Ouachita National Forest
Arkansas and Oklahoma

Environmental Assessment
For
Wolf Pen Gap Project
March 2014

Responsible Agency:
US Forest Service, Ouachita National Forest
Mena and Oden Ranger Districts

Responsible Official:
Tim Oosterhous, District Ranger
1603 Highway 71 North
Mena, AR 71953

For Further Information Contact:
Bill Pell, Planning and Recreation Staff Officer
501-321-5202

TABLE OF CONTENTS

LISTING OF FIGURES & TABLES

Chapter 1
Purpose of and Need for the Proposed Action

Introduction

On November 9, 2005, the Department of Agriculture published the Final Rule for Travel Management; Designated Routes and Areas for Motor Vehicle Use (rule); 36 CFR Parts 212, 251, 261, and 295 (70 Fed. Reg. 68,290). This rule requires designation of roads, trails, and areas that are open to motor vehicle use. Under the rule, motor vehicle use off designated routes and outside designated areas is prohibited once such designations are published on a motor vehicle use map (MVUM).

In order to comply with this rule, a Decision Notice was signed on January 4, 2010, for the Ouachita National Forest's Travel Management Project. Through the appeal process, this Decision was reversed solely as it relates to motor vehicle use designation changes in Wolf Pen Gap, a complex of motorized trails and roads near Mena, Arkansas.

When the MVUM was published reflecting the January 4, 2010, Decision (implementing most of the Decision), there were no changes to the current or existing designations of the Wolf Pen Gap road and trail system. Cross-country motor vehicle use was already prohibited at Wolf Pen Gap by Forest Supervisor order. When the MVUM was published, the forest floor remained closed to cross-country travel by motor vehicles.

The Wolf Pen Gap Project is necessary to make changes formally to the roads and trails designated for public use of motorized vehicles in a manner consistent with the Travel Management Rule.

Proposed Action (from September 30, 2010)

In September 2010, the Ouachita National Forest proposed to make changes to the existing system of roads and motorized trails for public use, including Off-Highway Vehicles (OHVs), at Wolf Pen Gap (WPG). In addition to making changes to motorized use designations, physical road and trail changes were proposed in order to create a more sustainable OHV network. These changes include route closures and obliteration, route relocations, and new route construction.

This proposal, known as the Wolf Pen Gap Project, would be implemented approximately 7 miles southeast of Mena, Arkansas, in T3S, R29W, R30W, and the western portion of R28W of Polk County.

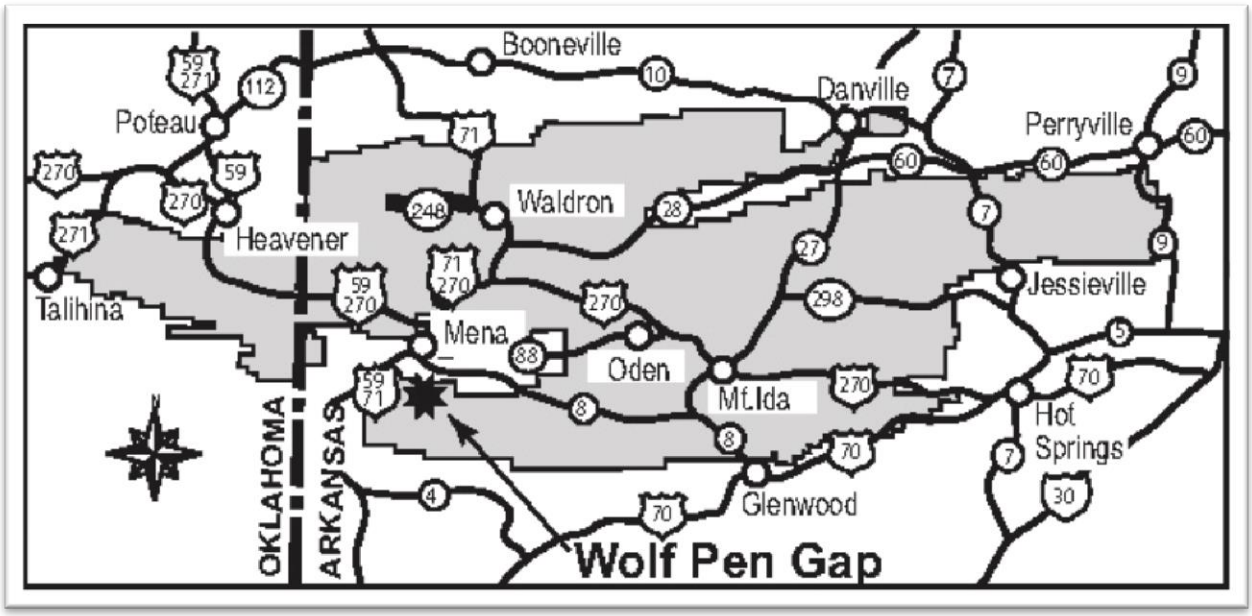

Figure 1. Wolf Pen Gap vicinity map.

Table 1 lists the proposed (September 2010) ***changes*** from the existing or current transportation system of roads and trails that would result from this proposal (types of designations listed in the tables are mutually exclusive):

Table 1. Proposed Action (Alternative B – Changes to the Existing Transportation System

Designated Road Use	**Existing (approximate miles)**	**Proposed Action (approximate miles)**	**Change**
Highway (Hwy) and OHV – year round[1]	20.2	6.1	-14.1
Hwy only – year round[2]	3.2	2.9	-0.3
Hwy year round – WPG Seasonal OHV[3]	0	14.3	14.3
WPG Seasonal – OHV and Hwy[4]	0	1.1	1.1
Road Total	23.4	24.4	1
Designated Trail Use	**Existing (approximate miles)**	**Proposed Action (approximate miles)**	**Change**
OHV – year round[5]	18.3	0	-18.3
WPG Seasonal OHV[6]	0	16.9	16.9
Trail Total	18.3	16.9	-1.4
Total WPG Routes	**41.7**	**41.3**	**-0.4**

1-Roads open to all vehicles, yearlong
2-Roads open to highway legal vehicles only, yearlong
3- Roads open to highway legal vehicles yearlong and open to OHVs, seasonally - February 1 through October 31
4- Roads open to highway legal vehicles and OHVs, seasonally—February 1 through October 31
5- Trails open to all-terrain vehicles that travel on three or more low-pressure tires; have handle bar steering; are less than or equal to 50 inches in width; and have a seat to be straddled by the operator. Trails open to vehicles with a seat or saddle and designed to travel with two wheels in contact with the ground. Trails open to vehicles 64 inches or less in width, designed to travel on four or more low pressure tires and having a bed for cargo.
6- Trails open to OHVs seasonally—February 1 through October 31

Activities included in the proposed action are illustrated in Appendix E, Alternative B (map). In addition to using designated routes, the public would be able to park motor vehicles legally on NFS lands in designated trailheads or within 24 feet from the edge of roads and trails designated for motorized use and not posted closed to parking. All closures and relocations would include obliteration of the old route footprint and forest floor restoration to a natural condition.

Additional activities proposed:

- Stream crossing improvements (272)
    - 110 culverts or planks
    - 133 arch culverts
    - 23 large arch culverts
    - 3 trail bridges
    - 3 road bridges
- Gate installations (14)
    - 1 administrative use
    - 13 wet weather management
- Obliterate user-created trails and restore the forest floor to a natural condition
- Obliterate closed road 48335 and restore the forest floor to a natural condition
- Stabilize shale-pit/watershed restoration
- Obliterate "warm-up" trail located at the West Trailhead parking lot
- Foot trail construction to Hawk's Gap Overlook

Any changes to designations of existing routes that are not proposed for closure or relocation would be implemented immediately upon publication of an updated MVUM. It is anticipated that route closure and obliteration, route relocation, and new route construction would occur in phases over the next 5 years.

Except for Trail 1 and FS Road 95, which would remain open to all motorized vehicle use year round, the following apply:

Wolf Pen Gap would be closed to ***OHV****s* under the following situations:

- 1 hour after sunset until 1 hour before sunrise (dusk until dawn)
- Seasonal periods to manage impacts from use (see Table 1 footnotes)

Parts or all of Wolf Pen Gap would be closed to ***all*** public motorized vehicle use under the following situations:

- During scheduled maintenance
- During and after precipitation events which, when combined with use, may cause damage to the trail system

Purpose of and Need for the Action

Contrasts between current and desired conditions illustrate the need for proposed management activities. The Revised Land and Resource Management Plan (Revised Forest Plan) for the Ouachita National Forest describes ***Desired Conditions*** for the Transportation System as follows:

> The transportation system of roads and trails is safe, affordable, and environmentally sound, responds to public needs, and is efficient to manage. The system provides public access for recreation, special uses, and fire protection activities and supports Forest management objectives. The system is well maintained commensurate with levels of use and available funding. The system is connected to state, county, or local public roads and trails. Unnecessary roads and trails are removed and the landscape restored. Rights-of-way to access National Forest System lands satisfy public needs and facilitate planned resource activities. Over the planning period, the number of inventoried unclassified roads and trails is reduced, and the development and proliferation of new unclassified roads is minimized. (Revised Forest Plan, p. 24)
>
> Recreation opportunities for OHV (Off-Highway Vehicle) enthusiasts will be available within an integrated system of designated roads and trails. Designated OHV routes provide a high-quality OHV experience. Conflicts between OHV enthusiasts and other recreational uses, with private lands and homeowners adjacent to National Forest land, and with resource issues, are addressed and resolved in a timely manner. Resolutions are consistent with area objectives and management direction. (Revised Forest Plan, p. 24)

Current Conditions:

The *Wolf Pen Gap Trail Complex Interim Management Plan* was developed in 2010. Implementation of the plan and Best Management Practices (BMPs) has resulted in some improvement of road and trail conditions and facilitated coordination and collaboration among stakeholders. The existing road and trail complex still includes a number of poorly located, improperly designed routes and is still connected to stream courses at some crossings.

Figure 2. Ouachita ATV Club, Trails Unlimited, and Ouachita NF employees installing an arch culvert to reduce sedimentation (improve water quality).

The purpose of this project is to implement the travel management rule and to implement the following ***Priorities and Objectives***:

> Designate and sign a system of designated routes suitable for recreational travel by motorized vehicles, including off-highway vehicles. (Revised Forest Plan, p. 65)
>
> Designate and sign a system of roads and trails suitable for public access by motor vehicle, including off-highway vehicles . . . ; at the same time, initiate the process to prohibit cross country travel by motorized vehicles except for emergency purposes and specific authorized uses. (Revised Forest Plan, p. 65)
>
> Develop and operate a system of OHV routes that satisfies some public demands for motorized recreation and protects environmental quality; maintain routes to agency guidelines . . . (Revised Forest Plan, p. 67)

Scope of This Environmental Analysis

Relevant Planning Documents

The following documents directly influence the scope of this environmental analysis.

