - A	2.186		8159	$3,732	94287	$43,132
FR401	Pine Camp	2.146		5465	$2,547	3200	$1,491
FR401A	Pine Camp - A	0.929		2540	$2,734	50	$54
FR401B	Pine Camp - B	0.679		1839	$2,708	890	$1,311
FR403	Bank Run	3.104		6500	$2,094	91000	$29,317
FR403A	Bank Run - A	0.922		2400	$2,603	7000	$7,592
FR404	Kemp Run	3.114		7344	$2,358	19622	$6,301
FR404A	Kemp Run - A	0.326		1458	$4,472	11522	$35,344
FR404B	Kemp Run - B	0.375		1614	$4,304	1640	$4,373
FR442	Big Run	1.317		3511	$2,666	772	$586
FR442A	Big Run - A	0.65		1558	$2,397	50	$77
FR442B	Big Run - B	0.407		1120	$2,752	50	$123
FR442C	Big Run - C	0.875		2476	$2,830	3086	$3,527
FR445	Sheffield Junction	2.4		8802	$3,668	116568	$48,570
FR491	Sackett Station	1.938		4850	$2,503	49100	$25,335
FR502	Wagner Run	1.457		4940	$3,391	39774	$27,299
FR541	Carlo	0.765		1360	$1,778	150	$196

Table 10. **Annual and deferred maintenance costs for Forest Service system roads in the Spring Creek watershed, Marienville Ranger District, 2002.**

Road Number	Road Name	Length within SCW	Total Length	Annual Cost	Annual cost/mile	Deferred Cost	Deferred cost/mile
FR559	W. Bird Dog	0.083	0.798	2000	$2,506	2000	$2,506
FR580	Spring Creek	3.843		32396	$8,430	49354	$12,843
FR580A	Spring Creek - A	0.413		1560	$3,777	10257	$24,835
FR581	Propagation	1.068	1.27	5220	$4,110	5352	$4,214
FR581A	Propagation - A	0.523		2096	$4,008	1050	$2,008
FR581B	Propagation - B	0.258		970	$3,760	560	$2,171
FR584	Elk Forest	2.213		5550	$2,508	45200	$20,425
FR632	Eldridge Run	0.064	1.893	4725	$2,496	1000	$528
FR661	Middletown	0.616		1525	$2,476	26100	$42,370
FR735	Watson Bend	0.493		1961	$3,978	480	$974
FR746	Lame Skunk	0.631		2764	$4,380	4378	$6,938
FR755	Head of Threemile	0.813	1.127	4239	$3,761	80478	$71,409
FR756	Out of the Swamp	0.192		425	$2,214	218	$1,135
FR757	Turkey Flock	1.031		4226	$4,099	28912	$28,043
FR774	Pearsall Run	1.535		6498	$4,233	28420	$18,515
FR774A	Pearsall Run - A	0.534		715	$1,339	8262	$15,472
FR775	Dog Trial	0.732		1252	$1,710	33990	$46,434
FR777	Gurgling Run	0.06	0.577	928	$1,608	4630	$8,024
FR830	Ponti	0.158		806	$5,101	1570	$9,937
FR830A	Ponti - A	0.2		771	$3,855	320	$1,600
FR830B	Ponti - B	0.122		294	$2,410	198	$1,623
FR832	Old 232	0.289		1070	$3,702	1620	$5,606
FR840	Hemlock	0.359		1295	$3,607	19090	$53,175
FR840A	Hemlock - A	0.216		726	$3,361	546	$2,528
FR840B	Hemlock - B	0.262		948	$3,618	419	$1,599
FR849	FR 136 Ponds	0.113		300	$2,655	1200	$10,619

COMMODITY PRODUCTION

Timber management (TM)

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

Efficient and economical road spacing for ground based logging systems on terrain similar to that of the Allegheny Plateau utilize an average 1200 to 1400 feet skid distance to the farthest harvest unit in order to balance economical yarding cost with road density.

On slopes of 45 percent and steeper, non-conventional yarding systems should be considered in any subsequent road spacing plan and sidehill location. With such harvest systems as skyline cable or track mounted, low ground-pressure skidders provide relatively less ground disturbance where critical steep slopes, spring buffers, and minimizing steep skid road construction are important considerations for environmentally and economically sound harvest planning. Road location for cable systems are technically more critical and must take into consideration cross slope topography, cable deflection, potential landing locations, and external yarding distance (skyline reach) of between 800 and 1200 feet depending on the yarder size, tower height, and spar tree configuration. It is important to note, however, that these are non-conventional harvest systems and not typical or readily available to logging operations in the Northern Appalachian region.

In addition, unroaded areas or areas with access constraints due to stream crossings may require other forms of non-conventional harvest plans such as helicopter, forwarder, and/or temporary skidder bridge. In the case of helicopter logging, road spacing should be based on a 0.5 to 1.0 mile yarding distance from back harvest unit to landings.

Road system and harvest objectives in the following steep drainages should include planning for non-conventional cable or low ground-pressure track yarding as an option: Wagner Run along FR's 502 and 124F; lower Lappin Run above FR 381; steep slopes above Spring Creek and its tributaries in the vicinity of FR124a, 403, 130a and b; and steep slopes above Little Hunter Creek near FR 227. Helicopter or non-conventional forwarder/temporary bridge crossing systems should be evaluated economically and environmentally in the unroaded areas of Hunter Creek stands.

In plateau areas where conventional skidder systems would be utilized, the opportunities for decommissioning system roads or obliteration of unclassified roads may be evaluated based on logging plans for efficient and economical road spacing as well as mineral estate road ownership. Future access needs for the following road segments may be evaluated in light of these considerations:

- Lappin Run: FR 381 from m.p. 0.0 to 9.8.
- Unclassified road segment NS22681 in the Hunter Creek area of Sackett oil and gas field
- Road segments NS26163, NS24976, and NS25125 off FR's 230 and 227 in Little Hunter Creek. Harvesting within the high road density oil field areas could potentially provide less logging and haul efficiency due to the large number of landings required, and subsequently nearly all roads in a harvest area would have to be used for hauling therefore increasing the maintenance cost.

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

The present road system emphasizes access to suitable timber and other areas appropriate for management activities such as wildlife management. Most of the analysis area is in the suitable timber base (Appendix A - Map 21). Past timber management has provided for a network of system roads within this watershed except for unroaded areas identified in TM(1). In the high road density oil field areas, existing oil and gas jurisdiction roads will be utilized for access. In addition, any proposed new roads or reconstruction routes will utilize existing openings, skid roads, or other unclassified road segments whenever possible to minimize impacts and changes to the landscape.

In addition to these environmental and economic factors affecting road proposals and location, proposed access routes should be located for a flexibility of conventional and non-conventional harvest systems in mind (see TM (1)). As modern silvicultural practices employ multiple treatments, as well as other access needs for regeneration, fire, and law enforcement, road system design standards and surfacing needs must be specific toward more year-round use and multiple entries. In addition, this may require more use of gates in lieu of seeding or berming to close a road system.

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

Without the existing and potential future additions to the road system, the ANF would not be able to manage the lands within the Spring Creek watershed to meet the goals set forth by the Forest Plan (USDA-FS 1986a and Appendix A - Map 22). The Forest Service would not be able to salvage and reforest lands that have been impacted by natural disturbances. Past road construction as part of management activities, developed a road system that emphasized economic and efficient access to management units. To continue economic and efficient access to future management units requires the need to develop new roads or new systems of skidding. New road construction needs to consider the entire area the road is to service. Skidding distance requirements should be reviewed, and increased skidding distance should lessen the need for new road construction.

Minerals management (MM)

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

A locatable mineral is an ore deposit or precious mineral resource. A leasable mineral is one that is owned by the Federal government and leased by a private individual or organization through the Bureau of Land Management (BLM) lease process. The BLM oversees all Federal mineral leases. Currently, there are three Federal leases on the ANF totaling 1026 acres. An additional 15,689 acres are currently unleased and available for leasing. Total federal mineral ownership is 34,973 acres, or about seven percent of the forest land-base. There are no locatable or leasable federal minerals in the Spring Creek analysis area.

A salable mineral is a common variety with no intrinsic material value, such as sand, stone, or gravel. The ANF owns 100 percent of the common variety minerals on the forest, but is currently only utilizing stone (pit run) for road surfacing. Existing stone pits in the Spring Creek analysis area all have access roads although additional access roads may be needed to access new stone sources (see MM(3)).

MM (2) How does the road system affect access to private minerals?

Roads are needed to access private mineral estates, and whenever feasible, existing roads are utilized. However, new wells and facilities usually require additional local access roads, which are constructed by the mineral operators. The Forest Service works with the mineral owner/operator in determining the location of new oil and gas access roads on the ANF. The location of access roads is negotiated during the development phase of new projects. The maintenance of oil and gas access roads is the responsibility of the mineral owner/operator.

The current road system allows for mineral owners/operators to operate and maintain their existing developments. Roads currently being used by mineral owners/operators are indicated in Appendix A - Map 23.

Oil and Gas Background on the Allegheny

The lands making up the ANF are "acquired lands", which means they were privately owned when the Federal Government purchased them. On roughly half of the ANF, a third party, someone other than the sellers of the land owned the subsurface mineral rights when the surface was sold to the Federal Government. These are referred to as Outstanding Rights since the subsurface rights were "outstanding" to a third party. On the remainder of ANF where the Federal Government does not own the subsurface mineral rights, the sellers of the land retained the subsurface mineral rights when they sold the surface to the Federal Government. These are known as Reserved Rights and are subject to a list of deed restrictions imposed by the Secretary of Agriculture known as "Rules and Regulations". These restrictions usually deal with prohibiting hydraulic mining and the need to participate in forest wildfire suppression. Owners of Outstanding or Reserved mineral rights have the right to access their private mineral estates for development, which includes building and maintaining access roads to drill and service their oil and gas wells. There are no known significant coal deposits or other "minerals" of value on the ANF.

Roads constructed by oil and gas companies to access wells and facilities; such as tank batteries, pipelines, and compressors, are "private" roads. These roads represent a significant investment by the oil and gas company and the owner has the right to prohibit use that interferes with their mineral operation. As the surface landowner, the Forest Service may use the road for management of the National Forest; however, the Forest Service cannot extend use of these private roads to the general public against the wishes of the mineral owner. The mineral owner, while legally able to exclude public vehicles from its road system, cannot exclude the public from accessing National Forest System lands on foot.

On the ANF, the Commonwealth of Pennsylvania, Department of Environmental Protection, Bureau of Water Quality is the "regulatory" agency when it comes to correcting problems associated with private oil and gas roads that are causing soil erosion and/or sedimentation. The Department of Environmental Protection (DEP) has been given primacy by the Federal Government for carrying out the provisions of the Federal Water Quality Act of 1965 via the Pennsylvania's Clean Streams Law (PA Clean Streams Law of 1937, as amended). The Forest Service works with the DEP and the mineral owner to correct problems associated with private oil and gas roads.

The Forest Service usually does not expend monies on oil and gas access roads that are not part of the Forest Service road system. The Forest Service may take remedial action when a responsible party cannot be found or reasonably made to correct deficiencies on roads. Many oil and gas roads have been recognized as valuable corridors for the management of the National Forest and have been added to the Forest Service road system.

Oil and gas developments usually have a typical progression of road use. In the beginning, there is a period of very intensive use when access roads are being built and well drilling and hydro-fracturing are occurring. For oil wells, there is usually an initial flush of production that can last anywhere from a month to a year when oil hauling can be significant. Following this initial flush, road use tapers off to a daily pick-up truck or ATV visit by the well tender, a monthly visit by a tanker truck to pick up oil, if the oil is not pipelined out, and the occasional 1 to 5 year visit by a service rig (a medium to full-sized truck with a mast capable of "pulling" the well to replace tubing, etc.). After being brought into production, gas wells usually require less visits by the well tender, and the gas is pipelined out, which results in less road use. Every month or so, a tanker truck may visit the gas well to pick up brine water. Over time, many oil and gas access roads "grass in", becoming stable corridors that generate little sediment. However, some older or poorly designed developments can be plagued with road sediment problems.

The oil and gas industry is characterized by long periods of apparent nonuse only to have a jump in oil, or gas prices that revitalize old holdings. The State of Pennsylvania has a criterion for "inactive wells". The Forest Service must respect the "right" for inactive wells to be put back into working order and not rule-out the possibility that this can occur. However, there are abandoned and orphaned wells on the ANF. An abandoned well is "any well that has not been used to produce, extract or inject gas, petroleum or other liquid within the 12 preceding months, or any well from which the equipment necessary for production, extraction or injection has been removed, or any well, considered dry, not equipped for production within 60 days after drilling, re-drilling or deepening, except that it shall not include any well granted inactive status" (PA Oil & Gas Act 1985). An orphan well is "any well abandoned prior to the effective date of Pennsylvania's Oil and Gas Act (April 18, 1985) that has not been affected or operated by the present owner or operator, and from which the present owner, operator, or lessee has received no economic benefit, except as a landowner or recipient of a royalty interest from the well" (PA Oil & Gas Act 1985). The PA Oil and Gas Act requires all abandoned wells to be plugged, and the State has well plugging programs in place to plug orphan wells based on safety concerns and potential harm to the environment. The Forest Service has also contracted services to plug orphan wells that are a safety concern or doing harm to the environment. After a well is plugged, access roads are decommissioned if they are not needed for current or future management of the National Forest.

MM (3) How does the road system affect the availability and management of pits?

The principal material used to surface low volume roads on the ANF is termed "common variety minerals". This is a soft sandstone found close to the surface, and extracted with a front end loader or similar means. The Spring Creek analysis area currently has 45 open pits, 23 depleted pits, 3 rehabilitated pits, and 15 potential pits. These are shown in Appendix A - Map 24. Potential pits are areas where based on previous experience with pit development, there is a potential for a pit source to be developed. Field verification of this has not occurred at this time. Experience has shown that many of these potential pits will not result in actual sources being developed. To reduce the cost of roads and road maintenance, many small pits have been established on the ANF. By having many small pits, the haul cost can be reduced. Over time, the best and easiest accessed pit material has been used. The quality, quantity, and ease of obtaining pit material is decreasing. For various reasons, alternative surfacing materials such as limestone are being used or investigated.

Range management (RM)

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

There are no range allotments on the Allegheny National Forest.

Water production (WP)

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

There are several small impoundments in the watershed. These impoundments are managed by the PA Game Commission for waterfowl habitat and not as a source of water. The roads are gated and are primarily grassed over, and are generally only used for maintenance of the impoundments. There are no water diversions, distribution canals or pipes in the watershed.

General Perspective

The ANF has, and will continue to develop, a variety of water systems to meet the needs of the public, as well as for ecosystem management purposes. These systems include wells, ponds, impoundments, reservoirs, drinking water systems and water transmission lines. Private citizens, companies or local authorities own many of these facilities. Private water rights exist on some portions of the ANF, and should the need arise these holders may develop these resources within certain perimeters. These rights may include transmission and distribution lines and rights-of-way since the holders are often located in nearby municipalities.