- Revised Land and Resource Management Plan for the Ouachita National Forest (USDA Forest Service, 2005a)
- Final Environmental Impact Statement, Revised Land and Resource Management Plan (USDA Forest Service, 2005b)
- Final Rule for Travel Management (36 CFR 212, Subpart B)
- Travel Management Project EA (USDA Forest Service, 2009)

The Revised Forest Plan guides all natural resource management activities for the Ouachita National Forest. The forest management direction, communicated in terms of Desired Conditions (Revised Forest Plan, pp. 6-26); Strategies (Revised Forest Plan, pp. 27-72); and Design Criteria (Revised Forest Plan, pp. 73-123) that apply to the forest lands identified in this proposal are incorporated by reference.

History of the Planning and Scoping Process

The Wolf Pen Gap Project was first listed in the Schedule of Proposed Actions on July 1, 2010. A public meeting was held at Rich Mountain Community College in Mena, Arkansas on July 29, 2010, to discuss opportunities for improving the Wolf Pen Gap road and trail complex. A Project Announcement Letter (PAL) or "scoping letter" dated September 30, 2010, was distributed at a public meeting held in Mena, Arkansas, on that day. Subsequently, it was mailed to interested citizens, organizations, other agencies and tribal officials requesting input on the proposed actions regarding motorized use at Wolf Pen Gap. The PAL was also published to the Forest's website at that time. On October 7, 2010, another public meeting was held in Mena to discuss issues associated with the proposal. There were 17 responses to the PAL. At the October 7th public meeting, 19 comments were documented.

On July 30, 2012, the responsible official mailed a letter inviting those interested to discuss eight preliminary management alternatives with him at the Mena office. The public was invited to drop by or make an appointment during the period August 6 through August 24, 2012. Through one-on-one meetings, phone conversations, and written correspondence, 78 responses were received.

See additional scoping and collaboration activities in Public and Partner Meetings, Appendix A.

On November 5, 2013, the draft environmental assessment (EA) was made available to the public, agencies, organizations and elected officials for an official 30-day notice and comment period under 36 CFR Part 218. Twenty-seven responses (letters or email messages) were received in a timely manner in response to this opportunity to comment. All comments were reviewed carefully by the District Ranger and members of the interdisciplinary team. These reviews led to several changes in the final EA in order to clarify or correct some of the information disclosed therein. No new alternatives were

added. Other changes to the EA were made in response to new information, including the Biological and Conference Opinions issued by the U.S. Fish and Wildlife Service on December 19, 2013.

Objection Process

This project is subject to subparts A and B of 36 CFR Part 218, Project-Level Predecisional Administrative Review Process (objection process) for projects not authorized under the Healthy Forest Restoration Act.

Issues

Issues (cause-effect relationships) serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. Issues also provide a tool for comparing trade-offs for the decision maker and public to understand. Based on a review of internal and external comments, as well as a review of known issues from the Forest-wide Travel Management Project, the Interdisciplinary Team identified the following issues relevant to this project that will be analyzed in depth.

- **Issue 1:** Use limitations (seasonal closures, precipitation event closures, limiting number of users, etc.) may result in a loss of revenue to Wolf Pen Gap businesses and local communities.
  Method of measurement: Months trail system is closed to OHV use.
- **Issue 2:** A loss of or change to the existing road and trail system may negatively impact the recreational opportunity of users.
  Method of measurement: Reduction in miles of OHV road and trail designations.
- **Issue 3:** Motorized use of the road and trail system may produce unwanted noise for local residents and other forest users.
  Method of measurement: Decibel limit
- **Issue 4:** The Forest Service may not have resources available to adequately maintain the road and trail system.
  Method of measurement: Miles of maintenance required.
- **Issue 5:** Sediment from proposed management activities and use of the resulting road and trail system may reduce water quality.
  Method of measurement: Estimated annual sediment yield in tons.
- **Issue 6:** Proposed management activities and use of the resulting road and trail system may have adverse biological effects on proposed, endangered, threatened and sensitive species (PETS) and adverse physical effects to their habitats.
  Method of measurement: Miles of road and trail designated for OHV use within WPG; estimated annual sediment yield in tons.
- **Issue 7:** Mixed use of different kinds and sizes of vehicles on roads and trails may create a safety hazard.
  Method of measurement: Miles of motorized route with mixed use designation.

These issues were used to formulate eight alternatives to the Proposed Action, including a No Action Alternative. These alternatives are described in Chapter 2.

Issues Eliminated From Further Study

This section details issues that are not appropriate for this project or resources that would not be affected by the Proposed Action or alternatives to it, and provides the reasons why these issues were eliminated from further study. Henceforth, the Proposed Action and alternatives will be referred to as "all alternatives."

Civil Rights, Minority Groups, and Environmental Justice. All alternatives would impact minority groups and women in the same manner as all other groups in society. All alternatives will not violate the civil rights of consumers, minority groups or women. There would be no disproportionately adverse environmental or health effects on low-income or minority populations, regardless of alternative.

Pursuant to agency policy at USDA Departmental Regulation 4300-004 and Forest Service policy (FSM 1730.3), the determination that a Civil Rights Impact Analysis (CRIA) and a statement of findings are not needed is documented in the project file.

Federal, State, and Local Laws. All alternatives are legal and would comply with all federal, state, and local laws.

Climate Change. Changing the designated system of roads and trails for public use of motorized vehicles would not affect global climate change. In turn, climate change has no effect on these proposed actions. Current public use of motorized vehicles would be relocated within WPG.

Forest Fragmentation. Forest fragmentation occurs when a landscape is broken into small islands of forest within a mosaic of other forms of land use or ownership. Fragmentation usually refers to permanent changes within the landscape such as farmland developed in the midst of forests or grasslands, or converting forestland into parking lots or residential developments. Changes in motorized use designations would not create notable changes in land use and no changes in ownership. No activities are proposed that would create forest fragmentation.

Special Land Uses, Jurisdictional Wetlands, Wild and Scenic Rivers. There are no parklands, prime farmlands, jurisdictional wetlands, wildernesses, Wild and Scenic Rivers or roadless areas within the Wolf Pen Gap Road and Trail system.

Effects Disclosed

This section lists the affected environment and the environmental effects disclosure appropriate for this project that will be detailed in Chapter 3.

- Recreation
- Local Economy
- Transportation System

- Public Health and Safety
- Air Quality and Noise
- Heritage Program/Cultural Resources
- Soils
- Water Resources and Quality
- Spread of Non-native Invasive Species
- Proposed, Endangered, Threatened, and Sensitive (PETS) Species
- Habitat and Management Indicator Species (MIS)

Decisions to Be Made

The District Ranger is the Responsible Official and must decide which alternative to select. The District Ranger must also determine if the selected alternative would or would not be a major Federal action significantly affecting the quality of the human environment.

Chapter 2
Alternatives Including the Proposed Action

Alternative Design

Technical Requirements and Monitoring Requirements for All Action Alternatives

The following requirements represent part of a concerted effort to minimize damages to cultural resources, soils, watershed condition, native vegetation, wildlife and its habitat, and other resources on public lands.

Cultural Resources

- For cultural resource sites that are eligible for National Register of Historic Places (NRHP) inclusion and for sites that the NRHP eligibility is undetermined: avoidance of historic properties would require the protection from effects resulting from the undertaking. Effects would be avoided by establishing clearly defined site boundaries and buffers around archeological sites where activities might result in an adverse effect. Buffers would be of sufficient size to ensure that integrity of the characteristics and values which contribute to the properties' significance would not be affected (as determined by the zone or Forest Archeologist).
- Should previously unsurveyed or unrecorded heritage resources be discovered, activities that may be affecting that resource will halt immediately; the resource will be evaluated by an archaeologist, and consultation will be initiated with the State Historic Preservation Officer (SHPO), tribes and nations, and the Advisory Council on Historic Preservation, to determine appropriate actions for protecting the resource and mitigating adverse effects. Project activities at that locale will not resume until the resource is adequately protected and until agreed-upon mitigation measures are implemented with SHPO approval.

Water Quality

- Existing routes would be reviewed for compliance with forest design standards and Best Management Practices (BMPs; a site-specific set of BMPs has been developed for Wolf Pen Gap trails). BMP monitoring would be conducted on the trail system at times determined by the District Ranger, whose staff would document a minimum of three such system-wide checks each year. Recommended time frames for monitoring are as follows: within a month after the peak season of use (late May or June); after the main summer season concludes (September); and after the system in closed for much of the winter (January or February). Additional BMP compliance monitoring would take place and be documented for individual trail and road segments during the course of routine patrols and maintenance trips throughout the year.

  - If less than 80% of cross-drain structures are functioning, they would be fixed within 30 days. If prompt corrections (within 30 days) cannot be made, an action plan would be submitted to the Forest Supervisor for approval within this timeframe.
  - With every maintenance entry, berms and ruts caused by use of the trail would be treated to reduce or prevent accelerated erosion and potential sedimentation.
- Place barriers at crossings where monitoring indicates a need to prevent OHV access into the stream channel.
- Large woody debris (LWD) would be removed from crossing structures in conjunction with maintenance activities when the woody material is detrimentally affecting the proper function of the structure. If possible, LWD will be placed downstream of the crossing; otherwise, it will be placed outside of the 100-year floodplain.
- Gravel/sediment would only be removed from stream or river channels with fisheries biologist or hydrologist approval and appropriate State and Federal permits, and it would not be used for road/trail maintenance (will not be placed on roads or trails). This criterion would only be applied when the stream crossing structure is improperly functioning or the crossing structure is threatened or compromised, based on a field review by a fisheries biologist and/or hydrologist.
- Stream surveys comparing the WPG streams to reference streams (Caney and Brushy creeks) would continue using the historic sample protocol (Clingenpeel J. A., 2012) (Clingenpeel and Cochran 1992). The current sampling frequency is every five years; the next sample year would be 2016. Analyses of BASS data would include some of the historic comparisons plus calculations of diversity indices and an index of biotic integrity similar or identical to Roghair and Dolloff (2013).
- Water quality instrumentation would be installed and monitored by the U.S. Geological Survey (USGS) within and downstream from WPG (see Appendix D) under the terms of an agreement between USGS and the Forest Service.

<u>Soils</u>

- Maintain soil health and stability within the watershed.
- Where OHVs are being used outside the designated trail surface, signs or natural barriers should be in place to discourage and prevent this and mitigation measures should be implemented to remedy any damage to the soil resource.
- When soil moisture is higher, especially during and after rainfall events, trail use would be curtailed in order to avoid excessive soil erosion and trail degradation. Volume and intensity of precipitation within rainfall events would inform decisions on trail use (closings and openings) during seasons and periods of wet weather. This threshold has been initially set at 0.4 inches within a 24-hour period, but would be subject to change based on future measurements and assessment of rainfall, trail condition, soil moisture, and their correlation. A Wet Weather Management Plan has been developed to specifically address this (Appendix B).

- Trail segments without sufficient drainage structures and other necessary components in place, or in place but not functioning properly, should be re-constructed to remedy this.
- Trail segments, which are located in areas of potential or existing soil instability, severe erosion, or connectivity to tributaries, should be re-routed to more suitable sites.
- To reduce soil loss from trails and improve water quality, trails and drainage structures should be located and designed to include the following considerations: minimize hydrologic connectivity; avoid sensitive areas such as riparian areas, hydric soils, wetlands, bogs, and unstable landforms; avoid the capture, diversion, and/or concentration of runoff from slopes adjacent to OHV trails; remove storm runoff from the trail surface before it concentrates enough to initiate rilling; dissipate intercepted water by rolling the grade; where trails cannot be effectively drained by rolling the grade or using reverse grades, provide trail drainage using OHV rolling dips; incorporate sediment basins at OHV rolling dip outlets instead of lead off ditches; provide energy dissipaters at OHV rolling dip outlets where sediment basins cannot be installed; incorporate design elements that discourage off-route use (e.g., taking shortcuts, cutting new lines); extend drainage outlets beyond the toe of fill or side-cast.
- Where trails are re-constructed or constructed, soil moisture content in the trail surface should be sufficient to enhance compaction for optimum soil strength. Soils exceeding 35 percent by volume of rock fragments will require more time and moisture to compact.
- Where trails are re-constructed or constructed, adjacent areas of loose soil material should be re-vegetated by seeding and covering with hay or mulch in order to stabilize the soils, prevent erosion, and discourage OHV use off the trail.
- Where soils in the approaches to watercourse crossings are exposed, they should be armored with rock or with some other mitigation measure so that erosion from up-slope water and splashing water from OHV tires can be reduced in order to minimize sedimentation.
- OHV operations in or near natural drainages, springs, seeps, areas subject to frequent flooding, or near open bodies of water would be minimized.
- Monitor sediment basin effectiveness (see TNC Monitoring Protocol, Appendix C).

<u>Proposed, Threatened, and Endangered Species</u>

- Coordinate with the USDI Fish and Wildlife Service on monitoring activities associated with federally listed aquatic species' distribution and abundance, and aquatic habitat condition/health.

<u>Non-Native Invasive Species</u>

- Monitor for new infestations of non-native species (NNIS). The Forest will follow the "Prioritizing, Prevention and Control Process for NNIS" developed for the Ouachita NF to treat infestations.

Compliance and Use

- Conduct motor vehicle use counts to determine use levels. This would be accomplished with a systematic count of numbers and types of OHV and highway legal vehicles.
- Annually review law enforcement data including check points, accidents and citations.

Recreation

- Implement Trails Unlimited "Best Management Practices" for trail design (http://www.fs.fed.us/nepa/fs-usda-pop.php/?project=33235).
- Conduct trail condition surveys according to the Trail Condition Assessment Survey Matrix.

Public Safety

- Conduct mixed use analysis on all roads within the trail system once the project is fully implemented. Analysis would occur every 5 years, more frequently as deemed necessary by the District Ranger.

Alternatives Considered But Eliminated from Detailed Study

An alternative was considered (formerly ***Alternative H***) that employed a formal adaptive management strategy. Upon further consideration, it was determined that adaptive approaches could be incorporated into all action alternatives.

An alternative was considered to allow only highway legal vehicles on roads (no OHVs). This "no mixed use" alternative would result in a disconnected system, creating dead end segments.

An alternative was considered that would close and obliterate all trails (roads open to all motorized vehicles would be retained). This alternative would not provide a different result or additional opportunity than other alternatives.

An alternative was considered that would permanently decommission the short-term resource protection trail closures; the remainder of the system would remain unchanged. This alternative would not provide a different result or additional opportunity than other alternatives.

As part of alternative development, in addition to these alternatives considered but eliminated from detailed study, there was also discussion on specific route locations, different combinations of routes, converting all roads to trails, and various use limitation methods (i.e. different seasons of use, lottery system).

Alternatives Documented in Detail

Activities Common to All Alternatives

In addition to using designated routes, the public would be able to park motor vehicles legally on NFS lands in designated trailheads or within 24 feet from the edge of roads and trails designated for motorized use and not posted as closed to parking.

Wolf Pen Gap would be closed to OHVs 1 hour after sunset until 1 hour before sunrise (dusk until dawn).

Activities Common to All Action Alternatives

User-created trails would be obliterated and the forest floor would be restored to a natural condition.

Unless otherwise stated in Alternative description, all old route footprints (resulting from proposed closures or relocations) would be obliterated and the forest floor would be returned to a natural condition.

Stabilize shale-pit/watershed restoration: reshape to redirect and disperse channeled surface water flow, install natural erosion barriers and rock on user-created trails, and prepare beds for planting shortleaf pine, black locust, and native grasses.

Stream crossing improvements: typical types and estimated quantities are shown in Alternative descriptions. Improvement types are based on size of stream crossing and route type (road or trail). Types listed are those currently used on the WPG road and trail system. Since we are taking an adaptive approach, the most appropriate stream crossing improvement method would be applied during implementation. Other improvement methods include rocked watercourse crossings, French drains, and gravel surface crossing approaches. *Note: estimated quantities include improvements on closed roads; prior to opening closed roads to public use or utilization for future management actions, such as timber salvage, crossings would be improved.*

Restrict OHV noise to 96 decibels.

Definitions - Road and Trail Motorized Use Designations

Road Designations

Highway (Hwy) and OHV – year round: Roads open to all vehicles, yearlong

Hwy only – year round: Roads open to highway legal vehicles only, yearlong

Hwy year round – WPG Seasonal OHV: Roads open to highway legal vehicles yearlong and open to OHVs, seasonally (*season varies by Alternative*)

WPG Seasonal – OHV and Hwy: Roads open to highway legal vehicles and OHVs, seasonally – February 1 through October 31

Seasonal – OHV and Hwy: Roads open to highway legal vehicles and OHVs, seasonally – September 1 through February 28

Seasonal – Highway only: Roads open to highway legal vehicles only, seasonally – September 1 through February 28

Trail Designations

OHV – year round: Trails open yearlong to:

- All-terrain vehicles that travel on three or more low-pressure tires; have handle bar steering; are less than or equal to 50 inches in width; and have a seat to be straddled by the operator;

- Vehicles with a seat or saddle and designed to travel with two wheels in contact with the ground;

- Vehicles 64 inches or less in width, designed to travel on four or more low pressure tires and having a bed for cargo.

WPG Seasonal OHV: Trails open to OHVs (as defined above), seasonally (*season varies by Alternative)*

Alternative A
(No Action)

This alternative serves as a baseline against which the effects of each action alternative can be compared. It reflects the existing system at the time the Forest-level travel management decision was made (January 2010), prior to short-term resource protection closures and implementation of new trail management practices. Currently designated roads and motorized trails remain designated. No changes to the transportation system would occur (i.e., new construction, obliteration).

Table 2. Alternative A - Designated Road and Trail Use

Designated Road Use	**Estimated Miles**
Highway (Hwy) and OHV – year round	20.2
Hwy only – year round	3.2
Road Total	23.4
Designated Trail Use	**Estimated Miles**
OHV – year round	18.3
Trail Total	18.3
Total WPG Routes	**41.7**

Alternative B

Alternative B (Proposed Action) as described in Chapter 1. See page 3 and Appendix E (Alternative B map) for more detail.

Table 3. Alternative B - Designated Road and Trail Use

Designated Road Use	**Estimated Miles**
Highway (Hwy) and OHV – year round	6.1
Hwy only – year round	2.9
Hwy year round – WPG Seasonal OHV[1]	14.3
WPG Seasonal – OHV and Hwy	1.1
Road Total	24.4
Designated Trail Use	**Estimated Miles**
WPG Seasonal OHV[1]	16.9
Trail Total	16.9
Total WPG Routes	**41.3**

[1] Season: February 1 through October 31

Alternative C
(Additional Resource Protection)

This alternative is a combination of some routes from the proposed action and some Trails Unlimited proposed routes that were selected based on soil types and to reduce (1) impacts to sensitive species, (2) connectivity to stream courses and (3) sediment. See Appendix E (Alternative C map). This alternative includes the analysis of three separate seasons of OHV use to further reduce impacts from sediment (see Table 4 footnote). OHV use would be limited to one of these three seasons.

Table 4. Alternative C - Designated Road and Trail Use

Designated Road Use	**Estimated Miles**
Highway (Hwy) and OHV – year round	5.6
Hwy only – year round	3.2
Hwy year round – WPG Seasonal OHV[1]	7.2
Road Total	16
Designated Trail Use	**Estimated Miles**
WPG Seasonal OHV[1]	22.6
Trail Total	22.6
Total WPG Routes	**38.6**

[1] Season(s):
- March 15 – August 31
- March 15 – March 31; June 1 – November 30
- March 15 – April 15; May 1 – July 31; September 1 – October 15

In addition to the changes made to WPG road and trail designations, the following activities are proposed:

- Stream crossing improvements (as many as 252)
  - 246 culverts, cement planks, or arch culverts
  - 3 trail bridges
  - 3 road bridges
- Gate installations
  - 11 wet weather management
- Obliterate closed road 48335 and restore the forest floor to a natural condition
- Obliterate "warm-up" trail located at the West Trailhead parking lot
- Foot trail construction to Hawk's Gap Overlook
- Close FS roads 48325, 48327, and 48320 that are currently open seasonally (administrative use – maintenance level one)
- Equip two vistas with picnic tables
- Build pavilion at the North Trailhead and equip with picnic tables

Alternative D
(Additional OHV Trail Miles)

In addition to the routes proposed in Alternative B (Proposed Action), this alternative includes several routes proposed by the public and a few routes proposed by Trails Unlimited that were specifically developed to provide additional recreational opportunities. See Appendix E (Alternative D map).

Table 5. Alternative D - Designated Road and Trail Use

Designated Road Use	**Estimated Miles**
Highway (Hwy) and OHV – year round	21.2
Hwy only – year round	2.9
Road Total	24.1
Designated Trail Use	**Estimated Miles**
OHV – year round	37
Trail Total	37
Total WPG Routes	**61.1**

In addition to the changes made to the Wolf Pen Gap road and trail system routes and designations, the following activities are proposed:

- Stream crossing improvements (as many as 364)
  - 352 culverts, cement planks or arch culverts
  - 9 trail bridges
  - 3 road bridges
- Gate installations (31)
  - 4 administrative use
  - 27 wet weather management
- Obliterate "warm-up" trail located at the West Trailhead parking lot
- Relocate "warm-up" trail
- Equip two vistas with picnic tables
- Build pavilion at the North Trailhead and equip with picnic tables
- Retain old footprint of FS Road 243 (resulting from proposed relocation/reconstruction) for administrative use – maintenance level 1
- Adds FS roads 48325, 48327, 48320 to the WPG Road and Trail System; changes their designation from open seasonally (September 1 through February 28) to Highway and OHV – year round

Alternative E
(No OHV Use)

This alternative retains the existing condition for roads except no OHV use would be allowed; all trails would be closed and obliterated. See Appendix E (Alternative E map).

Table 6. Alternative E - Designated Road and Trail Use

Designated Road Use	**Estimated Miles**
Hwy only – year round	24.0
Road Total	24.0
Designated Trail Use	**Estimated Miles**
Trail Total	0
Total WPG Routes	**24.0**

In addition to the changes made to WPG trail designations, the following activities are proposed:

- Stream crossing improvements (as many as 133)
  - 130 culverts, cement planks or arch culverts
  - 3 road bridges
- Obliterate "warm-up" trail located at the West Trailhead parking lot
- Motorized use designations for FS roads 48325, 28327, and 28320 would be changed from:

  Seasonal – OHV and highway (September 1 – February 28)
  to
  Seasonal – Highway only (September 1 – February 28)

Alternative F
(Minimal Change)

In regard to physical changes to the transportation system and changes in motorized use designations, this alternative would be similar to Alternative A (No Action), except that trails subject to short-term closures would be permanently decommissioned and two routes (Trail 836 and a portion of Trail 8) would be relocated. No other changes to the transportation system would occur; currently designated roads and motorized trails would remain designated. See Appendix E (Alternative F map).