Based on Forest Plan Standards and Guidelines (7500 Water Storage and Transmission), impoundments on the ANF will be designed, constructed, and maintained to meet laws and regulations established by federal, state, and local agencies. Impoundment designs will include water control features. On a smaller scale, consider utilization of road projects to develop shallow water areas. Under Section 7400 Public Health and Pollution Control Facilities, Water Supply, Management Areas 1.0, 2.0, 3.0, 6.1, 6.3, 6.4, 7.0 and 8.0 on the ANF, drinking water may be provided. If provided, it must meet Federal and State regulations and be protected to ensure its continued quality. Water systems may include springs, hand pumps and electric pumps. Electric pumps are excluded in 6.1, 6.2, 6.3 and 6.4. In Management Areas 5.0 and 9.1, drinking water supplies will not be developed. Carry-in/carry-out method of disposal will be emphasized and promoted and no dam construction will occur in Management Area 5.0 (USDA-FS 1986a, pg. 4-32, 33, 52, 68, 80, 95, 109, 23, 36, 146, 160, 167, 174, & 185).

In nearly all cases, water resource facilities on the ANF have been constructed using the latest technology, including the use of heavy equipment. Roads were constructed to provide safe and environmentally sound access to the facilities. The operation of these roads requires regular maintenance and monitoring as well as upgrades or major reconstruction to meet the intended purpose. At times maintenance requires nothing more than small mowing equipment while major repairs often mean heavy equipment must be brought back on site.

Analysis Area Perspective

Three waterfowl impoundments, ranging from 2 to 13 acres in size and created using earthen dikes, are located on Forest Service land in the Spring Creek watershed (Appendix A - Map 15).

To help maintain the integrity of these earthen structures, vegetation on these facilities need intermittent top-dressing with lime and fertilizer, mowing, and occasional re-seeding. Drains and water control structures need monitoring, and maintenance, as well as periodic replacement. These structures are subjected to failure due to a variety of influences. Maintenance and replacement operations are often most efficiently done with heavy equipment that requires road access. No surplus roads have been identified for decommissioning regarding these facilities.

The waterfowl impoundments in the Spring Creek watershed provide suitable habitat for migrating and breeding waterfowl, breeding sites for a variety of amphibians and insects, and foraging habitat for wading birds such as the great blue heron. The ponds in the analysis area are part of a larger collection of 10 impoundments on National Forest and State Game Lands near Owls Nest and not only provide unique habitat, but are confirmed foraging sites of the bald eagle, Indiana bat and northern long-eared bat.

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

The Spring Creek watershed is not a municipal watershed, and thus there are no affects.

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

There are no hydroelectric operations within the Spring Creek watershed, and thus there are no effects.

Special forest products (SP)

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

Past management activity and oil and gas development have established a road system that provides access to much of the watershed. This access allows ample opportunity for people to collect special forest products such as firewood, berries and seeds, and take photographs of flora, fauna and nature's beauty. There are no known outstanding opportunities for collecting special forest products in the analysis area. Some incidental collection of special forest products occurs; however, minor changes in the road system will not have a significant effect on these opportunities. Other than gathering firewood there are no other permits currently being issued for collecting special forest products in the analysis area. Generally, roads are left open for a few years following a timber sale to allow for the gathering of firewood. Firewood Permit holders are issued maps showing areas of closed timber sales now available for firewood gathering that are accessible by road.

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)?

There are several special use permit sites within the analysis area. Most of these sites are utility corridors or related to mineral developments. The current road system allows for access to operate and maintain these sites (Appendix A - Map 25).

General Public Transportation (GT)

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

Primary access into and out of the analysis area for recreation, administration, private rights, and commodity production is provided by State Highways 66, 948, LR 3002, and Township routes 310 in Spring Creek Township, 458, 322,and 313 in Highland Township, and 327 in Jenks Township. Forest system collector routes such as FR 124, FR 131, and FR136 also access private inholdings with seasonal camp communities. Many of these routes are on the boundary of the Spring Creek area, and have segments in and out of the analysis area. The primary purpose of the forest system roads is to provide safe, year-round access to these areas as well as provide access to resource management activities within the forest.

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 majority of private inholdings are accessed via forest collector routes as well as the township routes mentioned in GT (1). Two small 45-acre parcels in Spring Creek Township are accessed via closed Forest Roads 381 and 344, and private OGM roads. Road standard and maintenance levels minimally affect access via FR 344 since other access is provided via township road 301. However, the parcel in upper Lappin Run that is accessed via FR 381 is virtually inaccessible due to the low road standard and condition of that road. Alternate access through a private inholding via FR 383 and an existing unused OGM route from the west should be considered. This would also create an opportunity to decommission portions of FR 381 where it is hydrologically connected to Lappin Run (see AQ(4)). Appendix A - Map 26 shows roads needed for access to private land.

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

The analysis area has many oil and gas roads. These are roads built and maintained by a mineral owner to access their privately held oil and gas rights (see MM(2)). The roads needed for access to oil and gas rights are shown in Appendix A - Map 23. To reduce the roading impacts between oil and gas users and Forest Service resource management, a long standing policy and objective in route planning is to share road use by the Forest Service and other ownership whenever feasible. Roads that require maintenance/improvement prior to use for timber haul are added to the FS system as OGM jurisdiction, after consultation with the OGM operator.

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

Roads in the analysis area are managed and signed in accordance with their maintenance and traffic service design levels (Appendix A - Map 10) and are considered adequate under normal operating conditions. Any management activity that increases use or considerably alters normal traffic patterns would be mitigated with appropriate warning and precautionary signs. Additional road maintenance or reconstruction to restore or improve standards may be required to safely accommodate heavier traffic volumes. The following open system roads that receive year-round recreational traffic are in need of increased brushing intervals for safety sight distance: FR's 227, 403, and 228.

GT (5) How does the road system address the safety of road users on joint use roads (e.g. snowmobile trails on roads)?

Many of the snowmobile routes through the SCW follow open public roads (Appendix A - Map 7). Forest Service has the obligation to accommodate joint use as efficiently and safely as possible. Joint use roads may increase the potential for accidents, but the most common conflict occurs when timber and oil/gas operators plow snow off roads designated for snowmobile use. Many of these roads are plowed in the winter when OGM, timber, or local residents need safe access. The goal is to minimize user conflicts and to provide a high quality recreation experience while accommodating road use needs. Timber and oil/gas operators are asked to make every reasonable effort to maintain a snow covered running surface in joint use locations.

Permitting ATV use on open, public roads has been minimized because of concerns for safety on mixed traffic roads. About half of the Marienville and Timberline ATV trail systems are located on gated roads that timber and OGM operators use infrequently. Joint use roads may increase the potential for accidents and the long-term goal is to locate trails off roads where feasible and practical. Native road surface material breaks down rapidly due to the constant scrubbing action created by ATV tires loosening the fines that bind the surface material together. New stabilization products and techniques are being tested to better stabilize the road surface and reduce long-term maintenance needs and costs.

Administrative Uses (AU)

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

The road system provides ample access within Spring Creek so that research, inventory and monitoring can take place (Appendix A - Map 27). Forest Service Research, the North American Maple Decline Project, and the Porter's Prize administrative study have projects established in the Spring Creek watershed. All of the roads within Spring Creek are used periodically for access to conduct forest stand exams.

Forest system roads play a vital role in facilitating Forest Plan Monitoring for wildlife resources. Portions of FRs 124, 130, 131, 136, 226, 227, 227D, 227Da, 339, 343, 344, 404, and 404A are used every other year to conduct monitoring surveys for Management Indicator Species such as: the barred owl, American woodcock (*Philohela minor*), ruffed grouse and timber rattlesnake. Since 1978, FRs 124, 125, 131, 136 and the Sackett-Highland Road (T-313) are just a few of the many roads across the ANF that are used to conduct deer hunting season car counts to evaluate trends in dispersed recreation and hunting pressure on wildlife resources. During the last five years FRs 338, 395 and 442 have facilitated access to deer population surveys (pellet-group counts) that provide information for making project planning decisions, forest-wide population estimates, and bag limit recommendations made to the PA Game Commission.

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

The current road system is adequate for investigative and enforcement activities. High road densities provide more opportunities for unlawful activities, such as road hunting, illegal firewood gathering, etc. Catching violators is more difficult when there are multiple avenues of escape. Patrolling areas of high road density takes longer due to high road mileage.

There is considerable unlawful OHV (ATV/Snowmobile) activity within the analysis area that uses existing roads and utility corridors to access unlawful OHV trails (Appendix A - Map 17). Any new road work should include blocking unlawful OHV trails, wherever feasible.

Protection (PT)

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

Due to the low occurrence of wildfire on the ANF, little to no mechanical or hand treatment of fuels has occurred. Some prescribed burning is done for wildlife habitat improvement or site preparation for oak regeneration. The current road system allows access to most of the analysis area for any fuels management. There are several "large" unroaded areas within the analysis area where access is more limited but no fuels management is expected to occur in these areas.

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

The ANF has a low occurrence of wildfire primarily due to high annual precipitation and hardwood forest types present on the forest. Most of the wildfires that occur on the ANF are caused by human activities. The current road system is sufficient to meet the needs of the Forest Service and cooperators to suppress wildfires within the analysis area.

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

The current road system provides very good access to the analysis area with numerous exit routes if necessary. Due to low occurrence of wildfires on the ANF and the road system within the analysis area, risk to firefighters and public safety is low.

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

There are approximately 110 miles of Forest Service roads and 212 miles of OGM, State Game Land, and other unknown roads in the Spring Creek analysis area (Appendix A - Map 3). Some of these roads are constructed of pit run stone or native soil, with a portion of them well vegetated. The potential for airborne dust emissions exists on these unpaved and unvegetated surfaces. There is also approximately five miles of roads with limestone surfacing within the watershed. In addition to the Forest Service and OGM roads, there are approximately 45 miles of roads under state and township jurisdiction.

Two parameters, road surfacing and road management (percent of roads opened, restricted, & closed), were used to determine which roads in the SCW are the most likely to contribute to airborne dust emissions and present a public safety issue (Appendix A - Map 4 & Map 5). Roads in the watershed are paved, and surfaced with limestone, pit run, or composed of native soil. Paved roads have no risk for dust emissions. Limestone surfaced roads, because of heavier binding properties, are at low risk. Pit run and native soil are a higher risk, in that respective order, because stone and particles are easily broken down and with the right conditions may contribute to airborne dust problems. Additionally, open roads contribute more to airborne dust because they are traveled the most, while restricted and closed roads contribute to airborne dust to a lesser extent.

Based on this analysis, roads that are open and constructed of native soil or surfaced with pit run stone created the greatest risk for contributing to airborne dust emissions. The following roads in the watershed that have the highest potential risk are FRs 227, 131, 130, 343, 136, 338, 395, 403, portions of 124, and township roads 312, 313, 458,and 370.

An exception to this analysis was the OGM roads located in the watershed. These roads are typically surfaced with pit run and are privately owned and closed to the public, although a physical barrier may not be present. These roads do present a dust problem, but mainly to those OGM operators that routinely use them for administrative purposes.

Airborne dust can be generated by increased vehicle use and speed on roads. Control methods on Forest Service roads include a set speed limit and weight restrictions. During particular dry periods, without rainfall, these roads can have low visibility due to dust created by vehicle use. Forest users are advised to use headlights and maintain safe following distances as a safety precaution for increased visibility during particularly dry periods. The only known human health concerns would be with individuals with a low tolerance for particulate matter (dust). No health facilities are located in the immediate watershed area, therefore localized airborne dust is not considered a problem to any facility.

Other methods of control include improving surfacing material such as limestone or gravel to reduce dust particles. Limestone surfacing has stronger binding properties that reduce airborne dust more then traditional native soil or pit run stone. No chemicals are used for dust abatement in the watershed on Forest Service roads. However on some local township roads within the watershed, private oil and gas operators are permitted and do apply brine at certain times of the year when dust is a problem. At times townships within the watershed use tar on township roads for dust abatement.

Water is applied by OGM operators for dust abatement on some Forest Service and lease (OGM) roads within the watershed. The majority of this dust abatement occurs in and around the Sackett oil and gas field. The motorized ATV trail winds its way through the analysis area and, in portions, is located on both Forest Service roads and approximately 49 miles of private OGM lease roads. During the summer months these vehicles can create visibility problems due to dust.

Due to the large number of days with rainfall that occurs throughout the year in the area (est.150-170 days with 0.01 inches), the low volume of traffic on many of the unpaved roads as well as the closed tree canopy over the roads, airborne dust emissions are typically not a human health concern in this area. However, as mentioned, during dry spells, visibility on these roads may be a concern and caution is urged.

Recreation - Unroaded Recreation (UR)

Recreation evaluation criteria of unroaded areas

1. Mapped areas greater than ¼ mile from classified roads and motorized trails initially delineated possible unroaded areas. Distance of ¼ mile was used because it is consistent with both the Recreation Opportunity Spectrum (ROS) and the Scenery Management planning systems (USDA-FS 1995). One-quarter mile is used in ROS to delineate remoteness and is used in Scenery Management to delineate foreground areas where landscape visibility is high.

Each unroaded area was then evaluated for size and configuration to determine if it exhibits unroaded recreation potential. If so, it was identified as a potential unroaded area for purposes of analyzing unroaded recreation in the road analysis. An unroaded area with unroaded recreation potential is defined as an area where recreation users, in a typical days outing, can enjoy any number of non-motorized activities with an expectation of moderate remoteness and solitude, within a natural appearing setting that has little evidence of development. This fits within the ROS class of Semi-primitive, Non-motorized.

> **Size** – Core area must be at least 1000 acres in size. This size allows for enough area to meet the requirement for a days outing for traditional non-motorized activities and the potential to achieve the remoteness and solitude expectations.
>
> **Configuration** – Eliminate the narrow fingers (less than ½ mile wide) and determine if remaining core area is more than 1000 acres.

Blocks that have unroaded recreation characteristics

There were 52 potential unroaded blocks that remained when all classified roads were buffered by one-quarter mile (Appendix A - Map 6). Forty-eight of these blocks were less than 200 acres in size (See Step 2, Table 5). Two unroaded areas, SC2 and SC4, were entirely within the Spring Creek watershed and met the size and configuration criteria. SC 3 also met this criteria, but was only located partially within the SCW. SC 1 had two narrow fingers that extended into the SCW that were less than one-half mile wide. These fingers did not meet criteria for unroaded recreation. If these fingers are not considered, the remaining unroaded block is located outside the SCW boundary. The core area of this block does possess some unroaded recreation characteristics.

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

Nationally there is an excess demand and a limited supply of unroaded recreation opportunities. Based on the knowledge that unroaded areas are experiencing only low to moderate use on the ANF, there appears to be an excess supply and low to moderate demand of unroaded recreation opportunities. In the SCW, there is excess supply of unroaded recreation opportunities since the potential unroaded areas show little evidence of use. It has been found that most recreation occurs within a mile of roads.