Table 7. Alternative F – Designated Road and Trail Use

Designated Road Use	Estimated Miles
Highway (Hwy) and OHV – year round	21.5
Hwy only – year round	3.2
Road Total	24.7
Designated Trail Use	**Estimated Miles**
OHV – year round	16.1
Trail Total	16.1
Total WPG Routes	**40.8**

Additional activities included:

- Stream crossing improvements (as many as 236)
  - 231 culverts, cement planks or arch culverts
  - 2 trail bridges
  - 3 road bridges
- Gate installations
  - 14 wet weather management
- Equip two vistas with picnic tables
- Build pavilion at the North Trailhead and equip with picnic tables

Alternative G

(Modified Resource Protection)

In regard to route locations, this alternative is similar to Alternative C, but includes modifications (actions from other Alternatives) to satisfy some other resource needs (i.e., recreational opportunities, access to wildlife openings). See Appendix E (Alternative G map).

Table 8. Alternative G - Designated Road and Trail Use

Designated Road Use	Estimated Miles
Highway (Hwy) and OHV – year round	13.2
Hwy only – year round	3.2
Road Total	16.4
Designated Trail Use	**Estimated Miles**
OHV – year round	22.8
Trail Total	22.8
Total WPG Routes	**39.2**

Additional actions proposed:

- Stream crossing improvements (as many as 269)
  - 263 culverts, cement planks or arch culverts
  - 3 trail bridges
  - 3 road bridges
- Gate installations (15)
  - 4 administrative use
  - 11 wet weather management
- Foot trail construction to Hawk's Gap Overlook
- Equip two vistas with picnic tables
- Build pavilion at the North Trailhead and equip with picnic tables
- Obliterate "warm-up" trail located at the West Trailhead parking lot
- Relocate "warm-up" trail
- Retain old footprint of FS Road 243 (resulting from proposed relocation/reconstruction) for administrative use – maintenance level 1

Alternative H
(Adaptive Management – Seasonal Use Restrictions)

See Alternatives Considered But Eliminated From Detailed Study (page 15).

Alternative I
(Modified Season)

This alternative includes a modified OHV season of use. In regard to route locations, this alternative is the same as Alternative G with the exception of Trail 826; most of the existing route would be retained for OHV travel. A small turn-around and barrier would be installed near the intersection of Trail 8 and Trail 826. From this point to the top of the ridge (Hawk's Overlook), the trail would be foot traffic only. See Appendix E (Alternative I map).

Table 9. Alternative I –Designated Road and Trail Use

Designated Road Use	**Estimated Miles**
Highway (Hwy) and OHV – year round	5.6
Hwy only – year round	3.2
Hwy year round – WPG Seasonal OHV	7.6
Road Total	16.4
Designated Trail Use	**Estimated Miles**
WPG Seasonal OHV	23.2
Trail Total	23.2
Total WPG Routes	**39.6**

For routes designated as "WPG Seasonal OHV," OHV use would be limited to the following time periods:

- 2nd Friday of March through October 31
- 3 days before Thanksgiving through 2 days after Thanksgiving
- December 25 through January 2

In addition to the changes made to WPG road and trail designations, the following activities are proposed:

- Stream crossing improvements (269)
  - 263 culverts, cement planks or arch culverts
  - 3 trail bridges
  - 3 road bridges
- Gate installations (15)
  - 4 administrative use
  - 11 wet weather management
- Foot trail construction to Hawk's Gap Overlook
- Equip two vistas with picnic tables
- Build pavilion at the North Trailhead and equip with picnic tables
- Obliterate "warm-up" trail located at the West Trailhead parking lot
- Relocate "warm-up" trail
- Retain old footprint of FS Road 243 (resulting from proposed relocation/reconstruction) for administrative use – maintenance level 1

Alternative J
(Rotation)

This alternative employs a rotation schedule; OHV use would be rotated on a yearly basis between two portions of WPG, roughly east/west halves of the road and trail system. Portions of Trails 6 and 8 would remain open each year to provide access to the system.

In regard to route locations, this alternative is the **same** as Alternative G with the exception of Trail 826; most of the existing route would be retained for OHV travel. A small turn-around and barrier would be installed near the intersection of Trail 8 and Trail 826. From this point to the top of the ridge (Hawk's Overlook), the trail would be foot traffic only. See Appendix E (Alternative J maps).

Table 10. Year One Alternative J - Designated Road and Trail Use

Designated Road Use	Estimated Miles
Highway (Hwy) and OHV – year round	11.3
Hwy only – year round	5.1
Road Total	16.4
Designated Trail Use	**Estimated Miles**
OHV – year round	9.4
Trail Total	9.4
Total WPG Routes	**25.8**

Table 11. Year Two Alternative J - Designated Road and Trail Use

Designated Road Use	Estimated Miles
Highway (Hwy) and OHV – year round	7.5
Hwy only – year round	8.9
Road Total	16.4
Designated Trail Use	**Estimated Miles**
OHV – year round	17.4
Trail Total	17.4
Total WPG Routes	**33.8**

In addition to the changes made to the Wolf Pen Gap road and trail system routes and designations, the following activities are proposed:

- Stream crossing improvements (as many as 269)
  - 263 culverts, cement planks or arch culverts
  - 3 trail bridges
  - 3 road bridges
- Gate installations (15)
  - 4 administrative use
  - 11 wet weather management
- Foot trail construction to Hawk's Gap Overlook
- Equip two vistas with picnic tables
- Build pavilion at the North Trailhead and equip with picnic tables
- Obliterate "warm-up" trail located at the West Trailhead parking lot
- Relocate "warm-up" trail
- Retain old footprint of FS Road 243 (resulting from proposed relocation/reconstruction) for administrative use – maintenance level 1

Other Past, Present, and Reasonably Foreseeable Future Actions

A decision to implement the "Wolf Pen Gap Trail Complex Safety and Enhancement Proposal" was made in 2005. The project included the following actions, which were implemented through 2010:

- Close and decommission approximately 4.94 miles of existing road
- Construct approximately 2.54 miles of new road
- Close and decommission approximately 2.02 miles of existing OHV trail
- Construct approximately 1.72 miles of new OHV trail
- Add approximately 2.16 miles of existing road to the WPG Trail Complex
- Close 7 existing campsites
- Develop 8 new campsites
- Develop 3 new helispots
- Stabilize 21 stream crossings
- Develop a 1-2 acre trailhead
- Install gate on road 48320 north of road 48330 junction to seasonally close approximately 3.77 miles of road from March 1 – August 31
- Place an earthen mound approximately 0.75 mile from the end of road 48320
- Close the WPG Trail Complex from dusk until dawn

A decision to implement the "WPG Aquatic Habitat Improvement Project" was made in 2010. The project included one stream crossing improvement structure and less than 0.3 miles of road reconstruction to align with the new structure. This decision was not implemented.

The *Wolf Pen Gap Trail Complex Interim Management Plan* was developed in 2010 as a way to guide actions aimed at reducing sedimentation in WPG streams while this 2014 EA was being prepared. Implementation of the Interim Management Plan and Best Management practices (BMPs) has resulted in some improvement of road and trail conditions and facilitated coordination and collaboration among stakeholders toward the goal of a more sustainable system of motorized routes at WPG.

In 2011, approximately 5 miles of trail were closed for emergency resource protection under a Forest Supervisor Closure Order.

For the last several years, there has been growing public support for charging a user fee for Wolf Pen Gap. Charging a user fee would provide additional resources for system maintenance. Forest Managers plan to seek approval for implementing user fees through a separate administrative process.

An exchange of 81 acres of National Forest lands for 80 acres of privately owned land within the WPG vicinity is scheduled for fiscal year 2014. There are no additional planned management actions for the land that the Forest Service would be acquiring.

Polk County Judge, Brandon Ellison, and The Nature Conservancy (TNC) propose to implement an unpaved road improvement project within the Camp Creek subwatershed,

consisting of 0.5 miles of drainage repair activities on County Road 61 and replacement of an undersized and damaged box culvert with an open-arch, natural stream bottom crossing.

Summary Comparison All Alternatives

The following tables provide a comparison of alternatives utilizing both quantitative and qualitative measures.

Table 12. Comparison of Resulting WPG Complex by Alternative

	Alternative									
	Estimated Miles									
	A	B	C	D	E	F	G	I	J - 1	J - 2
Designated Road Use	No Action	Proposed Action	Additional Resource Protection	Additional OHV Miles	No OHV Use	Minimal Change	Modified Resource Protection	Modified Season	Rotation Year One	Rotation Year Two
Highway (Hwy) and OHV – year round	20.2	6.1	5.6	21.2	0	21.5	13.2	5.6	11.3	7.5
Hwy only – year round	3.2	2.9	3.2	2.9	24.0	3.2	3.2	3.2	5.1	8.9
Hwy year round – WPG Seasonal OHV	0	14.3	7.2	0	0	0	0	7.6	0	0
WPG Seasonal – OHV and Hwy	0	1.1	0	0	0	0	0	0	0	0
Road Total	23.4	24.4	16	24.1	24	24.7	16.4	16.4	16.4	16.4
Designated Trail Use										
OHV – year round	18.3	0	0	37	0	16.1	22.8	0	9.4	17.4
WPG Seasonal OHV	0	16.9	22.6	0	0	0	0	23.2	0	0
Trail Total	18.3	16.9	22.6	37	0	16.1	22.8	23.2	9.4	17.4
Total WPG Routes	**41.7**	**41.3**	**38.6**	**61.1**	**24**	**40.8**	**39.2**	**39.6**	**25.8**	**33.8**

Table 13. Comparison of OHV Season of Use by Alternative

Alternative	OHV Season of Use	Months
A – No Action	Yearlong	12
B – Proposed Action	February 1 – October 31	9
C – Additional Resource Protection	March 15 – August 31	5½
	March 15 – March 31; June 1 – November 30	
	March 15 – April 15; May 1 – July 31; September 1 – October 15	
D – Additional OHV Miles	Yearlong	12
E – No OHVs	Not Applicable	N/A
F – Minimal Change	Yearlong	12
G –Modified Resource Protection	Yearlong	12
I – Modified Season	2nd Friday of March through October 31 & 3 days before Thanksgiving through 2 days after Thanksgiving & December 25 through January 2	8
J – Rotation	Yearlong	12

Table 14. Comparison of Change in WPG Roads and Trails by Alternative

	Alternative								
	Change from Current Motorized Use (miles)*								
	B	C	D	E	F	G	I	J - 1	J - 2
Designated Road Use	**Proposed Action**	**Additional Resource Protection**	**Additional OHV Trail Miles**	**No OHV Use**	**Minimal Change**	**Modified Resource Protection**	**Modified Season**	**Rotation Year One**	**Rotation Year Two**
Highway (Hwy) and OHV – year round	-14.1	-14.6	None	-20.2	+1.3	-7.0	-14.6	-8.9	-12.7
Hwy only – year round	-0.3	None	-0.3	+20.8	None	None	None	+1.9	+5.7
Hwy year round – WPG Seasonal OHV	+14.3	+7.2	None	None	None	None	+7.6	None	None
WPG Seasonal – OHV and Hwy	1.1	None	None	None	None	None	None	None	None
Road Total Change	**+1.0**	**-7.4**	**+0.7**	**+0.6**	**+1.3**	**-7.0**	**-7.0**	**-7.0**	**-7.0**
Designated Trail Use									
OHV – year round	-18.3	-18.3	+18.7	-18.3	-2.2	+4.5	-18.3	-8.9	-0.9
WPG Seasonal OHV	+16.9	+22.6	None	None	None	None	+23.2	None	None
Trail Total Change	**-1.4**	**+4.3**	**+18.7**	**-18.3**	**-2.2**	**+4.5**	**+4.9**	**-8.9**	**-0.9**

*Alternative A (No Action) serves as the baseline to which change from current motorized use is compared.

Table 15. Alternatives Ranked by Degree to which they Meet Purpose and Need and Objectives (with 1st being the highest and 9th the lowest)

Purpose and Need and Objectives (Measure)		Alternative								
		A	B	C	D	E	F	G	I	J
		No Action	Proposed Action	Additional Resource Protection	Additional OHV Miles	No OHV Use	Minimal Change	Modified Resource Protection	Modified Season	Rotation
Recreation opportunities for OHV enthusiasts are available within an integrated system of designated roads and trails; designated OHV routes provide a high-quality OHV experience. (Months open & OHV miles available)		**2nd**	**5th**	**6th**	**1st**	**9th**	**3rd**	**4th**	**7th**	**8th**
Develop and operate a system of OHV routes that satisfies some public demands for motorized recreation and protects environmental quality. (Sediment & Route miles)		**6th**	**3rd**	**1st**	**7th**	**9th**	**5th**	**4th**	**2nd**	**8th**
The transportation system of roads and trails is:	Safe (mixed use miles)	**5th**	**7th**	**3rd**	**6th**	**1st**	**7th**	**4th**	**4th**	**2nd**
	Affordable (implementation cost)	**1st**	**4th**	**3rd**	**8th**	**2nd**	**6th**	**5th**	**7th**	**7th**
	Environmentally sound (resource protection)	**9th**	**7th**	**2nd**	**8th**	**1st**	**6th**	**4th**	**5th**	**3rd**
	Responds to public needs (WPG system availability & miles)	**2nd**	**5th**	**6th**	**1st**	**9th**	**3rd**	**4th**	**7th**	**8th**
	Efficient to manage (maintenance cost)	**5th**	**7th**	**2nd**	**8th**	**1st**	**6th**	**3rd**	**4th**	**4th**

Table 16. Comparison of Issues/Effects by Alternative

Issue/Effect Method of Measure	Alternative									
	A	B	C	D	E	F	G	I	J	
									Yr 1	Yr 2
#1 – Loss of revenue Number of months per year the trail system is closed to OHVs*	0	3	6.5	0	12	0	0	4	0	
#2 - Loss of recreational opportunity Reduction of miles available for OHV use	N/A	-0.1	-3.1	+19.7	-38.5	-0.9	-2.5	-2.1	-17.8	-13.6
#3 – Nuisance noise 96 Decibel limit	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
#4 – Inadequate resources for maintenance WPG road and trail system miles	41.7	41.3	38.6	61.1	24	40.8	39.2	39.6	39.6	
#5 – Water quality degradation from sediment Sediment delivery in tons per year	1,435	1,053	588	1,215	341	932	882	892	804	793
#6 – Negative impact on PETS Miles of route designated for OHV use	38.5	38.4	35.4	58.2	0.0	37.6	36.0	36.4	20.7	24.9
within Camp Creek subwatershed/ Sediment delivery in tons per year	1,435	1,053	588	1,215	341	932	882	892	804	793
#7 – Safety hazard of mixed use Road miles of motorized mixed use	20.2	21.5	12.8	21.2	0.0	21.5	13.2	13.2	11.3	7.5

*Does not include an estimate of wet weather management closures.

Chapter 3
Affected Environment and Environmental Consequences

Recreation

Current Conditions

Wolf Pen Gap (WPG), which consists of about 16,618 acres (13,477 acres National Forest and 3,141 acres private) located in western Arkansas, is noted for its rugged terrain, abundant motorized recreation opportunities, and diverse plant and wildlife communities.

The typical OHV visitor (customer segment) to WPG as described anecdotally from WPG managers is one similar to the *Social Affiliation* segment which includes families, clubs, and extended groups. This customer segment desires natural settings, favors interaction with other like-minded users, safe moderate trail conditions, and adequate access facilities with appropriate information and regulation enforcement to realize desirable beneficial personal outcomes (Baker & Cordell, 2007) (Driver & Peterson, 1991). Primary participants are thought to predominantly derive from northeastern Texas and northwestern Louisiana from communities such as Texarkana, Longview, Lufkin and Shreveport, based on field contacts with visitors by Forest Service employees. As the community of Mena, Arkansas, is the "gateway" to WPG, its economy and community are affected.

WPG is coincident with Arkansas Game and Fish Commission deer unit 11 and is, like most National Forest System lands, open to hunting during state regulated seasons. Season dates vary little from year to year and typically involve an archery season which occurs from late September to late February, a muzzleloading season which generally occurs from mid-October to the end of October and a modern gun season which occurs from early November to the beginning of December. A "Christmas" modern gun season occurs for a few days following Christmas Day.

The Recreation Opportunity Spectrum (ROS) is a method for classifying types of recreation environments, activities and "experience opportunities" or for specifying recreation setting objectives desired in discrete land units. Classes range from Primitive to Urban and are divided into three distinct components – the *physical setting* which is the character of the land and built environment, the *social setting* which describes the recreation and tourism use, and finally the *operational setting* which describes the character of recreation and tourism provider services and management controls (Stankey & Hendee, 1978). Generally, WPG most resembles the following classifications with the preponderance of the project area falling into the Roaded Natural category – Figure 3 depicts a matrix of current setting characteristics.

	Setting	Class					
		Primitive	Back Country	Middle Country	Front Country	Rural	Urban
Phys.	Remoteness			X	X		
	Naturalness			X	X		
	Facilities			X			
Social	Group Size			X	X	X	
	Contacts			X	X	X	
	Types of Encounters			X	X	X	
	Personal Gear/Equipment			X	X	X	
	Evidence of Use.			X	X	X	
Operational	Visitor Services			X	X		
	Mgmt. Controls			X	X		
	Domestic Animals				X	X	
	Individual Use Fees	X					
	Use Restrictions			X	X	X	
	Travel Mode/Access			X	X		

Figure 3. Current Recreation Settings in WPG.

Middle Country (MC): Area characterized by a predominantly natural or natural-appearing environment of 2,500 or more acres with a moderately high probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk. Motorized use is permitted.

Front Country (FC): Area characterized by a predominantly natural or natural appearing environment with a low probability of experiencing isolation from the sights and sounds of man. Interaction between users may be low to moderate, but with evidence of other users prevalent. Conventional motorized use is provided for in construction standards and design of facilities. Opportunities for both motorized and nonmotorized forms of recreation may be provided.

Rural (R): Area characterized by a substantially modified natural environment with a low probability of experiencing isolation from the sights and sounds of man. A considerable number of facilities are designed for use by a large number of people. Facilities for intensified motorized use and parking are provided.

Figure 4 depicts use data gathered by trail counters from March 2010 to March 2011 and from February 2012 to February 2013. A monthly average of the two time periods is also shown. In a one year time frame (2010/2011), a total of 13,655 vehicles were estimated to pass a certain location within WPG; the 2012/2013 estimate was 13,350; the average was 13,500 passes. The highest figure (13,655 passes) is used as a baseline when deriving growth trends and for the sake of relative analysis between differing action alternatives. Figure 5 includes an additional historic use estimate based on 1998 trail counter data.

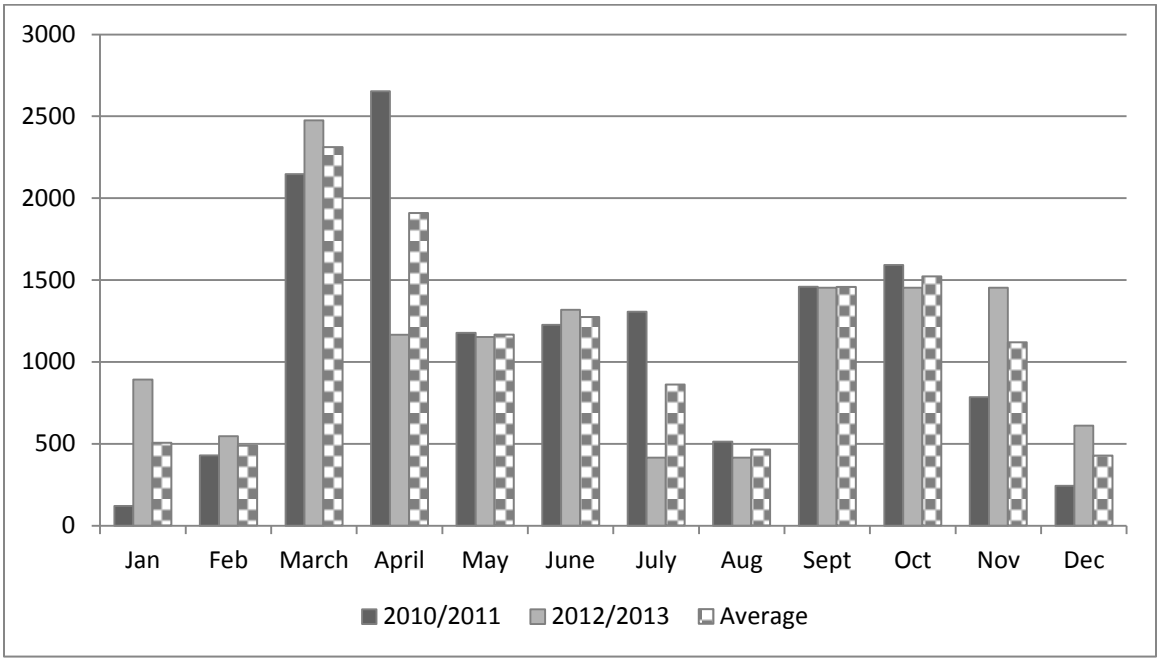

Figure 4. Wolf Pen Gap OHV Use Monitoring.