UR (2) Is developing new roads into unroaded areas, decommissioning of existing roads, or changing the maintenance of existing roads causing substantial changes in the quantity, quality, or type of unroaded recreation opportunities?

In SC 2 , approximately 36 percent of the area is managed as State Game Lands, where new roads are possible but not likely (Appendix A - Map 6). The remaining FS land is 1,012 acres, which meets the recreation evaluation criteria. Any new roads, even on the periphery, could decrease the size of this block below the 1000-acre threshold. Decommissioning of the last ½ to one mile of FR 338 and FR 230 could increase the size of this block substantially by about 400 acres.

Thirty-two percent of SC 4 is located on private, commercial timber land. Given its present shape and ownership status, the area does not possess unroaded recreation characteristics. New development on private land is likely, so the unroaded acres on private land should not be included in the total block, which leaves 887 acres of federal land. Without the private acres, the shape of the unroaded block is only 3000 feet at its widest point, which minimally meets unroaded recreation criteria. If the un-named loop road off of FR 226 were decommissioned, this size of this area would increase. The area would then possess some unroaded recreation characteristics. Decommissioning a portion of FR 226 would increase the size of this unroaded block considerably because it would connect to another unroaded block on the south side of FR 226. However, if these decommissions do not take place, the area could be developed with roads and not affect unroaded characteristics since it does not meet unroaded recreation criteria.

Most of SC 3 is located outside the SCW boundary. This area does possess unroaded recreation characteristics. Road construction within the SCW would minimally decrease the quantity of this unroaded block because most of the acreage is outside the SCW.

In this roads analysis, no specific recommendations to retain, expand, or road these unroaded areas are made. The areas should be discussed as they occur in future NEPA analyses.

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

The noise from constructing new roads would carry into the forest and could affect a recreationist's sense of remoteness. However, construction activities are short in duration. The sound from road maintenance activities could carry into the forest, but are also of short duration. Road use from standard vehicles does not carry far into the forest because of the low speeds involved, whereas off-road vehicle use does carry far across the landscape and could affect a sense of remoteness.

The northeast edge of SC 2 is located near the Sackett oil and gas field (Appendix A - Map 6). There is a higher than average noise level in the oil field because of the daily administration needs that include heavy equipment. This may decrease the sense of remoteness in the vicinity of the oil field. There is a low occurrence of illegal ATV use in this area.

SC 4 is located near the Marienville ATV/Bike Trail, which has high use on summer weekends. There is a low occurrence of illegal ATV use in this area. The noise level would decrease the sense of remoteness in the western half of the unroaded block on summer weekends.

Forest roads that get a low to average amount of traffic surround SC3. The sound from road traffic does not travel far from roads because of low vehicle speeds. There is a low occurrence of illegal ATV use in this area. FR 131 bounds this, which is a designated snowmobile trail. FR 130, between Lamonaville and FR 404, is also a snowmobile trail. Recreationists in the southwestern and northwestern portions of the unroaded block would hear the snowmobiles and could lose a sense of remoteness.

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

At the time of this writing, a proposed action was not available, so specifics on where roads will be built was not known. In general, there is minimal use by equestrians and hunters on SC 2, 3, and 4. Forest Road 226 is currently designated as a snowmobile connector trail and as a road open to disabled hunters; users would be affected if a section of this road were decommissioned. Forest Road 230 is open for fall hunting seasons; some hunters would be affected if a part of this road were decommissioned.

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

Equestrian use has been a recreational use of the watershed since 1959, when the first Allegheny Trail Ride occurred. User-created horse paths traverse each of the identified potential unroaded areas (SC 2, 3 and 4). The close-knit group of riders has established names for several of the scenic features in the watershed. The riding occurs in this area because of the private horse camp in Duhring, and many years of use have created 70+ miles of user-created horse paths in the SCW (SC 2, 3, and 4). The equestrians have a strong attachment to this area, and few areas on the ANF have the resources to support this kind of activity.

UR (6) - How is developing new roads into unroaded areas affecting the Scenery Management System (SMS)?

The forests in the potential unroaded blocks (SC 2-4) are generally over 50 years old and are relatively undisturbed and natural appearing. At this time the areas appear unaltered, and as such meet a scenic integrity level of high (USDA-FS 1995). New roads in these areas could affect the undisturbed character, although roads could be designed with the characteristic landscape attributes in mind to reduce the visual impact, although this would still result in a reduction of the scenic integrity level.

Road-related recreation (RR)

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

Nationally, as well as forest wide, there appears to be an excess supply of roaded recreation opportunities and low to moderate demand. On the ANF, thousands of acres accessible from hundreds of miles of open public roads receive little recreation use on a daily basis. Within the Spring Creek watershed there is an excess demand for camping sites along roads near streams and the ATV trails (Appendix A - Map 30). These activities are tied to user created and designated trails that are located in the watershed. Consequently these recreationists are not likely to relocate to another area since their recreation is tied to specific areas. For most other forms of recreation that occur in the watershed, there are alternate opportunities and a variety of locations for similar experiences in the watershed and across the entire Allegheny National Forest. Most areas in the watershed receive low use during the winter and weekdays from spring to fall, and moderate use on summer weekends and during big game season.

RR (2) Is developing new roads into unroaded areas, decommissioning existing roads, or changing maintenance of existing roads causing significant changes in the quantity, quality, or type of roaded recreation opportunities?

More than 90 percent of the SCW can currently be characterized as a roaded recreation opportunity based on the recreation evaluation criteria for unroaded areas. Most of this area is currently managed as Roaded Natural ROS class, which emphasizes roaded recreation. Given the abundance of roaded recreation opportunities in the SCW, building roads into currently unroaded areas would have a small effect on the total amount of roaded recreation opportunities. In the SCW, 367.4 miles of road have been recorded, and decommissioning a few miles of road would have a small effect on the quantity of roaded recreation opportunities.

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

The construction, rehabilitation, or maintenance of roads will displace some recreationists while that road activity is occurring. This disturbance is temporary and users will return when the road activity is completed. Some roads in the SCW are open to ATV, trailbikes and snowmobile (OHV) use (Appendix A - Map 7). The noise from these machines is loud and can carry some distance through the forest and may affect other recreationists in the vicinity. Some OHV riders will leave the designated trails to travel to a residence or scenic feature, which could affect recreationists who do not expect to hear OHV's. Many recreationists have told us they would like to see more roads open to vehicles. Sightseeing and wildlife viewing from a vehicle are popular activities. In general, most recreation in the SCW seems road- or vehicle-based and recreationists seem accustomed to hearing and seeing vehicle traffic when they recreate.

RR (4) Who participates in roaded recreation in the areas affected by road constructing, maintaining, or decommissioning?

At this time a proposed action was not available, so specifics on where roads will be built was not available. The heaviest recreation use in the SCW is ATV trail riding. Snowmobiling, horse use, hunting, and fishing are other recreation uses in the SCW. It is likely that some roads that serve the ATV and snowmobile trail system will be reconstructed through the Spring Creek EIS project. Some sections of these trails may be constructed into roads to access timber units. The hundreds of miles of roads in the SCW provide vehicle and walk in access to most parts of the watershed although decommissioning some roads will make it harder for some recreationists to access the forest.

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

Equestrian use has been recreational use of the watershed since 1959, when the first Allegheny Trail Ride occurred. User-created horse paths radiate out from Duhring within a four-mile radius. The close knit group of riders have established names for several of the scenic features in the watershed. The riding occurs in this area because of the private horse camp in Duhring, and many years of use has created 70+ miles of user-created horse paths in the vicinity. The equestrians have a strong attachment to this area, and few areas on the ANF have the resources to support this kind of activity.

The Marienville and Timberline ATV Trail systems are high demand, intensively used trails (Appendix A - Map 7). The trails provide a premier trail riding opportunity that is uncommon elsewhere in the eastern US. The Forest Plan states that ATV trails are only appropriate in ORV Intensive Use Areas (IUA)(USFS 1986a, pg. 4-9, 4-10). A majority of the SCW is within two IUA's. Comparable opportunities are few on the ANF, and ATV use is not appropriate, according to Management Area guidelines, in most places on the ANF.

Fishing use is concentrated near fish stocking points, which are easily accessed by roads (Appendix A - Map 29). Most fishing use in the SCW occurs along Spring Creek south of Duhring, and along East Branch Spring Creek south of Pigs Ear. Although there are many miles of stocked streams on the ANF, participants usually have a traditional fishing hole.

Hunting use occurs in most places across the ANF. Although hunters usually have a traditional hunting area, there are opportunities for quality hunting experiences throughout the ANF.

RR (6) - How does the road system affect the Scenery Management System (SMS)?

Forest Service Land – Forest Age Class

- 79% of the forest in the analysis area is over 51 years old
- 7% is forest 21-50 years old
- 11% is forest less than 20 years old
- 3% open or shrub

Private and State Game Lands within the SCW are not included in above numbers.

Eleven percent of the SCW is less than 20 years old (Appendix A - Map 31). Some areas of SCW have more harvesting per acre than others, although overall there is little evidence of timber harvest. The northeast portion of the SCW has more 0-20 year forests and more 50+ year forests than average, which creates a higher contrast and a forest that appears more managed or altered. This area also has more roads per square mile than the rest of the SCW. An area with prevalent resource management and higher road density creates a forest setting that appears more altered and less natural. The roads within the Sackett oil and gas field were not designed with the landscape character in mind, but are instead laid out to access wells laid out in a grid pattern to maximize production. The roads are 400 feet apart on average, with connector roads linking each parallel road. The roads go up and down slopes without regard to steepness or drainage patterns, which creates a very industrial character. The scenic integrity in this area is "unacceptably low" (USDA-FS 1995).

The scenic integrity in the rest of the NE quadrant can be characterized as "low", the NW quadrant as "moderate", the SW quadrant as "high", and the SE quadrant as "moderate" (USDA FS 1995).

In general, the road system has a tremendous impact on the scenic integrity. Roads permit easier access for resource management and for recreationists, and these activities can have a negative impact on the scenic integrity if not designed or managed with the landscape character in mind. Very high road densities, as seen in the Sackett oil and gas field, has altered the landscape to such a degree that much of the value for recreation resource management is lost. The benefit/risk analysis discussed in Step 5 has recommendations on several road segments within the Sackett oil and gas field to work with OGM operators to decommission those road segments.

Passive-Use Value (PV)

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

General Perspective

Like other aspects of the environment, road entry (construction), closure or decommissioning has the potential to affect unique physical, biological or unique features as well as threatened or endangered species. The effects of roads on unique physical or biological features are described under section TW (4). Potentially, road construction can physically alter existing conditions that may change the value, function or suitability of unique habitats or features. An indirect effect of road construction may be the increase in human disturbance in an area. Generally, road closure or decommissioning has an opposite effect. Closures eliminate or restrict vehicle entry, consequently reducing the ease or risk of human disturbance. Road decommissioning not only eliminates access by vehicle but also creates conditions that facilitate the restoration of the land and vegetation that was disturbed by the original construction. In the Biological Assessment (BA) for Threatened and Endangered Species on the ANF, Indiana bat section, the ANF will carry out Forest Service responsibilities described in Recovery Plans for federally endangered and threatened species (USDA-FS 1998). Direction includes: assessing the occurrence of animal and plant species in all areas to be affected by land adjustments or resource management activities, design actions to avoid, minimize and mitigate potential adverse impacts, and protect key and specialized habitats through coordination of other resource activities or area closure

(USDA-FS 1998, pg. 29). These activities will be coordinated with the Terms and Conditions found in the Biological Opinion (BO) for Threatened and Endangered Species on the ANF USDI-FWS 1999).

Bald Eagle – Road construction or maintenance occurring near an active nest, foraging or roosting area can adversely affect bald eagles. Mortality or injury to eggs or young is possible if adults abandon or are temporarily flushed from the nest. Road construction or maintenance near foraging or roosting sites can temporarily or permanently displace eagles, resulting in increased energy expenditures and/or reduced food intake. Nesting or foraging eagles may become habituated to the presence of routine traffic levels on public roads. Consequently, they may be adversely affected by roads that are only opened seasonally (during the breeding season), are subject to only occasional traffic, or are used for other activities (such as hikers and OHV's). The degree of vegetative screening and the proximity of roads to nesting, foraging, perching or roosting areas dictate to what extent eagles will be influenced by human activities (USDI-FWS 1999, pg. 47).

Indiana Bat - Tree cutting and corridor clearing associated with road construction and maintenance can adversely impact the Indiana bat. This permanently removes potential roost trees for the species. The existence and use of ANF roads is not expected to adversely affect the species because: most forest roads are infrequently traveled logging roads, bats using roost trees near forest roads either acclimate to their presence or select alternate roosts, many times infrequently used roads become travel and foraging corridors and provide openings with additional sunlight that make trees adjacent to the road more suitable as roost trees, and there appears to be an abundance of roost trees for the species. (USDI-FS 1999, pg. 48). Road decommissioning may have beneficial affects on the species by allowing re-stocking of potential roost trees.

Clubshell and Northern Riffleshell Mussels - Through implementation of the Forest Plan, the construction, maintenance, and operation of forest roads may cause adverse effects to these mussels through the introduction of fine sediment into tributaries of the Allegheny River. Those tributaries that are the most likely to be affected by road activities are those that directly enter the Allegheny River downstream of the Allegheny Reservoir (USDI-FWS 1999, pg. 48).

Small Whorled Pogonia – One common characteristic of this threatened orchid is its proximity to logging roads or other features that create persistent breaks in the forest canopy (USDA-FS 1998, pg. 72). Many existing colonies are associated with canopy breaks such as old logging roads. Sites where the small whorled pogonia no longer exists may be attributed to the forest canopies becoming dense and not enough sunlight reaching the forest floor. Timber harvesting is often closely associated with forest road construction. Harvesting may increase available browse and reduce overall deer browsing pressure on understory vegetation. A forest road increases access into an area facilitating the harvest of deer, keeping their numbers more in balance with the habitat, and further decreasing browsing pressure. Field surveys are completed for all planned surface-disturbing activities, including road construction, in suitable habitats. Potentially adverse effects may occur if there is an accidental impact of surface-disturbing activities on an undetected population of small whorled pogonia (USDA-FS 1998, pg. 72-75).

Analysis Area Perspective

For the unique physical, biological or natural features/communities refer to section TW (4). Assuming that currently restricted (signed or gated) roads remain unchanged, there are no known unique physical, biological or natural features that would be affected as a result of planned road entry, closure, or decommissioning. Should a decision be made to open more roads an increase in potential risk to the timber rattlesnake that use rock outcrops is possible. Road decommissioning and additional closures will reduce human disturbance near these unique physical features and risk to this sensitive species. Road decommissioning that eliminates stream crossings will improve water quality over the long-term for any aquatic or riparian communities and associated sensitive species. Any proposed road construction will be evaluated to determine whether unique, natural, biological or physical features within the analysis area will be affected.