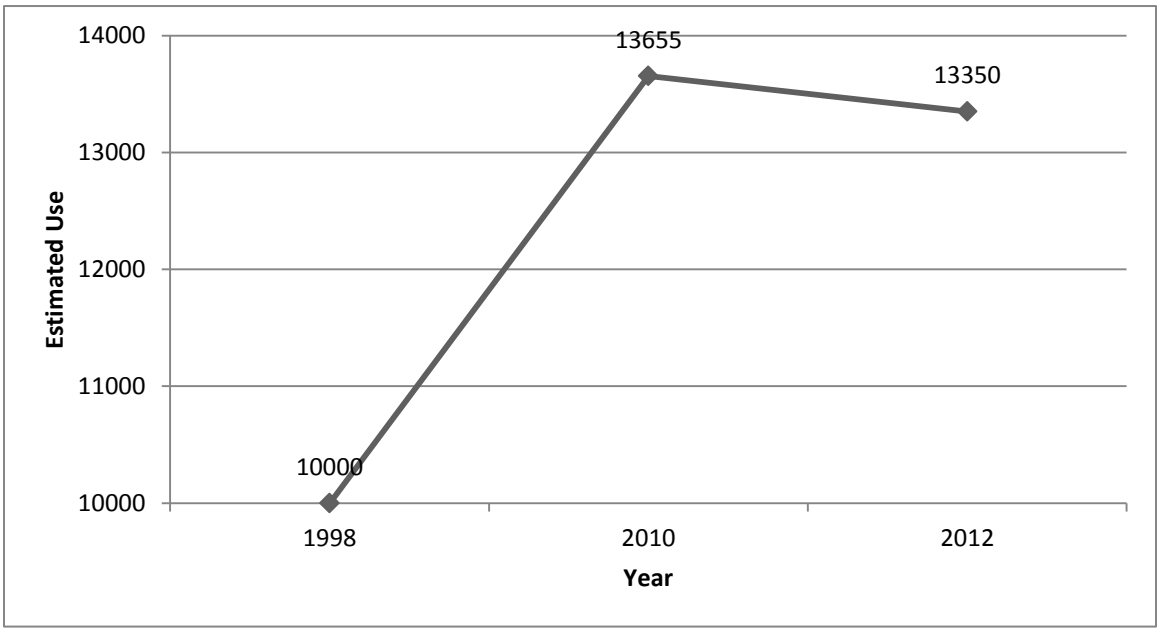

Figure 5. WPG Road and Trail Historic Use Estimates.

Issue 2. ***A loss of or change to the existing road and trail system may negatively impact the recreational opportunity of users.***

Effects

Based on public comments, it seems reasonable to say that two distinct factions developed concerning continued OHV use at WPG emerged – those who would like to see opportunities increase and those that would prefer to manage for fewer (or no) OHV opportunities at WPG. Generally speaking, those that were in favor of increases are active participants or affected businesses, while those in favor of fewer opportunities are neighbors that are concerned about their safety, the safety of users and the perceived imposition of noise and dust that OHV use poses to their neighborhood and private land.

When analyzing actions for outcomes, beneficial and negative, active participants, the community (neighbors), the economy and the environment are involved. For the sake of this analysis, primarily the active participants will be discussed in detail as other components are analyzed in detail in different sections of this assessment. It is important to point out that the action alternatives do not identify the preferred customer segment and therefore activity type, so it is presumed that OHVs such as "four-wheelers and "UTVs" are the prescribed activity type, not other types of off-road vehicles (such as full size 4x4's).

Among the multitude of alternatives, actions that have impact on recreation setting components (physical, social and operations) will be analyzed. Most change occurs with respect to differences in the amount of available OHV mileage open for use, seasons of use and minor modifications in recreation facility development. Both seasons of use and availability of OHV access are operational in nature while minor modifications in recreation facilities are a physical component.

Operational Setting Components

Figure 6 depicts the amount of open OHV routes (both road and trail) that will available for OHV recreation opportunities by alternative. Clearly, Alternative D has the most mileage of all types while Alternative E has no OHV opportunities and all others have some combination of the two types. Generally, for the *Social Affiliation* customer segment, trail design is an important factor in their attainment of beneficial outcomes Alternatives C, D, G, and I seem to best facilitate beneficial outcomes for that customer segment. Alternative E, with no OHV use, would clearly provide only disbenefits to active participants, as they would have no opportunity in the setting to participate in their favored activity.

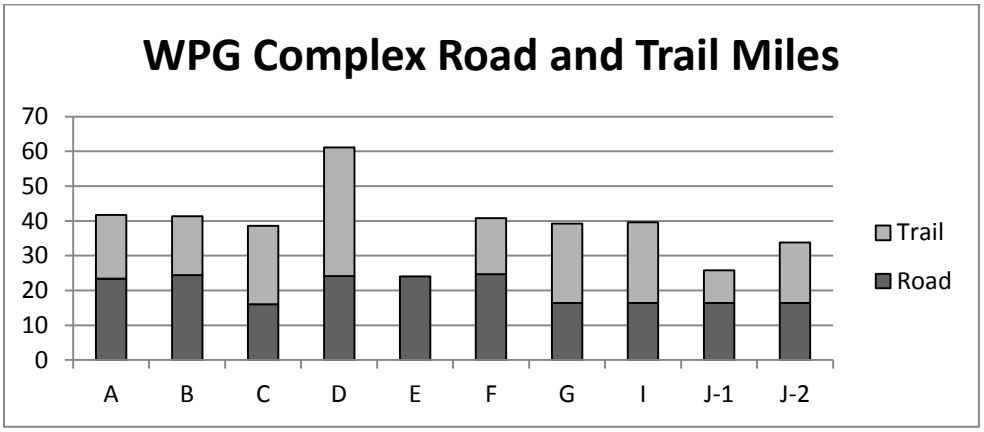

Figure 6. WPG Road and Trail Miles by Alternative.

The other operational component that is discussed in many action alternatives is the idea of restricting OHV use to specific seasons of use, and these are depicted below in Table 17. Public comment was clear that this was not a preferred method of management. However, it should be noted that the seasons of use in action alternatives were crafted to generally follow what appear to be current patterns and trends in use. In addition, it remains a question if active participants of the *Social Affiliation* customer segment, traveling from 4 to 5 hours distance would necessarily stop coming to WPG based on the season of use factor alone. To reiterate, as the *Social Cohesion* customer segment tends to ride in groups and doing so requires planning and information (Baker & Cordell, 2007), it would seem that a known season of use would not deter such users. However, if the user is more local, such as an adjacent neighbor, this could certainly be detrimental to their benefit attainment. With regard to hunting (deer hunting specifically), *motorized* access may be limited by some alternatives which define seasons of OHV use; however, hunting as an activity is never eliminated by any alternative.

Additionally, if another desired beneficial outcome is increased tourism dollars, as stated by many commenters, and tourists, by definition, are non-local and come from some distance to ride OHVs, the seasons of use may provide increased tourism while decreasing opportunities of the local market segment to ride at any time.

Table 17. OHV Season of Use by Alternative

Alternative	OHV Season of Use	Months
A	Yearlong	12
B	February 1 – October 31	9
C	March 15 – August 31	5½
	March 15 – March 31; June 1 – November 30	
	March 15 – April 15; May 1 – July 31; September 1 – October 15	
D	Yearlong	12
E	Not Applicable	N/A
F	Yearlong	12
G	Yearlong	12
I	2nd Friday of March through October 31 & 3 days before through 2 days after Thanksgiving & December 25 through January 2	8
J	Yearlong	12

Physical Setting Components

Action alternatives also include changes to setting components by removing or constructing/improving facilities. Table 18 illustrates these proposed modifications/improvements by alternative.

Table 18. Setting Component Change by Alternative

Modification	Alternative								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
Obliterate warm-up trail		●	●	●	●		●	●	●
Relocate warm-up trail				●			●	●	●
Foot trail construction		●	●				●	●	●
Install picnic tables at vistas			●	●		●	●	●	●
North Trailhead pavilion & picnic tables installation			●	●		●	●	●	●

Generally speaking, the *Social Cohesion* market segment, made up of families, groups, and clubs, represents most customers at WPG. With this market segment in mind, it appears that any of the proposed improvements would provide additional benefit attainment, should they be developed, while the simple obliteration of the "warm-up trail" may make it difficult to "train" younger family or group members in a safer, more secure environment.

Indirect Effects

Indirect effects of recreation can be described as those that occur off-site and or post activity. Indirect effects attributed to the *Social Affiliation* market segment may include strengthened relationships with family and friends, greater family bonding, improved local economic stability, increased local tourism revenue, greater community ownership

and stewardship of recreation and natural resources and improved soil, water and air quality. While these attributes are difficult to quantify in this particular analysis due to the lack of specific data, it is certainly feasible that although near-term individual benefits are often easy to ascertain, the recreation experience produces benefits far after and distant from the activity itself (Driver & Peterson, 1991)

Another indirect effect is that two spur or camp roads providing motorized access to designated dispersed campsites may be affected by the project. Alternative C would obliterate the parent road of spur 48320AC, which serves one campsite; Alternatives B and D would reroute the parent road of spur 277AC, which also serves one campsite. Under these alternatives, motorized access would no longer be provided to these campsites.

Long-term Use Trends

By utilizing current use data and known national trends in OHV use, growth in use can be expected to be as much as 2.3% per year (Cordell, 2005).

Cumulative Effects

Implementation of the forest-wide Travel Management Project (2010 decision) closed the forest floor to most motorized use by the public and led to publication of maps showing which roads and trails were designated for motorized use by the public. There are no other known actions that would result in additional effects on users.

Local Economy

Current Conditions

Travel and Tourism consists of sectors that provide goods and services to visitors to the local economy as well as to the local population. These industries include: retail trade; passenger transportation; arts, entertainment and recreation; and accommodation and food services. It is not known, without additional research, such as surveys, what exact proportion of the jobs in these sectors is attributable to expenditures by visitors, including business and pleasure travelers, versus by local residents. Some researchers refer to these sectors as "tourism-sensitive." They could also be called "travel and tourism-potential sectors" because they have the potential of being influenced by expenditures by non-locals.

As shown in Figure 7, from 1998 to 2009, estimated Polk County travel and tourism employment grew by 117 jobs; estimated non-travel and tourism employment shrank by 180 jobs (Headwaters Economics, 2012).

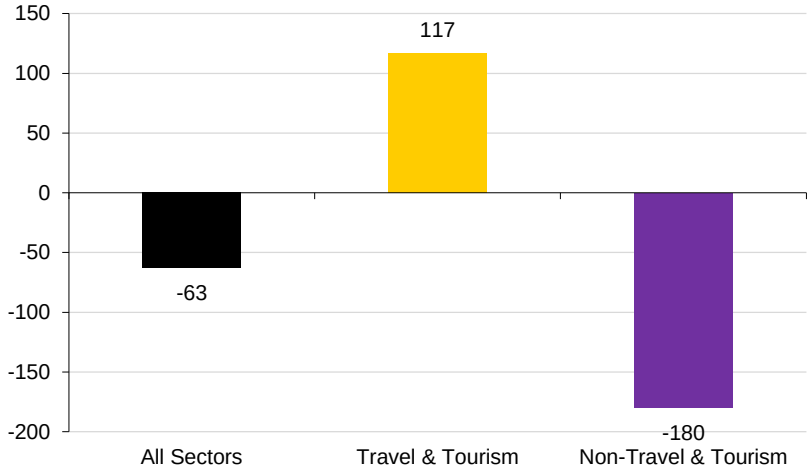

Figure 7. Estimated Job Sector Changes in Polk County, 1998 - 2009.