The watershed has occupied habitat for the Indiana bat and bald eagle. Eagle use is currently limited to occasional foraging at the waterfowl impoundments. Suitable unoccupied habitat for the small whorled pogonia exists on several of the benches, saddles and headwater areas especially in mixed oak habitat. It is unknown if the road system in Spring Creek is affecting the Indiana bat. Given the closed canopy structure of the forest, roads provide travel corridors and varying solar exposure levels. The bat is characterized by inhabiting relatively open stands with varying degrees of solar exposure to roosts. Roads provide this characteristic in the SCW. However, roads also reduce potential roost trees and increase human disturbances. Roads do provide a primary source of corridors in which to capture the bat with current mist net techniques. It appears that the road system is not negatively affecting the species but activities that occur due to road presence (firewood cutting, timber harvest, road maintenance, recreation) may have impacts to the species.

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

At this time there are no specific areas within the Spring Creek watershed that have been identified as having unique cultural, traditional, symbolic, sacred, spiritual, or religious significance. However, there are at least 185 recognized archaeological sites that have not been formally evaluated for inclusion to the National Register of Historic Places.

Historic sites may be significant to area residents. For example, it is thought that historic logging railroad grades are valued by people as travelways for hunting, fishing, and other outdoor activities, and also hold a value for their sense of place created by their historic nature.

Prehistoric sites may be significant to the Seneca Nation of Indians. Presently unknown is the extent, if any, of the Seneca Nation's affinity for the Spring Creek watershed area. A process of consultation with the Tribal Historic Preservation Office (THPO) of the Seneca Nation has been initiated for the Spring Creek EIS project. This consultation, in addition to project scoping, may provide us with the information needed to better address this question.

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

To date, such values, and therefore, groups of people, have not been specifically identified pertaining to unroaded areas or the analysis area in general. Scoping efforts involving the general public, and including the Seneca Nation of Indians, may provide us with information needed to better address this question.

See answers to questions PV(2), RR(4), RR(5), SI(6), and SI(7) for additional information pertaining to social values.

PV (4) Will road construction, closure, or decommissioning significantly affect passive-use value?

Road system changes will affect different passive use values to varying degrees. For example, building additional roads or increasing motorized use will favor those forest users seeking access and motorized recreation, while closing roads and road decommissioning will favor those forest users seeking a non-motorized experience.

Social Issues (SI)

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

A person's perceived needs and values for roads are both personal and socio-economic: access for recreation (fishing, hunting, driving, etc.), access for timber sales/firewood cutting for themselves and their local economy, and access for OGM activities. It is assumed that many people desire to have more roads open to them than currently exists due to the cutting of locks on gates and the illegal OHV use. The SCW has a mix of open, closed, and restricted roads. Roads access most areas within the SCW. More than 85 percent of the SCW is within ¼ mile of a classified road.

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

Several public comments received for the Spring Creek Roads Analysis indicate the desire to allow more recreational uses on roads. Presently pedestrian uses such as hiking, horse use, and mountain biking are permitted on all open and gated roads. Motorized uses, such as snowmobile and ATV use, are only permitted on designated trails. Commenters also expressed a need for good hunting access to control deer herds and to provide better access for hunters with disabilities. Many roads are opened during fall hunting season to provide additional vehicle access. The ANF frequently hears from recreationists that more gates need to be open to provide access. In general, many of these recreationists view a gated road as an area closed to them because they cannot access the area by vehicle, especially in view of most recreation occurring within a mile of open roads. The typical recreationist to the ANF prefers easy access. There is a vocal minority who campaign for more road closures and obliteration. Some unroaded areas on the ANF (Minister Creek, Hickory Creek Wilderness, Morrison Run area) are popular because of the scenic features and recreational opportunities. There are no areas like this within the SCW.

The oil and gas industry is dependent upon roads for accessing and developing their subsurface minerals, and they are permitted to build additional roads if needed to expand their development.

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

Decommissioning roads and limiting public access to such sites may help to limit cumulative affects to them (e.g., vandalism, inadvertent damage, intentional looting). However, sites that cannot be monitored easily may also be more subject to damage. Limiting motor vehicle access for management would increase the costs of future monitoring, documentation, investigation, evaluation, and interpretation of sites. The Forest Service has not documented any paleontological sites on the ANF, however, there is a record of a fossil found in Spring Creek area in Elk County (Briggs and Rolfe 1983).

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

Presently it is unknown what affect roads have on cultural and traditional uses. There are no known reserved treaty rights. The road system may both positively and negatively affect such uses. Roads provide a means of vehicular access that may better enable some people to utilize the forest. However, the ease of access provided by roads may contribute to an increased level of activity, which is seen as a negative effect by some people.

SI (5) How are roads that are historic sites affected by road management?

The Spring Creek analysis area has an extensive historic logging railroad system throughout the watershed, although only portions of it have been formally documented at this point. There are a few historic roadways within the analysis area that have only been recently identified on the ground. The extent of historic oil and gas roads is also not completely known. Past Forest Service practices were to sometimes utilize abandoned road/railroad grades for road building. This practice of adaptive reuse is often good for land stewardship, although documentation may be lacking from early management activities. For example, if a portion of a road has been built on a historic railroad grade bed, there may be little to no remains left of the railroad feature, compromising the integrity of the historic site, and making it difficult for researchers to identify the complete railroad system in the field. In many past cases this practice was implemented without a Determination of Eligibility (DOE) for inclusion to the National Register of Historic Places. Once the road construction has occurred it is difficult for a historic site to meet the criterion necessary for National Register eligibility.

SI(6) and SI (7)-combined: "How is community, social, and economic health affected by road management and management of unroaded areas (for example, lifestyles, businesses, tourism industry, infrastructure maintenance)?

The Spring Creek watershed is located within Forest County's Jenks and Howe townships and Elk County's Highland and Spring Creek townships. The lifestyle of the people and general nature of these communities is very rural in nature. Roaded access to recreational opportunities, seasonal housing, and economic opportunities based on natural resources (such as wood harvesting and oil and gas development) are very important in this area.

The data in Table 11 displays the local employment, income, and housing characteristics in and adjacent to the Spring Creek analysis area (Pennsylvania State Data Center 2001).

Table 11. Employment, income, and housing data for townships located in the Spring Creek watershed, Marienville Ranger District, 2002

Township/County	Employ. % Manuf.	Empl. % Service	% Unempl.	Per Capita Income	Pop. Persons (/sq.mi.)	Total Housing Units	Seasonal Housing Units
Jenks/Forest	18.1	32.9	6.9	9585	1321	1542	998
Howe/Forest	19.2	34.2	11	6340	300	692	612
Highland/Elk	43.8	18.5	11.4	9444	551	676	448
SpringCk./Elk	43.6	18.1	7.8	8686	215	594	45
4-TownshipTotal	31.18	25.93	9.28	8513.75	2387	3504	2103
Forest County	19.2	27.9	5.2	9349	(11)	8701	6560
Elk County	47.5	22.1	3.7	10775	(41)	18115	3039
Pennsylvania			4.6	26058	(265)	5249750	148230

The following data for the four townships is taken from the 1990 census (Pennsylvania State Data Center 2001) and outlines basic social and economic conditions in the SCW area:

- SCW township residents have lower per capita incomes and higher unemployment rates compared to the state and county averages.
- The density of people per square mile in Forest County was 11 and in Elk County was 41. In comparison, the average for PA was 265 people per square mile (Strauss et al. 2000).
- There are no incorporated towns or urban populations within Forest County.
- Within Forest County's Jenks Township (but outside of the SCW boundary to the west) lies the small community of Marienville.
- Elk County has over four times the population of Forest County but is still nearly 1/3 rural in nature. Ridgway is the closest incorporated borough about 10 to 15 miles to the east of the SCW.
- Several other small, unincorporated communities exist on the private land inholdings within the Spring Creek area (Lamonaville, Duhring, Four Corners, Pigs Ear, Highland, Russell City, Watson Farm, Parrish, Pine Camp, Nansen). These communities are primarily made up of recreational dwellings and seasonal residents.
- Nearly 80 percent of the housing units in Forest County are seasonal/recreational residences. Forest County has the highest ratio of seasonal/recreational residences of any county in the State. It ranks fourth in total number of seasonal housing units (6,560) exceeded only by those counties within the Pocono Mountains resort area (10,000 to 15,000 each). That percent is exceeded in Howe Township with 88 percent of its housing units classed as seasonal.
- When all four townships are summed, 60 percent of the housing units are seasonal/recreational in nature.

The tourism industry is primarily centered around Marienville. This community provides basic services (food, fuel, lodging) to the permanent and seasonal residents of the SCW along with specialty retail establishments (including a hardware store, a motor sports store, a scenic train station, private campgrounds, and a motor sports raceway). Scattered in the outlying areas of the townships are a few small retail establishments offering varying combinations of groceries, food, drink, and fuel. Some are only open during the primary recreational use seasons.

Most of these service industries rely on the seasonal residents and recreational visitor to maintain their businesses. The features that draw recreational users to the area include the ATV/Trailbike system [see response to question RR (5)], the public snowmobile trail system, extensive acreage of state and federal land available for dispersed recreation, equestrian trails, and seasonal dwellings. The public road system provides access to these outdoor recreation opportunities and seasonal dwellings that would not otherwise be possible. The main manufacturing industries are the Highland Forest Resources Inc. sawmill and Pennsylvania General Energy, an oil and gas field office. The main features that support these industries are the woodlands and oil and gas resources that abound in the surrounding ANF, Pennsylvania State Game Lands, and private land holdings. Most of the oil and gas resources are privately held and adequate access to these natural resources is important to these local industries.

A survey of local residents in the four-county area surrounding the ANF suggests the forest is important to them in many different ways. The survey results indicated at least 79 percent of the respondents rated the following categories as somewhat important: Scenery, Ecology, Quality of Life, Recreation, Economy (Wang 2001). With such a wide range it appears the residents feel the forest is important not only for economic and recreation benefits but also for quality of life as well.

For many in the SCW area, living here is a lifestyle choice. They would consider the SCW area to be at least as important, if not more so, than those surveyed in the entire-four county area because of their relatively high dependence on ANF dispersed or motorized recreation opportunities and on natural resource-oriented employment. Three larger unroaded areas exist within this watershed; however, none of them have been identified in surveys, or within the comments, as significant recreation resources. Use appears very low. Although comments from some users indicate there may be too many roads for reasons related to ecological health and desire for more unroaded recreation opportunities, the lifestyles of the local community appears to be more dependent on roaded areas to meet their economic and recreational needs.

The local community business economy depends both on the seasonal residents and recreational visitors who depend heavily on the public road system in the SCW area. The local service and tourism industry depends heavily on the seasonal residents who in turn need access to their seasonal dwellings using FH 0327, FR130, FR 131, FR124, Pigs Ear Road, Watson Farm Road, SR 3002, Twp 313, and SR 4009. The main recreational activities for local and seasonal residents include ATV riding, hunting, fishing, wildlife viewing, and driving. Public road access is important for users to reach the trailheads for ATV trail system and the equestrian trails. Access is also important to seasonal and local residents to reach big game that abound throughout the area. Fishing opportunities primarily exist during the spring trout season in the main branch of Spring Creek.

Over the years there have been requests for ATV and snowmobile connector trails from the main seasonal residence communities to the designated trail system, and much of the illegal use can be traced to these communities. Future opportunities exist for improved access to trailheads, as well as additional trailheads and connector trails to serve these users.

Users have also depended on public road access to fish and game. Many of the seasonal residences were appropriated after WWII primarily for hunting and fishing as well as an escape from the city. The majority of hunters hunt within close proximity to their vehicle and so depend on good access to reach their hunting locations (FR 227, 403, 395, 396, 230, 226, 404, 343, 442, 136) (Appendix A -

Map 11). Many hunters in the seasonal residence communities hunt right from their dwellings. Some of the classified roads and many of the gated and unclassified roads are used for hunting trails as well. There seems to be a great demand to open gated roads for additional vehicle access to good hunting opportunities. Anglers (Appendix A - Map 29) also need and use public roads to access the fishing opportunities in Spring Creek (Duhring Road; Twp 322; FR 130, 136, 227, 403, 343,442; State Game Land 28 Road and Lamonaville Road.) The main routes are also used to stock local waters that support this fishing use. This use is primarily in demand during the spring trout season.

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

See Question SI (6) – combined with Question SI (7).

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

There are no Wilderness areas in Spring Creek analysis area.

SI (9) What are the traditional uses of animal and plant species within the area of analysis?

The Spring Creek watershed has a history of traditional use including timbering, firewood gathering, hunting and fishing, berry picking, and recreational "leaf peeping" and wildlife viewing. Without the present road system many of these uses would take place in a limited capacity or not take place at all. Timbering has occurred over the past 100 years and is responsible for the forests today. Valuable hardwoods are presently maturing and support the current timber management program. Firewood gathering occurs throughout the watershed and is used for campfires and to heat both permanent and seasonal homes. Once timber sales are completed the areas are traditionally opened for firewood collection.

Hunting and fishing are very popular in the Spring Creek area, with many seasonal camps used to house these recreationists. Big game (white-tailed deer, black bear and wild turkey) and small game (squirrel and ruffed grouse) are hunted. Fishing opportunities exist along Spring Creek and its major branches.

Berry picking occurs within the watershed and is a popular family outing. Blackberries and raspberries (*Rubus sp.*) occur throughout the watershed along opening edges and within timber management units. Blueberries (*Vaccinium sp.*) occur in the drainage north of FR130 (Lamonaville Road) and south of FR 775. Huckleberries (*Gaylussacia sp.*) are found in the Big Run drainage area.

Recreational viewing of flora and fauna occurs throughout the watershed and is a year-round event. Autumn provides exceptional opportunities for "leaf-peeping" as the maple trees change to their many colors of red, orange and gold.

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

Any change is likely to affect a person's sense of place. Recreationists who prefer roaded recreation activities may have a higher tolerance for change than folks who prefer unroaded recreation activities where solitude and remoteness are important. Places with unique or scenic features are more often considered special by recreationists, and these areas should be treated with extra care when designing roads or other developments. The landscape character should be considered so that new features blend into the landscape rather than contrast with it.

Civil Rights and Environmental Justice (CR)

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

For many of the above-mentioned groups the question will be answered at the Forest-Level Roads Analysis.

Because of the variety of land uses for all people on the ANF, access to the watershed was determined to be of prime importance. Road management was used as the sole parameter to help determine the roads that are most beneficial. Road management is measured by the amount of open, closed, or restricted roads in the watershed.

Currently 23% of all roads in the watershed are open, 67% are closed, and 10% are restricted (Figure 3 and Appendix A - Map 4). Roads that are open access key areas in the watershed and provide year-round opportunity to certain areas to provide the most benefits to the public users. Those roads open and used the most include: State Route 66 and 948, Township routes 322, 327, 370, 458, 313, and 332, and FRs 136, 124, 343, 131, 130, 227, 403, and 395.

Approximately 10% of the roads are seasonally restricted and provide access to seasonal uses that are in high demand. An example of this would be for hunting season when roads are opened to allow hunters more access to certain wildlife habitat areas. These roads also offer isolation to certain areas when they are closed the remainder of the year for those willing and wanting to walk in. Some of the roads included in this category include: FRs 396, 125, 584, 580, 232, 442, and 226.