Table 19 displays percent of total employment by job sector for Polk County, Arkansas, and the United States (U.S.), and Table 20 displays average annual wages in 2010 for Polk County and the U.S. In 2010, travel and tourism comprised 10.1% of total employment in Polk County. The majority of these jobs were in food services (6.8%) and gasoline stations (1.8%). Annual wages averaged $12,177 for travel and tourism jobs, compared to $26,927 for non-travel and tourism jobs in the private sector in Polk County (Headwaters Economics, 2012).

Table 19. Percent of Total Employment by Job Sector

	Polk County, AR	U.S.
All Sectors		
Private	80.7%	83.1%
Travel & Tourism	10.1%	12.9%
Retail Trade	2.8%	2.3%
Gasoline Stations	1.8%	0.6%
Clothing & Accessories	0.6%	1.1%
Misc. Store Retailers	0.3%	0.6%
Passenger Transportation	0.0%	0.4%
Air Transportation	0.0%	0.4%
Scenic & Sightseeing	0.0%	0.0%
Arts, Entertainment, & Rec.	na	1.5%
Performing Arts & Spectator Sports	na	0.3%
Museums, Parks, & Historic Sites	0.0%	0.1%
Amusement, Gambling, & Rec.	na	1.1%
Accommodations & Food	7.3%	8.7%
Accommodation	0.6%	1.4%
Food Services & Drinking Places	6.8%	7.3%
Non-Travel & Tourism	*36.6%*	70.2%
Government	19.3%	16.9%

Table 20. Average Annual Wages, 2010 (2011 $s)

	Polk County, AR	U.S.
All Sectors	$26,695	$48,218
Private	$25,869	$47,917
Travel & Tourism	$12,177	$21,258
Retail Trade	$15,749	$20,557
Gasoline Stations	$15,772	$19,380
Clothing & Accessories	$9,415	$19,293
Misc. Store Retailers	$28,633	$24,060
Passenger Transportation	na	$60,162
Air Transportation	na	$62,013
Scenic & Sightseeing	na	$28,780
Arts, Entertainment, & Rec.	na	$33,297
Performing Arts & Spectator Sports	na	$79,330
Museums, Parks, & Historic Sites	na	$31,448
Amusement, Gambling, & Rec.	na	$20,319
Accommodations & Food	$10,836	$17,719
Accommodation	$17,331	$26,744
Food Services & Drinking Places	$10,285	$16,034
Non-Travel & Tourism	*$26,927*	$52,804
Government	$30,152	$49,691

Issue 1. ***Use limitations (seasonal closures, precipitation event closures, limiting number of users, etc.) may result in a loss of revenue to Wolf Pen Gap businesses and local communities.***

Effects

Seasonal and other imitations on OHV user would be the most likely actions to affect the local economy. Monthly use data were collected from trail counters for 2010 and 2012 within WPG. The annual vehicle passes estimated per year were 13,655 and 13,350, respectively. For this analysis, the assumption was made that one vehicle pass equals one user. Using these data, the number of OHV users can be estimated for each alternative based on the time period the system would be available for use. Alternatives B, C, and I include OHV seasons of use; Alternative E would not provide for any OHV use. The remaining alternatives provide for OHV use year-round. Estimated numbers of OHV users, as well as estimated reduction in users, are shown in Table 21 for each alternative.

Table 21. Estimated Number of OHV Users by Alternative

Alternative	2010	2012	Reduction	
			2010	2012
A	13,655	13,350	0	0
B	12,507	10,395	1,148	2,955
C1	7,952	5,705	5,703	7,645
C2	7,956	7,747	5,699	5,603
C3	8,367	6,886	5,288	6,464
D	13,655	13,350	0	0
E	0	0	13,655	13,350
F	13,655	13,350	0	0
G	13,655	13,350	0	0
I	11,493	9,369	2,162	3,981
J	13,655	13,350	0	0

There are many reports and data sets that address the impact of tourism on the economy, although none are specific to the contribution of WPG OHV users on the economy of Polk County and/or Mena, Arkansas. In this section, two reports are used to provide estimates of the economic impacts of the WPG alternatives that would limit seasons of use or allow no OHV use (Alternative E). These reports are considered the best available information. The estimated reduction in users for each alternative (Table 21), projected onto 2010 and 2010 use data, is used in conjunction with these reports:

- Updated Spending Profiles for National Forest Recreation Visitors by Activity (White & Stynes, 2010)

- The Economic Impact of Travel in Arkansas (Arkansas Department of Parks and Tourism, 2012)

A third report, summarized below, provides additional background on studies concerning travel management decisions and the local economy.

Potential Economic Impacts on Mena, Arkansas and the Surrounding Region Regarding the 2010 Forest Service Travel Management Decision for Ouachita National Forest

In 2010, the Mena Chamber of Commerce commissioned a study by the Institute for Economic Advancement (IEA) at the University of Arkansas at Little Rock of the economic impacts of limiting OHV use in Polk County (Hamilton, Halebic, & Pahari, 2010). The IEA study developed scenarios reflecting the possible loss of tourism activity on Polk County's economy from the forest-wide 2010 Travel Management decision and analyzed the economic impact of those losses using an Implan Model of the county.

The IEA study quantified several economic measures:

- Output –value of all business activities related to visitor spending
- Value added –payments to the factors of production (labor, capital, land, etc.)
- Labor income – value of the added wages and salaries paid to workers
- Indirect business taxes –property taxes, sales taxes, and excise taxes paid by businesses
- Employment – annual number of full-time jobs

The IEA study analyzed a scenario in which there was a 10% reduction in OHV tourism in Polk County as a result of implementing the selected alternative of the Travel Management Project for the Ouachita National Forest. The modeled economic impact is shown in Table 22 (Hamilton, Halebic, & Pahari, 2010).

Table 22. Estimated Economic Impact of a 10% Reduction in OHV Tourism in Polk County

Economic Measure	Impact
Change in Expenditure ($)	-5,865,400
Output ($)	-7,731,034
Value Added ($)	-4,388,042
Labor Income ($)	-2,427,225
Employee Compensation ($)	-1,669,322
Indirect Business Taxes ($)	-728,619
Employment (Jobs)	-124
Change in Unemployment Rate (%)	+1.37

The 2010 Forest-wide alternative on which the IEA study was based would have reduced the yearly number of OHV users at WPG from an estimated 17,000 to 5,000 (USDA Forest Service, 2009), but apparently the study authors assumed for the sake of their scenario that OHV use would increase elsewhere in the county to partially compensate for the reduction in use at WPG (resulting in only a net 10% reduction in OHV tourism in the county).

Direct and Indirect Effects

Alternatives B, C, E & I

Spending Profiles for National Forest Recreation Visitors by Activity

White and Stynes (2010) estimated national visitor spending for OHV use, categorized by three spending levels. The Ouachita was classified as a "low" spending level forest. The following two tables show national spending averages for OHV use of non-local and local visitors. Non-local visitors spend the most per trip; their primary expense is gas and oil.

Table 23. Non-Local Visitor National Spending Averages for OHV Use

OHV Use Spending category	$ Per Party Per Trip ("Low" Spending Level)	
	NL-Day Trips	NL-Overnight Trips
Lodging[1]	0.00	32.04
Restaurant	12.86	15.83
Groceries	14.33	63.97
Gas & Oil	53.57	88.15
Other Transportation	0.13	0.00
Entry Fees	5.82	0.76
Recreation & Entertainment	6.71	3.77
Sporting Goods	4.27	0.89
Souvenirs/Other	0.14	13.25
Total Spending	**97.83**	**218.66**

1-Includes camping

Table 24. Local Visitor National Spending Averages for OHV Use

OHV Use Spending category	$ Per Party Per Trip ("Low" Spending Level)	
	Local-Day Trips	Local-Overnight Trips
Lodging[1]	0.00	21.34
Restaurant	7.58	13.59
Groceries	8.44	32.86
Gas & Oil	31.56	42.47
Other Transportation	0.08	0.00
Entry Fees	3.43	3.24
Recreation & Entertainment	3.95	3.77
Sporting Goods	2.51	1.65
Souvenirs/Other	0.08	5.69
Total Spending	**57.63**	**124.61**

[1]Includes camping

The national average party size for OHV use is 2.4; the average party size on the Ouachita (not activity-specific) is 2.3 (White & Stynes, 2010). For this analysis, an average party size of 2.35 was used. Due to the considerable range of national spending averages by trip type, a local day-trip spending average (the lowest figures by alternative) and a nonlocal overnight spending average (the highest figures by alternative) are used to illustrate the estimated *range* of reduction in expenditures by alternative (Table 25).

Table 25. Estimated Annual Reduction in Visitor Spending for WPG OHV use by Alternative

Trip Type	Alternative					
	B	**C1**	**C2**	**C3**	**E**	**I**
2010 Use Estimates						
Local Day Trip ($)	28,153	235,914	139,759	129,680	334,867	53,020
Nonlocal Overnight Trip ($)	106,818	935,311	530,274	492,032	1,270,554	201,167
2012 Use Estimates						
Local Day Trip ($)	72,467	187,481	137,405	158,519	327,387	97,628
Nonlocal Overnight Trip ($)	274,953	711,343	521,341	601,455	1,242,175	370,419

The Economic Impact of Travel in Arkansas

The Arkansas Department of Parks and Tourism estimates traveler expenditures and traveler volume for every county in the state. Estimates of traveler expenditures are calculated using the Travel Industry Association of America 2006 Impact of Travel on Arkansas Counties as a reference point. Arkansas county traveler estimates use Census of Transportation data as a benchmark, the most recent being the 1995 American Travel Survey. A person-trip occurs, for the purpose of these data, every time one person goes to a place 50 miles or more, each way, from home in one day or is out of town one or more nights in paid or unpaid accommodations and returns to his/her origin.

Estimates of traveler expenditures and volume in Polk County are displayed in the Table 26 (Arkansas Department of Parks and Tourism, 2012).

Table 26. 2011 Economic Contribution and Volume of Visitors to Polk County

Total Travel Expenditures ($)	20,355,561
Travel-Generated Payroll ($)	3,716,958
Travel-Generated Employment (Jobs)	234
Travel-Generated State Tax ($)	1,236,535
Travel-Generated Local Tax ($)	434,466
Visitors (Person-Trips)	84,189

Based on this information, each visitor to Polk County contributed $242 to the local economy, generated $44 in payroll, and $5 in local tax revenues. The estimated reductions in economic contributions resulting from seasonal use restrictions are shown in the following table.

Table 27. Annual Reduction in Economic Contributions of Visitors by Alternative

Economic Contribution	Alternative					
	B	C1	C2	C3	E	I
2010 Use Estimates						
Total Travel Expenditures ($)	277,568	1,378,895	1,377,928	1,278,554	3,301,562	522,737
Travel-Generated Payroll ($)	50,684	251,788	251,612	233,466	602,870	95,453
Travel-Generated Jobs	3	16	16	15	38	6
Travel-Generated Local Tax ($)	16,861	83,763	83,705	77,668	200,559	31,755
2012 Use Estimates						
Total Travel Expenditures ($)	714,472	1,848,439	1,354,716	1,562,892	3,227,818	962,542
Travel-Generated Payroll ($)	130,464	337,528	247,373	285,387	589,405	175,762
Travel-Generated Jobs	8	21	16	18	37	11
Travel-Generated Local Tax ($)	43,402	112,287	82,295	94,941	196,080	58,471

Combining the results of both analyses above, the minimum and maximum estimates for expenditure reductions are shown for each alternative in Table 28.