Most (67%) of the roads in the watershed are considered closed roads. These roads provide a lower benefit to those who want access, but a higher benefit for those wanting more isolation. An exception to this rule may be the OGM roads in the watershed. Although many of them have no barrier, they are privately-owned roads and are closed to the public. OGM operators routinely use these roads, and because of the density of these roads, they may not provide the isolation experience that some are seeking. Many of the closed roads included in the watershed are located in the Sackett oil and gas field and are unnumbered. Other closed roads are evenly distributed across the watershed.

Several roads across the ANF are designated as disabled hunter roads. This designation allows only those persons with a disabled hunter permit to access the road with a vehicle. (Appendix A - Map 32). Hunters with the disabled hunter permit are allowed to use their vehicle as a blind and shoot from the vehicle. Although hunters with the disabled hunter permit are allowed to hunt from any open road, roads designated for disabled hunters provide an area with less interruption from passing vehicles. Within the Spring Creek watershed, FR 226 is the only road designated as a disabled hunter road. FR 113 is also a disabled hunter road, but it is located about ½ mile outside the analysis area boundary. The use on FR 226 from hunters with the disabled hunter permit is low.

In recent years there has been more pressure by older hunters to open more roads and to permit the use of hunting from ATV's. The ANF is closed to ATV use during hunting season. ATV use has grown tremendously over the last decade and problems with riding ATVs off of designated trails has also grown considerably. The ANF has determined that ATV use is only manageable and environmentally responsible on hardened surfaces. To date, we have not changed the ATV policy for persons with disabilities.

There is a need to modify the gate design to allow persons with disabilities to pass a closed gate on foot. A three-foot wide hardened path around the gate is adequate to allow people to pass while excluding motorized vehicles. All gates on the National Forest should incorporate this design.

At this time there are no fees to use any of the facilities within the Spring Creek watershed, with the exception of a fee recently instituted for ATV trails. Since this activity requires equipment that costs thousands of dollars it is presumed that this fee will not affect low-income groups. Otherwise, there are no Forest Service caused monetary barriers to low-income groups.

Step 5 Describing opportunities and setting priorities

Purpose and Products

The purpose of this step is to:

- Compare the current road system with what is desirable or acceptable
- Describe options for modifying the road system that would achieve desirable or acceptable conditions

The products of this step are:

- A map and descriptive ranking of the problems and risks posed by the current road system,
- Assessment of the potential problems and opportunities of building roads in a currently unroaded area,
- A map and list of opportunities, by priority, for addressing important problems and risks
- A prioritized list of specific actions, projects, or forest plan adjustments requiring NEPA analysis

Problems and Risks Posed by the Current Road System

Benefit/Risk Priority Analysis

Step 5 of the roads analysis process includes a requirement to prioritize road projects that will address important problems and risks. In the Lewis Run roads analysis, the first one done on the ANF, it was possible to group roads by type or concern in order to prioritize projects because of the relatively smaller size of the analysis area (USDA-FS 2001a). Because the Spring Creek analysis area is over 56,000 acres in size and includes 2,238 road segments (a segment is typically a section of road between two intersections), a more systematic and quantitative approach was needed. In an effort to develop this new approach and improve the prioritization process, the team reviewed roads analysis reports completed on other National Forests. An internet search resulted in two project level roads analyses available. These were the Duck Swain project roads analysis from the Dixie National Forest in Utah completed in April of 2001 (USDA-FS 2001b) and the Lower Steamboat Watershed roads analysis from the Umpqua National Forest in Oregon completed in October 2000 (USDA-FS 2000b).

The Spring Creek roads analysis interdisciplinary team reviewed the prioritization process completed in these reports and agreed to use a Benefit /Risk Priority analysis similar to the Umpqua roads analysis. Several important modifications were made to this process and are discussed below.

Methods

The Benefit/Risk Analysis process works from the premise that each road segment can have certain benefits and risks (or problems) associated with it, and that these benefits and risks can be described using a set of relevant questions that highlight the benefits and risks. In this analysis, the use of the term "risk" encompassed both the risk and problem definitions outlined in the Roads Analysis Guide in that "problems are conditions for certain environmental, social, and economic attributes that managers deem to be unacceptable" and "risks are likely future losses in environmental, social, and economic attributes if the road system remains unchanged" (USFA-FS 1999, p. 25). With this approach, investments in the road system can be prioritized by addressing concerns on road segments with the greatest benefit and greatest risk first, and making investments in the road system last on those road segments with the least benefit and least risk. By characterizing the benefits and risks on a low, medium, and high scale, a matrix of investment priorities can be conceptualized (Figure 4). Hypothetical outcomes for each of the boxes in the matrix were developed prior to the analysis.

Figure 4. Benefit/Risk Analysis Final Outcome Matrix, Spring Creek watershed, Marienville Ranger District, 2002.

RISKS	BENEFITS			
	Scores	**Low 2-13**[1]	**Medium 14-25**	**High 26-41**
	Low 8-18[1]	**Box 9** Monitor – Leave alone (854)[2]	**Box 8** Maintain - low priority (102)	**Box 7** Maintain – low priority (11)
	Medium 19-30	**Box 6** Restrict or Close (588)	**Box 5** Mitigate – Maintain (172)	**Box 4** Maintain - high priority (143)
	High 31-56	**Box 3** Decommission Mitigate, OGM[3] (182)	**Box 2** Restrict or close (86)	**Box 1** Mitigate - Maintain (100)

1 – Values represent the range of total benefit or risk scores assigned to each category.

2 – Values represent the number of road segments assigned to each box in the matrix out of a total of 2,238 segments.

3 – OGM roads that are candidates for decommissioning when use has ended or alternative access should be investigated.

The analysis questions in the Spring Creek roads analysis were based on the questions in the publication Roads Analysis: Informing Decisions about Managing the National Forest Transportation System (USDA-FS 1999), plus any additional questions pertinent to the Spring Creek analysis area. Early in the roads analysis ID team meeting, it was recognized that some questions in the Roads Analysis Guide lent themselves to modeling the transportation system through quantitative means, while others did not.

The following process was used for the Spring Creek roads analysis:

1. The roads analysis ID team reviewed each question to determine if individual road segments could be rated based on that particular question. Those questions that could be modeled in the transportation system on a road segment by road segment basis were identified as "keep" questions in the analysis, and those that could not be modeled, were not pertinent to the Spring Creek roads analysis, or did not have any information available at this time, were identified as "drop" from further analysis. The results of this stage of the analysis are shown in Table 12. As a result of this step, 44 questions that were pertinent to the Spring Creek roads analysis, could be modeled, and had data available that could be used to rate each question as to its relative benefit or risk. Table 12 also highlights the rationale used by the roads analysis ID team for questions that were "dropped". It should be noted that questions that were dropped from further analysis at this point were analyzed in Step 4 to the extent applicable for the Spring Creek watershed. As examples, question "PT1: How does the road system affect fuels management", is not applicable to the ANF. Fuels management has not been a concern on this forest for the past 20-30 years. The ANF does not manage its road system for fuels management at this time. The question is addressed to the extent necessary in Step 4. Therefore, this question was identified as "drop". Question "AQ2: How and where does the road system generate surface erosion" is pertinent to the Spring Creek analysis area and could be modeled by road segment. Therefore, this question was identified as a "keep".

Table 12. Keep/Drop reasoning and Benefit/Risk assignments for roads analysis questions, Spring Creek watershed, Marienville Ranger District, 2002. (See key at end of table for Section Codes[1])

Keep/ Drop	Benefit/ Risk	Section[1]	Question #	Drop Reasoning
keep	risk	AQ	1	
keep	risk	AQ	2	
keep	risk	AQ	3	
keep	risk	AQ	4	
keep	risk	AQ	5	
keep	risk	AQ	6	
keep	risk	AQ	7	
keep	risk	AQ	12	
keep	risk	AQ	13	
keep	risk	AQ	14	
keep	benefit	AU	1	
keep	benefit	AU	2	
keep	risk	AU	2	
keep	benefit	CR	1	
keep	risk	EC	1a	
keep	risk	EC	1d	

Table 12. Keep/Drop reasoning and Benefit/Risk assignments for roads analysis questions, Spring Creek watershed, Marienville Ranger District, 2002. (See key at end of table for Section Codes[1])

Keep/ Drop	Benefit/ Risk	Section[1]	Question #	Drop Reasoning
keep	risk	EF	1	
keep	risk	EF	5	
keep	benefit	GT	1	
keep	benefit	GT	2	
keep	risk	GT	3	
keep	risk	GT	4	
keep	risk	GT	5	
keep	benefit	MM	2	
keep	benefit	MM	3	
keep	risk	PT	4	
keep	benefit	REC/RR	developed	
keep	benefit	REC/RR	dispersed	
keep	risk	REC/RR	visual	
keep	risk	REC/UR	2	
keep	benefit	SI	3	
keep	risk	SI	3	
keep	risk	SI	5	
keep	benefit	SU	1	
keep	benefit	TM	1, 2, 3	
keep	risk	TM	1, 2, 3	
keep	benefit	TW	1	
keep	risk	TW	1	
keep	benefit	TW	2	
keep	risk	TW	2	
keep	benefit	TW	3	
keep	risk	TW	3	
keep	benefit	TW	4	
keep	risk	TW	4	
drop		AQ	8	addressed in other questions-further define in NEPA-need more info.
drop		AQ	9	criteria for measuring the risk associated with this question by road segment could not be established
drop		AQ	10	criteria for measuring the risk associated with this question by road segment could not be established
drop		AQ	11	criteria for measuring the risk associated with this question by road segment could not be established
drop		EC	2	this question is of a broad nature and could not be addressed on a road segment basis
drop		EC	3	this question is of a broad nature and could not be addressed on a road segment basis
drop		EF	2	data for measuring the risk associated with this question by road segment is not available at this time
drop		EF	3	criteria for measuring the risk associated with this question by road segment could not be established

Table 12. Keep/Drop reasoning and Benefit/Risk assignments for roads analysis questions, Spring Creek watershed, Marienville Ranger District, 2002. (See key at end of table for Section Codes[1])

Keep/ Drop	Benefit/ Risk	Section[1]	Question #	Drop Reasoning
drop		EF	4	this question is of a broad nature and could not be addressed on a road segment basis
drop		MM	1	this question is not applicable to this analysis area as there are no USA owned minerals within the analysis area
drop		PT	1,2,3	this question is not applicable to the ANF as the historical risk of wildfires is minimal
drop		PV	1,2,3,4	addressed in other questions-further define in NEPA-need more info.
drop		RM	1	this question is not applicable to the ANF as there are no range allotments
drop		SI	1,2	this question is of a broad nature and could not be addressed on a road segment basis
drop		SI	4	this question was not applicable to the analysis area
drop		SI	6,7,8,9,10	this question is of a broad nature and could not be addressed on a road segment basis
drop		SP	1	this question was not applicable to the analysis area
drop		WP	1,2,3	this question is of a broad nature and could not be addressed on a road segment basis

1-Question Codes:

AQ-Aquatic, Riparian Zone, and Water Quality
AU-Administrative Uses
CR-Civil Rights and Environmental Justice
EC-Economics
EF-Ecosystem Functions and Processes
GT-General Public Transportation
MM-Minerals Management
PT-Protection
PV-Passive-Use Value
REC/RR-Road-related Recreation
REC/UR-Unroaded Recreation
RM-Range Management
SI-Social Issues
SP-Special Forest Products
SU-Special-Use Permits
TM-Timber Management
TW-Terrestrial Wildlife
WP-Water Production

2. Each "keep" question was then categorized as a benefit or risk or both with respect to the transportation system. As examples, for question "AQ2: How and where does the road system generate surface erosion", it was clear that this was a risk associated with the road system. Question "TW2: How does the road system facilitate human activities that affect habitat" had both a benefit and a risk factor. It was a risk in that roads allow for easier human interaction with wildlife habitat, but a benefit in that some road segments allow for management of the wildlife habitat to improve the habitat, i.e. planting shrubs, etc. Of the 44 relevant "keep" questions, 16 evaluated benefits and 28 evaluated risks (Table 12).
3. The ID team also identified potential criteria for ranking each road segment. The team agreed that these were preliminary criteria, and each specialist would revise or formulate additional criteria as necessary based on their review of the road system. During the analysis of the road segments for each criterion, specialists were given the latitude to revise the "keep" and "drop" list, and to update whether a question was a risk or a benefit. These changes were discussed in small groups and finalized by the roads analysis team (Table 12).
4. For each "keep" question, a map was generated that displayed information that could be used

to determine the benefit or risk rating for each segment. Each specialist then highlighted the map to show how each road segment met the criteria (high, medium, low, not applicable) in Table 13.

Table 13. Ranking criteria for Benefit/Risk analysis, Spring Creek watershed, Marienville Ranger District, 2002. *(See key at end of Table 12 for Question Codes)

Question*	Benefit/Risk	Rank	Criteria for Rank
AQ1	Risk	Low(1)	no Group III soils within 300' of a stream course or road segment >300' from a stream course
		Medium(2)	road segment <300' from a stream course, but segment is small and located at the end of a road
		High(3)	Group III soils intercepted by road segment within 300' of a stream course or road segment <300' from a stream course
AQ2	Risk	Low(1)	limestone surfaced road within 300' of a stream course or closed Forest Service and State Game Land roads
		Medium(2)	restricted Forest Service roads; other closed private roads
		High(3)	open Forest Service pit-run roads within 300' of streams, and all OGM roads
AQ3	Risk	Low(1)	road removes acreage from unroaded areas less than 500 acres
		Medium(2)	road segments within known historic landslide areas
		High(3)	Forest Service road segments within known historic landslide areas
AQ4	Risk	Low(1)	culvert meets or exceeds 50-year flood design
		Medium(2)	culvert within one size of meeting 50-year flood design
		High(3)	culvert more than one size from meeting 50 year-flood design
AQ5	Risk	Low(1)	closed or restricted Forest Service roads within 300' of a stream course; open Forest Service roads with little or no OGM within 300' of a stream course; other closed roads within 300' of a stream course
		Medium(2)	closed Forest Service roads with OGM access within 300' of a stream course; some private or unknown roads within 300' of a stream course
		High(3)	Sackett; main travel routes (i.e. state/township roads) within 300' of a stream course; other more developed OGM areas within 300' of a stream course
AQ6	Risk	Low(1)	roads not within 300' of a stream course
		Medium(2)	n/a
		High(3)	roads within 300' of a stream course
AQ7	Risk	Low(1)	limestone surfaced road within 300' of a stream course, or closed Forest Service and State Game Land roads
		Medium(2)	restricted Forest Service roads; other closed private roads
		High(3)	open Forest Service pit-run roads within 300' of streams, and all OGM roads
AQ12	Risk	Low(1)	limestone surfaced roads and crossings within 300' of a stream course; closed Forest Service and State Game Lands roads within 300' of a stream course
		Medium(2)	restricted Forest Service roads within 300' of a stream course; end of road sites (i.e. OGM well pads) within 300' of a stream course

Table 13. Ranking criteria for Benefit/Risk analysis, Spring Creek watershed, Marienville Ranger District, 2002. *(See key at end of Table 12 for Question Codes)

Question*	Benefit/Risk	Rank	Criteria for Rank
		High(3)	pit-run surfacing on roads within 300' of a stream course, and most OGM roads within 300' of a stream course
AQ13	Risk	Low(1)	closed or restricted roads and crossings within 300' of Spring Creek and East Branch Spring Creek
		Medium(2)	n/a
		High(3)	open roads and crossings within 300' of Spring Creek and East Branch Spring Creek
AQ14	Risk	Low(1)	limestone surfaced road within 300' of a stream course, or closed Forest Service and State Game Land roads within 300' of a stream course
		Medium(2)	restricted Forest Service roads within 300' of a stream course; other closed private roads within 300' of a stream course
		High(3)	open pit-run roads within 300' of streams, and all OGM roads within 300' of a stream course
AU1	Benefit	Low(1)	n/a
		Medium(2)	n/a
		High(3)	road segments needed for research access
AU2	Benefit	Low(1)	n/a
		Medium(2)	n/a
		High(3)	roads patrolled regularly during law enforcement patrols
AU2	Risk	Low(1)	closed roads or roads that have a low potential for illegal activities
		Medium(2)	roads that have a medium potential for illegal activities
		High(3)	roads where known illegal activities are occurring or have a high potential for illegal activities
CR1	Benefit	Low(1)	closed road segments
		Medium(2)	restricted road segments
		High(3)	open road segments
EC1A	Risk	Low(1)	estimated cost to maintain the road is less than $2,000 per mile per year
		Medium(2)	estimated cost to maintain the road is between $2,000 and $4,000 per mile per year
		High(3)	estimated cost to maintain the road is more than $4,000 per mile per year
EC1D	Risk	Low(1)	estimated cost to complete all identified deferred maintenance items is less than $20,000 per mile.
		Medium(2)	estimated cost to complete all identified deferred maintenance items is between $20,000 and $40,000 per mile.
		High(3)	estimated cost to complete all identified deferred maintenance items is more than $40,000 per mile.
EF1	Risk	Low(1)	road removes acreage from unroaded areas less than 500 acres
		Medium(2)	road bisects a corridor between two or more unroaded areas with a majority of continuous older age classes of more than 500 acres or removes more than 100 acres from unroaded areas of at least 500 acres with a variety of forest age classes

Table 13. Ranking criteria for Benefit/Risk analysis, Spring Creek watershed, Marienville Ranger District, 2002. *(See key at end of Table 12 for Question Codes)

Question*	Benefit/Risk	Rank	Criteria for Rank
		High(3)	road removes more than 100 acres of potential unroaded forest from an unroaded area with a majority of continuous older age classes of more than 500 acres
EF5	Risk	Low(1)	road use consists of passenger vehicles
		Medium(2)	road use consists of passenger vehicles and heavy truck traffic or OHV use; or light use of all 3 types
		High(3)	road use consists of passenger vehicles, heavy truck traffic, and OHV use, or very high volume of traffic (state routes), or a high density oil field
GT1	Benefit	Low(1)	open roads with pit run surfacing accessing private land
		Medium(2)	all open roads with limestone surfacing accessing private land, or open FR roads with paved surfacing accessing private land
		High(3)	paved municipal roads
GT2	Benefit	Low(1)	n/a
		Medium(2)	n/a
		High(3)	road segment used to access private land
GT3	Risk	Low(1)	n/a
		Medium(2)	n/a
		High(3)	road segment originally constructed by OGM and needed by the Forest Service or road segments needing a ROW
GT4	Risk	Low(1)	n/a
		Medium(2)	road management = restricted and road is used as an ATV or snowmobile trail
		High(3)	road management = open, road is used as an ATV or snowmobile trail, and road needs brushing
GT5	Risk	Low(1)	road management = closed and road is used as an ATV or snowmobile trail
		Medium(2)	road management = restricted and road is used as an ATV or snowmobile trail
		High(3)	road management = open and road is used as an ATV or snowmobile trail
MM2	Benefit	Low(1)	n/a
		Medium(2)	n/a
		High(3)	roads needed to access OGM developments/wells
MM3	Benefit	Low(1)	for potential pits, road segments within ¼ to ½ mile
		Medium(2)	for pits where we have tested and found stone, but have not developed a pit, road segments within ¼ to ½ mile
		High(3)	for existing open pits, road segments within ¼ to ½ mile
PT4	Risk	Low(1)	all closed roads and restricted roads with limestone surfacing
		Medium(2)	restricted roads with pit run or native surfacing and open roads with limestone surfacing
		High(3)	open roads with pit run or native surfacing
REC/RR-Developed	Benefit	Low(1)	low use, limited season. Include: Kelly Pines, ATV trailheads at FR 395, FR401, Pigs Ear, Timberline, and Marn ATV
		Medium(2)	moderate use, summer season. Include: Kelly Pines, ATV trailheads at FR 395, FR401, Pigs Ear, Timberline, and Marn ATV
		High(3)	high use, extended season. Include: Kelly Pines, ATV trailheads at FR 395, FR401, Pigs Ear, Timberline, and Marn ATV

Table 13. Ranking criteria for Benefit/Risk analysis, Spring Creek watershed, Marienville Ranger District, 2002. *(See key at end of Table 12 for Question Codes)

Question*	Benefit/Risk	Rank	Criteria for Rank
REC/RR-Dispersed	Benefit	Low(1)	Final score between 1-5. Rate each road according to the amount of use by dispersed activity it gets on an annual basis. 1 = low use, limited season, 3 = high use, extended season. Includes following recreation opportunities: dispersed camping, equestrian use, hunting, fishing, sightseeing, and trails on roads
		Medium(2)	Final score between 6-10. Rate each road according to the amount of use by dispersed activity it gets on an annual basis. 1 = low use, limited season, 3 = high use, extended season. Includes following recreation opportunities: dispersed camping, equestrian use, hunting, fishing, sightseeing, and trails on roads
		High(3)	Final score between 11-15. Rate each road according to the amount of use by dispersed activity it gets on an annual basis. 1 = low use, limited season, 3 = high use, extended season. Includes following recreation opportunities: dispersed camping, equestrian use, hunting, fishing, sightseeing, and trails on roads. Major access roads like SR 66 and 948 and roads that are designated for ATV trail use are rated as high
REC/RR-Visual	Risk	Low(1)	High – moderate scenic integrity. Final score between 1-2. Road density range: 1= 0-5mi, 2= 6-10mi, 3 = 11+. Age class range: 1= unfragmented with 1-2 age classes, 2= moderate fragmentation and a range of age classes, 3= highly fragmented, 0-20 age class adjacent to 90+ age class and geometric stand boundaries
		Medium(2)	Moderate – low scenic integrity. Final score between 3-4. Road density range: 1= 0-5mi, 2= 6-10mi, 3 = 11+. Age class range: 1= unfragmented with 1-2 age classes, 2= moderate fragmentation and a range of age classes, 3= highly fragmented, 0-20 age class adjacent to 90+ age class and geometric stand boundaries
		High(3)	Very low to unacceptably low scenic integrity. Final score between 5-6. Road density range: 1= 0-5mi, 2= 6-10mi, 3 = 11+. Age class range: 1= unfragmented with 1-2 age classes, 2= moderate fragmentation and a range of age classes, 3= highly fragmented, 0-20 age class adjacent to 90+ age class and geometric stand boundaries
REC/UR (UR2)	Risk	Low(1)	road use consists of passenger vehicles
		Medium(2)	road use consists of passenger vehicles and heavy truck traffic or OHV use: or light use of all 3 types
		High(3)	road use consists of passenger vehicles, heavy truck traffic, and OHV use, or very high volume of traffic (state routes), or a high density oil field
SI3	Benefit	Low(1)	road is beyond 100m of site boundary
		Medium(2)	road is within 100m of site boundary and road is classified as either restricted or closed
		High(3)	road is within 100m of site boundary and road is classified as open
SI3	Risk	Low(1)	road is beyond 100m of site boundary
		Medium(2)	road is within 100m of site boundary and road is classified as either restricted or closed
		High(3)	road is within 100m of site boundary and road is classified as open
SI5	Risk	Low(1)	n/a
		Medium(2)	n/a
		High(3)	this road segment is/was known to be an historic site
SU1	Benefit	Low(1)	n/a
		Medium(2)	n/a

Table 13. Ranking criteria for Benefit/Risk analysis, Spring Creek watershed, Marienville Ranger District, 2002. *(See key at end of Table 12 for Question Codes)

Question*	Benefit/Risk	Rank	Criteria for Rank
		High(3)	roads needed to access special-use permit sites
TM1,2,3	Benefit	Low(1)	1)Landing located on poorly drained group 2 or 3 soils or mitigating costs for hardening and drainage dispersion are prohibitive. Also restrictive operating seasons and contract clauses would be the norm. 2)Road is a the bottom of or mid-slope of steep hill. With toe of slope location there is more cost involved with landing prep. and maintenance due to springs, and run off from skid trails. With mid-slope locations (no bench) landing would have to be constructed on a hillside requiring cut and fill and subsequent higher investment and operating costs. 3) Road at the bottom of, or positioned sideslope on a steep hillside where landing operations would be restrictive and difficult to construct without major earthmoving or resource impacts. Treatment units would be 50% or greater than the optimum yarding range described above for a desired harvest system. 4) Access for reforestation activities is prohibited by steep slopes, boulders, and riparian zones. 5) Long skid distances (over 2000') would increase operational costs with greater need to protect resources from skid trail rutting when long, sustained trails are used for multiple log turns. 6) Pit access is via an unrestricted, low standard or non-system road and difficult to control use and access. 7) Convex shaped slopes or long skyline tail tree lengths would compromise payload deflection, operational efficiency, and risk subsequent resource damage.
		Medium(2)	1) Landing located on marginal to moderately drained group 2 soils or well drained soils, but within 300 ft. of a riparian zone and would require additional mitigating measures (hardening landings, intercept run-off). 2) Road is upslope but with an alignment perpendicular to the contours and possibly entrenched which tends to concentrate erosion and run-off from landing sites down the road and ditches with no opportunity to drain off into the veg. Landing locations for conventional and non-conventional logging systems are more restricted by terrain. 3) Good road standards and drainage; but restricted by seasonal hunting traffic (i.e.: road is opened for hunter traffic, especially handicap hunting road) Low: High road standard road used for recreation traffic and trails. Road is a dual use or crossed by ATV, bike, snowmobile, or hiking trails. 4) The degree of steepness or terrain cross-section is marginal: becoming too steep for conventional logging systems or not steep enough and convex for cable systems. Spacing is 25% to 50% greater than the margins described above. 5) Access for above equipment may require a long unloading distance to work site. 6) Greater distances may require longer turn times and skid distances. 7) Pit access requires a long non-system low standard access road. 8) Single end suspension of log payloads may require strategic placement of yarder, additional landing construction, and/or higher tail tree heights.

Table 13. Ranking criteria for Benefit/Risk analysis, Spring Creek watershed, Marienville Ranger District, 2002. *(See key at end of Table 12 for Question Codes)

Question*	Benefit/Risk	Rank	Criteria for Rank
		High(3)	1) Landing located in group 1 soils and not within 300 ft of a riparian zone. Longer potential operating season and less restrictions. 2) Road is on the slope break and provides optimum position for conventional and non-conventional logging systems. Rubber tired skidders on the uphill (moderate bench) ,track skidders or cable yarders on the slopes below with landing benches for bringing product uphill. For helicopter logging, the road alignment provides optimum approach and take-off opportunities with less terrain or overhead obstructions and long gradients. 3) Road has good surface hardening and drainage control, which contributes to operational efficiency at landings; less attention needed for administration and monitoring. 4) Road is on the slope break and provides optimum position for conventional and non-conventional logging systems. Rubber tired skidders on the uphill (moderate bench) ,track skidders or cable yarders on the slopes below. On steep slopes it's located at the top of a convex slope cross-section for optimum yarder set-up and payload deflection. Optimum spacing between roads for conventional ground skidding is 1200' to 1500', for medium running skyline yarders 800' to 1200', and for helicopter 3000' to 5000', draft animal 300' to 500', and forwarder 2000' to 3000'. 5) The road or strategic segments of it are located on moderate benches that provide good turn around and landing locations for low boys and tractor trailers that haul equipment, fertilizers, and herbicides. 6) Spacing of 1200' to 1500' between roads or to the end of a management area which provides for economical and efficient operations (turn times). 7) Pit access is close to a maintained system road with short driveway access and easy resource protection. 8) In respect to the terrain cross section, the road is located at the top of a convex slope that provides good lift and partial suspension of log payloads and therefore less ground disturbance.
TM1,2,3	Risk	Low(1)	1) Located in well drained group 1 soils or on a moderate slope that does not exhibit ponding conditions. 2) Long distance forwarder skid roads are entirely on well drained group 1 soils that hold up to the sustained passes or there are opportunities for skid trail hardening that do not necessarily create temporary roads in lieu of permanent. 3) Road is on the slope break and provides optimum position for conventional and non-conventional logging systems. Rubber tired skidders on the uphill (moderate bench) ,track skidders or cable yarders on the slopes below with landing benches for bringing product uphill. For helicopter logging, the road alignment provides optimum approach and take-off opportunities with less terrain or overhead obstructions and long gradients. 4) Terrain and closure restrictions effectively prohibit illegal timber and firewood cutting. 5) The road or strategic segments of it are located on moderate benches that provide good turn around and landing locations for low boys and tractor trailers that haul equipment, fertilizers, and herbicides. 6) Road density is minimum. At least 1500 ft. spacing between roads.

Table 13. Ranking criteria for Benefit/Risk analysis, Spring Creek watershed, Marienville Ranger District, 2002. *(See key at end of Table 12 for Question Codes)

Question*	Benefit/Risk	Rank	Criteria for Rank
		Medium(2)	1) Predominantly group 2 soils that tend to be less well drained during periods of high moisture. 2) Predominantly group 2 soils that tend to be less well drained during periods of high moisture. 3) Road is upslope but with an alignment perpendicular to the contours and possibly entrenched which tends to concentrate erosion and run-off from landing sites down the road and ditches with no opportunity to drain off into the veg. Landing locations for conventional and non-conventional logging systems are more restricted by terrain and call for greater construction impacts and costs. 4) Roads crossing or near private lands can be blocked, gated, and/or monitored for illegal trespass. 5) Access for reforestation equipment like low-boys and tractor trailers carrying fertilizer, herbicide, or application equipment may require a long unloading distance to work site. 6) Road and OGM asset density is greater than 600 ft. apart.
		High(3)	1) Group 3 soils or low-end group 2 soils with perched water tables limit opportunities for landing locations. Increased soil rutting and generation of sediments. 2) High yarding volumes skidded over long distances require multiple equipment passes over the same forwarder road. This would increase compaction and resource damage to the forwarder road, which is built on native soils that would not be hardened with pit run stone. Soil groups of 3 and 2 are the most vulnerable. 3) Road is a the bottom of or mid-slope of steep hill. With toe of slope location there is more cost involved with landing prep. and maintenance due to springs, and run off from skid trails. With mid-slope locations (no bench) landing would have to be constructed on a hillside requiring cut and fill and subsequent higher investment and operating costs. 4) Flatter terrain with access roads that cross through or near a private property boundary compromises our ability to protect stands from illegal harvesting and resource damage. 5) Access for reforestation activities is prohibited by steep slopes, boulders, and riparian zones. 6) Road and/or OGM assets (i.e.: well pads, pipelines, electric lines) less than 600 ft. apart creates fragmentation of stands and a constraint to skidding and fencing operations. In the case of a logging operation, more landings and, therefore, more loading and trucking as well as skidding costs would incur. For a reforestation operation, the requirement to fence in such small areas or somehow provide many gate entrances to access the OGM facilities within the fenced area would be extremely cost prohibitive because of the enormous amount of fencing needed or the difficulty in managing the gate closures.
TW1	Benefit	Low(1)	segment has culverts larger than 6ft diameter
		Medium(2)	segment contains wood/steel bridges
		High(3)	segment contains concrete bridges
TW1	Risk	Low(1)	no roads within ½ mile and or/ riparian systems adjacent to road are limited
		Medium(2)	1 road is within ½ mile and/or limited wetlands are adjacent to road
		High(3)	2 or more roads are within ½ mile and/or several wetlands are adjacent to segment
TW2	Benefit	Low(1)	road has limited hunting use and/or no pits that provide habitat
		Medium(2)	road has seasonal use or regular use as a hunting road; pits may be present that provide limited habitat benefits

Table 13. Ranking criteria for Benefit/Risk analysis, Spring Creek watershed, Marienville Ranger District, 2002. *(See key at end of Table 12 for Question Codes)

Question*	Benefit/Risk	Rank	Criteria for Rank
		High(3)	road is used as main collector road for hunting access; pits may be present that provide vernal ponds, roosting pockets for bats, or openings
TW2	Risk	Low(1)	no roads within ½ mile; road not used as a collection point for ATV trailheads
		Medium(2)	1 road is within ½ mile; road used for access to ATV trailheads; pits may be present that provide no habitat or have removed habitat
		High(3)	2 or more roads within ½ mile; ATV trail heads present on segment; pits are present that have had a negative affect on habitat
TW3	Benefit	Low(1)	road is seldom used as an access point for hunters, trappers
		Medium(2)	road is opened seasonally for hunter access
		High(3)	road is used as a hunter access road; road is important travel route to hunter access roads; trapping is known from area
TW3	Risk	Low(1)	low use (less than 3 cars a day); speed is generally less than 15mph; no known timber rattlesnake habitat is present
		Medium(2)	increased use (3-10 cars a day); speed is generally less than 25mph; timber rattlesnake habitat may be present
		High(3)	highest use (more than 10 cars a day); speed is 25mph or higher; timber rattlesnake habitat may be present
TW4	Benefit	Low(1)	road may access potential managed wetlands or openings
		Medium(2)	road may be needed to access managed wetlands or openings
		High(3)	road required to access managed wetlands or openings
TW4	Risk	Low(1)	road is adjacent to a limited unique plant community, TES habitat, or wetlands
		Medium(2)	road is adjacent to limited unique plant communities, TES habitat, or wetlands
		High(3)	road is adjacent to extensive unique plant communities, TES habitat, or large wetlands

5. Each road segment was then classified according to the assigned criteria rank (low, medium, high) in a GIS coverage of the road system. For each question, an attribute was developed in the GIS coverage. This attribute was named the same as the question number to reduce confusion. Thus, for the benefit question TW2B, there is an attribute TW2B that was calculated to reflect the map highlighted by the specialist. By putting this information into the GIS coverage, we were able to print maps of each question, and complete an analysis of the benefits and risks. Each GIS attribute was reviewed by the specialists to ensure each road segment was attributed correctly.

Results

1. At this point, within GIS, each road segment had been attributed for the 44 questions that were "keepers". The total benefit and the total risk for each road segment were then calculated by summing the individual risks and benefits for that road segment (Appendix A-Maps 35 -Benefit Score Map & 36-Risk Score Map). The GIS was then used to display segments based on their total benefit and risk score, separating them into high, medium and low. Investments have been made over time to systematically reduce the risks of the road system. This was indicated in the Spring Creek Watershed Analysis by a comparison of the

present day road system and the road system that existed in 1937 (Spring Creek Watershed Analysis, unpublished data).

2. Based on the relative total risk and benefit of each road segment, each road segment was assigned to a box in the matrix. Based on their location in the matrix, a preliminary recommendation was made for each road segment (Figure 4 & Appendix A - Map 35-risk/benefit matrix score results). Each road segment was then reviewed individually to determine if the preliminary recommendation was appropriate, i.e., were there "decommission" segments sandwiched between "maintain" segments. Based on this review, there were 42 road segments that needed their recommendations revised. These are highlighted in Appendix A - Map 36-out of the box map). Final recommendations from the benefit/risk analysis are shown in Appendix A - Map 37-final recommendations map and Appendix B - Table 2a, 2b, 2c, and 2d.

3. Priorities are based on completing work on road segments with a high total benefit and a high total risk, Matrix Box 1. The road with the highest total risk and the highest total benefit was given a priority of 1. The road with the next highest risk and next highest benefit was given a priority of 2. Where segments existed with the same risk, the highest benefit was prioritized higher. Where both the risk and benefit were the same, Forest Roads, then State, then Township, then OGM, and then other roads were prioritized. Thus the road segment with the lowest risk and the lowest benefit has the lowest priority. Map 38 in Appendix A shows the road segments with the top 20 priorities, the bottom 20 priorities, and then all other road segments by their matrix box. Each road segment's priority is indicated in Appendix B - Table 2a, 2b, 2c, and 2d.

Discussion

1. Caution is advised in evaluating the resulting data and maps from the Benefit/Risk analysis completed in Step 5 for the following reasons:

   a) This analysis is based on the questions provided in Roads Analysis: Informing Decisions about Managing the National Forest Transportation System (USDA-FS 1999), and any additional questions pertinent to the Spring Creek analysis area. Although this list of questions is comprehensive, it is not all-inclusive. Secondly, the final analysis completed in Step 5 of the process only evaluated the relevant "keep" questions in Table 12 and used the criteria in Table 13. While the team was confident in the questions and criteria selected for this analysis, there could potentially be other questions, criteria, and factors identified that could adequately model the benefits and risks of a road system.

   b) While all roads of all ownerships were evaluated based on the above criteria (Table 13), the most complete and accurate data available was for Forest Service System roads. Complete and accurate data was not always available for roads managed by other jurisdictions (e.g. State Game Lands, private, OGM). Therefore, the scoring of the benefit and risk factors for these road segments for some questions may not include all the data used for Forest Service System roads For example, road costs, EC1A and EC1D, were calculated only for Forest Service roads. No attempt was made to determine the costs of maintaining the road system for State, Township, or OGM roads. Therefore, economic considerations as a risk factor are weighted against Forest Service roads as compared to roads under other jurisdictions.

2. All questions are not of equal importance. There was considerable discussion as to whether all questions should be weighted equally. It was initially agreed that all questions should not be weighted equally. Therefore, each roads analysis ID team member was given seven votes for applying weight to questions they believed were of more importance. This is commonly called the Nominal Group Method. After the specialist's analysis of the criteria, a second vote was used to weight the final questions. As part of the analysis, the total benefit and total risk scores were also calculated based on weighted questions. The results of using weighted questions and unweighted questions were reviewed. Based on this review, only minor differences in recommendations for road segments were found between the two methods. Because of this, the team decided to use unweighted questions.

3. The team reviewed the final list of "keep" questions that were considered relevant to the Spring Creek analysis area and that could be modeled (Table 12). It was noted that some questions, although relevant, were not as important because their elements were captured in other questions and could possibly be grouped with other questions, or they added only minor benefit/risk elements to the overall assessment. The team considered eliminating these to reduce the number of questions in the final modeling process. While eliminating questions from the analysis could gain some efficiency, the team finally agreed to use all of the relevant "keep" questions that could be modeled to produce this model of the road system and to obtain a better understanding of the process.

4. What other benefits are there to completing this analysis? This process and analysis can be used to document the changes in the benefits and risks associated with alternative actions developed in NEPA analysis. This analysis documents the existing condition, and makes recommendations for improving the road system, i.e., reducing the risk and increasing benefits for specific road segments. When taken forward into NEPA, it could show the net change of the benefits and risks of the road system for implementing each alternative.

5. The priorities are based on a science-based analysis. This analysis utilizes the science-based process developed for roads analysis (USDA-FS 1999). It should be noted that the Spring Creek roads analysis ID team identified potential road segments for decommissioning prior to initiating this process. The results between the professional judgment and the calculated matrix were similar and are discussed below.

6. Automating the process. Because this process uses GIS, the potential exists to significantly automate the process. If forest-wide coverages and criteria can be developed that can be used to model the road system, the time necessary to attribute the road segments can be significantly reduced.

SPRING CREEK ROADS ANALYSIS RECOMMENDATIONS

Many of the answers to questions raised in Step 4 provided recommendations that should be considered during project level analysis. Some of these recommendations may appear to be in conflict with one another as the recommendation generally is made in response to an individual resource concern. The appropriate time to resolve these apparent conflicts is when project level decision-making takes place. The consideration of site-specific needs and trade-offs will influence how these recommendations are to be applied. Some of these recommendations could also be considered for addition as standards and guidelines during Forest Plan revision.

Site-specific road segment recommendations made as a result of the benefit/risk analysis and final outcome matrix are documented in Appendix B - Table 2a, 2b, 2c, and 2d. This table also includes aquatic resource recommendations by road segment. Table 3 in Appendix B includes site-specific recommendations for culverts that are undersized to meet a 50-year flood event.

Recommendations for Issue #1 - Management of Existing Road System

- Work with OGM to decommission roads identified in benefit/risk analysis as "Work with OGM to eliminate loop or decommission".
- Continue to monitor the percentage of open, restricted, and closed roads. Continue to open roads seasonally as needed to provide access for deer herd management.
- Include blocking of unlawful OHV trails, wherever feasible, with any new road work.
- Consider resurfacing the following roads that have the highest potential risk for airborne dust emissions: FRs 227, 131, 130, 343, 136, 338, 395, 403, portions of 124, and township roads 312, 313, 458, and 370.

Recommendations for Issue #2 – Access

- Lappin Run – Consider alternate access through a private inholding via FR 383 and an existing unused OGM route from the west. This would also create an opportunity to decommission portions of FR 381 where it is hydrologically connected to Lappin Run.
- Consider non-conventional yarding systems in any subsequent road spacing plan and sidehill location on slopes of 45 percent and steeper.
- Work with OGM to decommission roads identified in benefit/risk analysis as "Work with OGM to eliminate loop or decommission".
- There is a need to modify the gate design to allow persons with disabilities to pass a closed gate on foot. A three-foot wide hardened path around the gate is adequate to allow people to pass

while excluding motorized vehicles. All gates on the National Forest should incorporate this design.

Recommendations for Issue #3 – Potential Impacts to Water Quality

- Recommend limestone surface armoring and other sediment filtering measures for road stream crossings on FR 403, 124, 108, 184, and 381.
- Replace numerous culverts at stream crossings that are not sized for a 50-year flood event (see AQ 4 and Appendix B, Table 3). These pipes should be replaced as time and money warrants, while concentrating on the pipes that are the most undersized.
- Consider additional site-specific recommendations listed in Appendix B - Table 2a, 2b, 2c, and 2d to address water quality concerns. These include recommendations for culverts (lengthen, unplug, replace, realign), sediment filtering measures, and addressing existing stream fords.

Recommendations for Issue #4 – Availability and Management of Pits

- Reduce the need for expansion or creation of new pits by utilizing limestone surfacing.

Recommendations for Issue #5 – Unroaded Areas

- No specific recommendations to retain, expand, or road these unroaded areas are made in this analysis. These areas should be discussed as they occur in future NEPA analyses.

Recommendations for Issue #6 – Impacts of Roads on Native Wildlife and Plants

- Work with OGM to decommission roads identified in benefit/risk analysis as "Work with OGM to eliminate loop or decommission".
- Include blocking of unlawful OHV trails, wherever feasible, with any new road work.
- Continue to monitor the percentage of open, restricted, and closed roads. Continue to open roads seasonally as needed to provide access for deer herd management.
- No specific recommendations to retain, expand, or road these unroaded areas are made in this analysis. These areas should be discussed as they occur in future NEPA analyses.
- Continue inventory efforts to evaluate the extent of noxious weed and invasive plant species of concern across the ANF.
- Continue to document the location of wetlands throughout the Spring Creek watershed and the presence or absence of exotic plant species and the potential for them to spread by the road system.

- Continue to assess the degree of encroachment and closeness of roads to wetland areas and the associated impacts as the location of wetlands are documented.

SPRING CREEK ROADS ANALYSIS CONCLUSIONS

The following six questions from Miscellaneous Report FS-643 titled Roads Analysis: Informing Decisions about Managing the National Forest Transportation System (USDA-FS 1999) were used as a guide to summarize the conclusions from the Spring Creek Roads Analysis.

1) Does the existing system of roads create an unacceptable risk to ecosystem sustainability?

Unacceptable risk is based on legal, social, and policy criteria. Based on the responses to the questions in Step 4, the existing road system with the Spring Creek analysis area does not create an unacceptable risk to ecosystem sustainability.

2) Can the maintenance requirements of the existing system be met with current and projected budgets?

Forest Service roads:

Historically, the maintenance budgets have not been adequate to maintain the road system to an adequate level. Some roads have been closed or their use restricted to reduce the level of maintenance needed. Additionally, some maintenance has been "deferred" until it could be included within a timber sale. The majority of the deferred maintenance listed in Table 10 will be accomplished within a timber sale, rather than as road maintenance.

State/Township roads:

Historically, the Commonwealth of Pennsylvania and the local townships do not have adequate funding to maintain the current road system. This is evidenced by the continual low ratings for Pennsylvania for road conditions. While Pennsylvania has shown a vast improvement in the condition of its roads, it continues to rank near the bottom for road conditions. This scenario is expected to continue into the future.

3) Are some existing roads not needed to meet projected access needs?

An analysis was completed to determine the minimum road system needed to meet management objectives. This analysis included a determination of which roads were needed to meet specific resource needs. The resources included within this analysis included:

- Hunting Access (including Disabled Hunter Access) - Map 11 & Map 32
- Wildlife Management Access - Map 18
- Timber Access - Map 22
- OGM Access - Map 23
- Special Uses - Map 25
- Access to Private Land - Map 26

- Research Access - Map 27
- Developed and Dispersed Recreation Access - Map 28 & Map 30
- Fishing Access - Map 29

Three approaches were taken to identify potential roads for decommissioning. First, any remaining roads not needed to meet resource objectives listed above, should be considered for decommissioning. There were 9.8 miles of these roads identified on Map 39 in Appendix A.

Second, each specialist identified roads that decommissioning would benefit their specific resource. There were 33.4 miles of roads identified on Map 40 in Appendix A. These roads could be considered for decommissioning. Of note, is that the entire interdisciplinary team did not agree to these roads, but were only suggestions based on single resource issues.

Third, as part of the benefit/risk analysis, road segments classified as high risk/low benefit (Figure 4, Matrix Box 3) were examined to determine if they should be candidates for decommissioning. The interdisciplinary team identified 33.5 miles of these roads which included roads with a recommendation of "Realign/Mitigate/Decommission" and "Work With OGM" (Appendix B - Table 2a, 2b, 2c, and 2d, Map 41 in Appendix A). The roads identified in this process were not always the same roads identified in the first two approaches.

4) If new access is proposed, what are the expected benefits and risks?

Any proposed additions to the transportation system will be analyzed through the NEPA process. There are 28.3 miles of potential new road construction in the Spring Creek watershed, in addition to 6.1 miles of new road construction approved in the East Side EIS. Potential new construction or reconstruction is shown on Map 42 in Appendix A. Any road shown on this map would be constructed or reconstructed only after a need is determined for that road, and the proper NEPA analysis is completed. The benefits and risks of providing new access in a particular area will be evaluated during this process.

5) What opportunities exist to change the road system to reduce the problems and risks or to be more consistent with forest plan direction and strategic intent of the roads system?

The opportunities to reduce the problems and risks of the road system are shown in Appendix B - Table 2a, 2b, 2c, and 2d, Table 3, and Appendix A - Map 37. The priorities for each road segment are indicated on Appendix A - Map 38. Implementing the standard mitigation measures of the forest plan and/or the deferred maintenance identified in the deferred maintenance surveys will bring the road system in line with forest plan direction and strategic intent of the road system.

The Spring Creek analysis area includes Forest Service land assigned to Management Areas (MA) 1.0, 3.0, 6.1, and 6.3 (Figure 2 and Appendix A - Map 1). Forest Plan direction for road management in these MAs is summarized in Table 2. Road density for Forest Service system roads within the Spring Creek watershed were calculated at 1.4 miles/square mile in Management Area (MA) 1.0, 1.7 mi./sq. mi. in MA 3.0, 1.8 mi./sq. mi. in MA 6.1, and 0.6 mi./sq. mi in MA 6.3. All of these road densities are well within Forest Plan Standards and Guides (USDA-FS 1986a). These road densities were calculated by taking the miles of road and dividing by the square miles in the project area, management area, etc. This results in one average (discrete) value for the entire area. This has been the standard method used for calculating road densities cited in the literature including the 1986 Forest Plan and monitoring reports.

In the Spring Creek roads analysis, road density variation was calculated on a more site specific basis using a new methodology. Using GIS, the forest was divided into 30 meter by 30 meter pixels (approximately 100 feet by 100 feet). Each pixel was assigned a value based on whether a road was present in the pixel or not. The computer then took each of those pixels, one at a time, and summed the number of pixels that had a road present within a one mile block centered around each pixel. Thus, each 30 meter by 30 meter pixel, had a road density assigned to it. This methodology produces a map that displays road density variation across an area.

Using this method, total road density variation (i.e., all roads-including private, OGM, and Forest Service) within the Spring Creek watershed ranges from 0 to 15.1 miles/square mile (Appendix A - Map 2a), with the highest road densities occurring in the Sackett oil and gas field. Only 29.7% of the roads contributing to the total road density are Forest Service administered roads (Table 3). Forest Service system road density variation ranges from 0 to 4.96 miles/square mile in the Spring Creek watershed (Appendix A - Map 2f).

Based on the older averaging method, road densities for Forest Service system roads meet Forest Plan direction for all management areas within the roads analysis area. Based on the newer site specific method using GIS, road density variation would appear to exceed Forest Plan direction in some areas within the Spring Creek analysis area. However, because two different methods were used to calculate road density, their numerical values cannot be directly compared. The road density variation values should not be used to determine consistency with management area direction because they are calculated using a different methodology. The newer method is useful to identify or highlight areas where road density or the effects of high road density may be a concern.

6) Are additional roads or improved roads needed to improve access for forest use or protection, or to improve the efficiency of forest use or administration?

Additional roads (28.3 miles) were identified as being needed for vegetation management. These are shown in Appendix A - Map 42. These roads may be either new construction or improvement of existing non-system roads. These roads may have a secondary use of access for deer hunting.

This analysis did not identify any Forest Service system roads that needed improvement. Improvement is defined as "Activity that results in an increase of an existing roads traffic service level, expands its capacity, or changes its original design function" (36CFR 212.1.1). The existing standard of the Forest Service roads are adequate if properly maintained.

NEPA analysis needs

This roads analysis was completed prior to the Spring Creek EIS. Many of the opportunities identified will be incorporated into the EIS process. If some opportunities are identified, other than maintenance and administrative decisions, that will not be incorporated into the EIS, they will require a site-specific NEPA analysis in the future when the decision is made to implement them.

Step 6 Reporting

Purpose and Products

The purpose of this step is to:

- Report the key findings of the analysis

The products of this step are:

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

Report

This report will be reviewed by the personnel from Allegheny NF and shared with other offices in the Forest Service that are also working on roads analysis. This report will be available to the public upon request and posted on the Spring Creek web page. The report will be included in the Spring Creek EIS project file.

Maps

A list of all maps used for this report is included in Appendix A.

Literature Cited

Brody, A.J. and Pelton, M.R. 1989. Effects of roads on black bear movements in western North Carolina. In Forest Roads: A Synthesis of Information. June 2000. USDA Forest Service. 117 pp.

Briggs, D.E.G. and W.D. I. Rolfe. 1983. A giant arthropod trackway from the lower Mississippian of Pennsylvania. Journal of Paleontology, 57::377-390.

Davis, J.R. 1992. Nesting and brood ecology of the wild turkey in the mountains of western North Carolina. *In* Forest Roads: A Synthesis of Information. June 2000. USDA Forest Service. 117 pp.

Federal Register. 2001a. Department of Agriculture, Forest Service, 36 CFR Part 212, et. al. Administration of the Forest Development Transportation System; Prohibitions; Use of Motor Vehicles Off Forest Service Roads; Final Rule. Federal Register, Vol 66, No. 9, January 12, 2001, pp. 3206-3218.

Federal Register. 2001b. Department of Agriculture, Forest Service, Forest Transportation System. Notice of final administrative policy. Federal Register, Vol 66, No. 9, January 12, 2001, pp 3219-3241.

Giocomo, J.J., M. Brittingham and L. Goodrich. 1998. Effects of Forest Openings in the Contiguous Forest of Eastern Pennsylvania on the Reproductive Success of Forest Songbirds. Abstract presented at the 54th Annual Northeast Fish and Wildlife Conference, Camp Hill, PA, May 1998.

Hartzler, I.C., P. Dalby and J.M. Benner. 1998. Comparison of Bird Abundance and Species Composition Patterns among Different Types of Forest Fragmentation. Abstract presented at the 54th Annual Northeast Fish and Wildlife Conference, Camp Hill, PA, May 1998.

Hassinger, J. 2000. Rights-of-Way as of Y2K: An Inventory of Access Corridors – The Pennsylvania Story. Presentation given at the Pennsylvania Wildlife Society Meeting, April 2, 2000, Titusville, PA, that included research results from Findlay, S. and J. Bourdages. 2000. Response Time of Wetland Biodiversity to Road Construction on Adjacent Lands. Conservation Biology. 14: 86-94 and Haskel, D. 2000. Effects of Forest Roads on Microinvertebrate Soil Fauna of the Southern Appalachian Mountains. Conservation Biology. 14: 57-63.

Hunter, Jr., M.L. 1990. Wildlife, Forests, and Forestry. Principles of Managing Forests for Biodiversity. Regents/Prentice Hall. Englewood Cliffs, NJ.

Hunter, Jr., M.L. 1997. The Biological Landscape. Pages 57-67 *in* K.A. Kohm and J. F. Franklin, editors. Creating a Forestry for the 21st Century. The Science of Ecosystem Management. Island Press. Washington, DC and Covelo, CA.

Kroodsma, R. L. 1984. Effect of edge on breeding forest bird species. Wilson Bulletin, 96(3): 426-436.

McNab, W. H. and P. E. Avers, comps. 1994. Ecological Subregions of the United States: Section descriptions. Administrative Publication WO-WSA-5, Washington, DC: U.S. Department of Agriculture, Forest Service. 267 p.

Noss, R. 1984. The Ecological Effects of Roads or The Road To Destruction. http://www.eco-action.org/dt/roads.html, 6/6/02.

PA-DEP (Pennsylvania Department of Environmental Protection). 1998. Section 303(d) list, final. Harrisburg, PA.

PA-DEP. 2001. Title 25, Environmental Protection. Chapter 93, Water Quality Standards. Harrisburg, PA.

Pennsylvania's Clean Streams Law of 1937, as amended. 1937. P.L., Act 394, as amended (35 P.S. 691.1 et. seg.)

Pennsylvania's Oil and Gas Act. 1985. Act 223, Title 58 Oil and Gas, Chapter 11 Oil and Gas Act, Sec. 601.103 and 601.210, April 18, 1985.

Pennsylvania State Data Center. 2001. Census of Population and Housing, 1990,1980: Summary Tape File 1 and 3. Institute of State and Regional Affairs, Penn State Harrisburg, Middletown, PA. http://pasdc.hbg.psu.edu/pasdc/Data_&_Information/County_Profiles.html (Dec. 2001)

Pomeroy, J.S. 1981. Landslides and related features, Pennsylvania -- Warren 1º x 2º Quadrangle: U.S. Geological Survey Open-File Report 81-238, 112 plates, map scale 1:24,000.

Strauss, C.H., B.E. Lord, M.J. Powell, M. Shields, and T.W. Kelsey. 2000. Economic Impact of Pennsylvania's Hardwood Industry: Current Status and Proposed Growth. Unpublished report. College of Agricultural Sciences, The Pennsylvania State University, University Park, PA.

Trombulak, S.C. and C.A. Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Conservation Biology. Vol. 8: 18-30 (February 2000) .

USDA-FS (U. S. Department of Agriculture-Forest Service). 1986a. Allegheny National Forest Land and Resource Management Plan. Warren PA.

USDA-FS. 1986b. Allegheny National Forest Final Environmental Impact Statement Land and Resource Management Plan (FEIS), Warren, PA.

USDA-FS. 1986c. Allegheny National Forest Record of Decision Final Environmental Impact Statement Land and Resource Management Plan, Warren, PA.

USDA-FS. 1986d. 1986 ROS Book. 277 p.

USDA-FS. 1990. Economic Considerations of Surfacing Materials on the ANF. Unpublished report. Allegheny National Forest, Warren, PA.

USDA-FS. 1994. Forest Service Handbook. FSH 7709.56b – Transportation Structures Handbook. Amendment No. 7709.56b-94-1, July 27, 1994. Washington, D.C.

USDA-FS. 1995. Landscape Aesthetics. A Handbook for Scenery Management. Agriculture Handbook # 701. U.S. Dept. of Agriculture, Forest Service.

USDA-FS. 1997. Fisheries Amendment to the Allegheny National Forest, Land and Resource Management Plan. Warren, PA.

USDA-FS. 1998. Biological Assessment For Threatened and Endangered Species on the ANF. 86 p.

USDA-FS. 1999. Roads Analysis: Informing decisions about managing the National Forest Transportation System. Misc. Rep. FS-643. Washington, D.C.: U.S. Dept. of Agriculture Forest Service. 222 p.

USDA-FS. 2000a. Forest Service Roadless Area Conservation. Final Environmental Impact Statement, Vol.1 and Vol.2 – Maps of Inventoried Roadless Areas. Washington, D.C.: U.S. Dept. of Agriculture Forest Service, November 2000.

USDA-FS. 2000b. Lower Steamboat Creek Watershed Roads Analysis. October, 2000. North Umpqua Ranger District, Umpqua National Forest. http://www.fs.fed.us/r6/umpqua/planning/roads_analysis/lwr_steamboat/Lower_Steamboat_RA.pdf) (12 Dec. 2001)

USDA-FS. 2001a. Lewis Run Project Roads Analysis Report. Version 1.0. Allegheny National Forest, Bradford Ranger District.

USDA-FS. 2001b. Duck Creek – Swains Roads Analysis. Version 1.0. April, 2001. Cedar City Ranger District, Dixie National Forest. http://www.fs.fed.us/dxnf/d2/ra/exec_sum/index.html (12 Dec. 2001)

USDI-FWS (U.S. Department of Interior-Fish and Wildlife Service). 1977 and 1983. National Wetlands Inventory prepared by Office of Biological Services for the National Wetlands Inventory. Newton Corner, MA 01258.

USDI-FWS. 1999. Biological Opinion on the Impacts of Forest Management and Other Activities to the Bald Eagle, Indiana Bat, Clubshell and Northern Riffleshell on the ANF. 91 pp.

Verry, E.S. 2000. Water flow in soils and streams: sustaining hydrologic function. In Riparian Management in Forests of the Continental Eastern United States. E.S. Verry, J. W. Hornbeck, C.A. Dolloff editors. Lewis Publishers, Boca Raton. 402 pp.

Wang, G.A. 2001. Assessing Life in the Allegheny Forest Region: Results of a Survey. Unpublished report. USDA Agreement #99-6. The Pennsylvania State University.

Personal Communications

Bodenhorn, Richard. Wildlife Conservation Officer, Pennsylvania Game Commission.

Burd, Steve. U.S. Forest Service Law Enforcement Officer, Allegheny National Forest.

deCalesta, David. Research Wildlife Biologist (retired), Northeast Forest Experiment Station, Irvine, PA.

A Maps Appendix

Map 1	Management areas
Map 2a	Road density variation (all classified roads of all ownerships)
Map 2f	Road density variation (Forest Service Roads only)
Map 3	Jurisdiction with road numbers
Map 4	Road management (closure devices)
Map 5	Road surfacing
Map 6	Unroaded areas
Map 7	ATV/Bike and snowmobile trails (with roads)
Map 8	Unroaded areas w/ timber age class
Map 9	Unroaded areas w/ forest type
Map 10	Traffic Service Level
Map 11	Roads needed to disperse deer hunters
Map 12	Roads within 300 feet of streams
Map 13	Fisheries/Hydrology crossings of concern
Map 14	Mass wasting areas within Spring Creek analysis area
Map 15	NWI wetlands, wetland and riparian ecological land types (ELT's), streams and waterbodies
Map 16	Roads within 300' of stream used by OGM
Map 17	Roads used as illegal OHV trails
Map 18	Wildlife management access
Map 19	Annual maintenance cost for FS roads
Map 20	Deferred maintenance cost for FS roads
Map 21	Land Suitability Class (timber)

B Data Appendix

See separate file for Appendix B - Table 1a, 1b, Table 2a, 2b, 2c, 2d, and Table 3.

C Photos Appendix

See separate file for Appendix C.