Table 28. Range of Expenditure Reduction Estimates by Alternative

Expenditure Reduction ($)	Alternative					
	B	C1	C2	C3	E	I
Minimum	28,153	187,481	137,405	129,680	327,387	53,020
Maximum	714,472	1,848,439	1,377,928	1,562,892	3,301,562	962,542

Alternatives A, D, F, G and J

These alternatives provide for OHV use year-round. Alternative D would expand the road and trail system available for OHV use. It could be surmised that this additional recreational opportunity may increase the number of visitors to WPG, thus increasing economic contributions to the local economy.

No indirect economic effects are expected from Alternatives A, F, G and J; the number of OHV users would be expected to remain unchanged.

Cumulative Effects

No other Forest Service management decisions have been made that would influence recreational expenditures in Polk County; no other actions on private or state lands are known that would influence recreational expenditures in Polk County; therefore, no cumulative effects are anticipated.

Transportation System

Current Conditions

Maintenance Levels

The Forest Transportation System is defined as the system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands (36 CFR 212.1). System roads are the roads that the Forest Service has determined are necessary for public access to National Forest land or are needed to administer the National Forest. Maintenance levels are defined by the USDA Forest Service Handbook (FSH) as the level of service provided by, and maintenance required for, a specific road. System Roads are maintained at 5 levels, as described in FSH 7709.58. The WPG and surrounding transportation system includes maintenance level 1, 2, and 3 roads:

Road maintenance level 3. Assigned to roads open and maintained for travel by prudent drivers in standard passenger cars. User comfort and convenience are low priorities. Roads in this maintenance level are typically low speed, single lane with turnouts, and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

Road maintenance level 2. Assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to (1) discourage or prohibit passenger cars or (2) accept or discourage high-clearance vehicles.

Road maintenance level 1. Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate." Roads receiving level 1 maintenance may be of any type, class or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic, but may be open and suitable for nonmotorized uses.

Funding

From 2010 to 2012, road maintenance funding for the Ouachita National Forest declined by 42%. 2012 trail maintenance funding was 7% less than in 2010. See Figures 8 and 9.

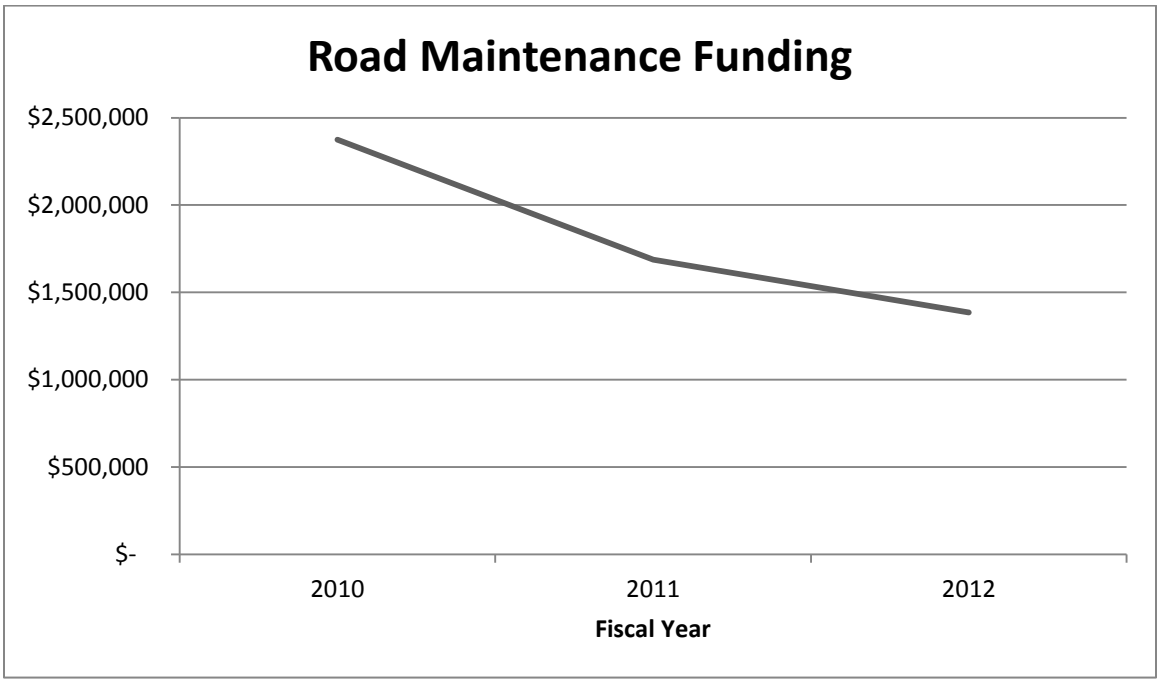

Figure 8. Forest Trend in Road Maintenance Funding.

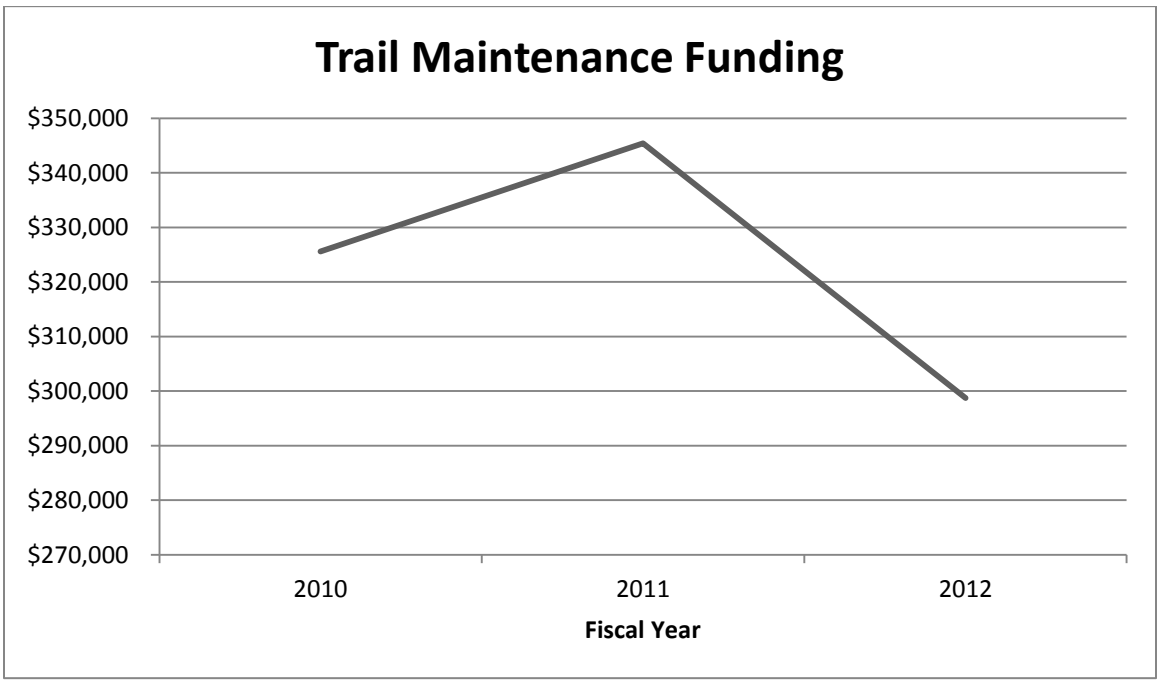

Figure 9. Forest Trend in Trail Maintenance Funding.

The current WPG system includes approximately 23.4 miles of road and 18.3 miles of trail requiring periodic maintenance. The system is comprised of the motorized use designations shown in Table 29:

Table 29. WPG Current Motorized Use Designations

Roads	**Miles**
Highway and OHV - year round	20.2
Highway only - year round	3.2
Road Total	**23.4**
Trails	
OHV - year round	18.3
Trail Total	**18.3**
Total WPG Routes	**41.7**

Issue 4. ***The Forest Service may not have resources available to adequately maintain the road and trail system.***

Direct Effects

Alternative C would reduce road miles within WPG by approximately 7.4 miles (32% reduction from the current system). Alternatives G, I and J would reduce roads by approximately 7 miles (30% reduction). Alternatives B, D, E, and F would increase roads by approximately 1.0, 0.7, 0.6 and 1.3 miles, respectively (4% to 6% increase). See Figure 10.

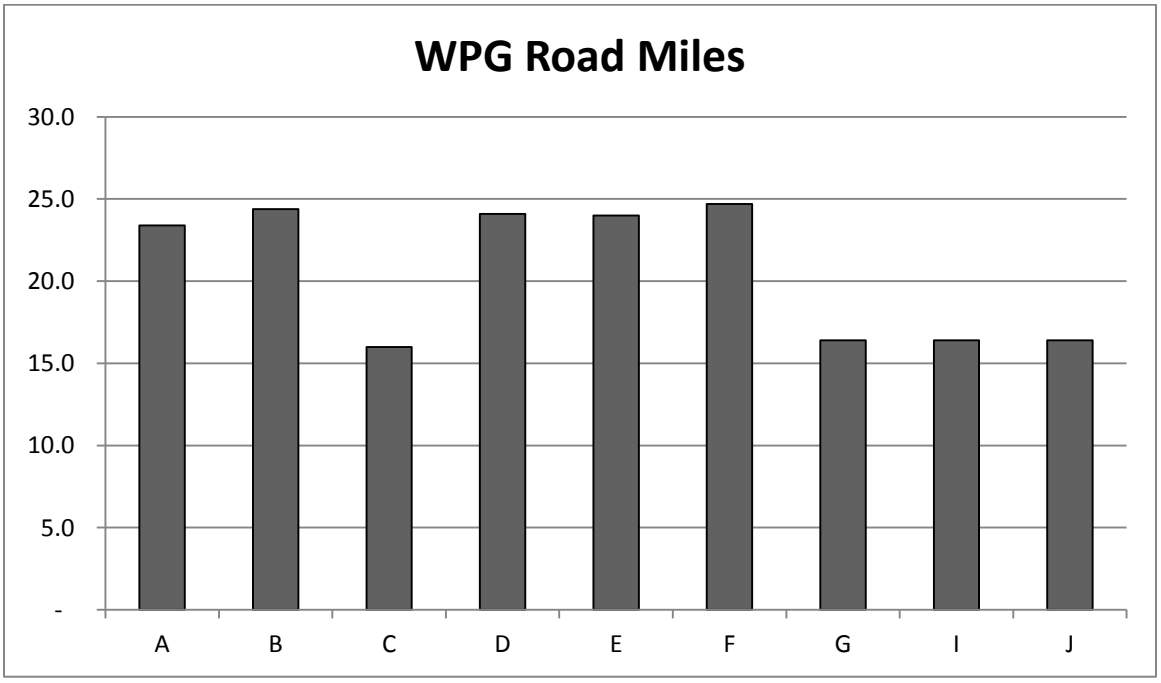

Figure 10. WPG Road Miles by Alternative.

Under Alternative E, all trails (18.3 miles) within WPG would be obliterated. Alternatives B and F would reduce trail miles by 1.4 and 2.2, respectively (8% to 12% reduction). Alternatives C, G, I and J would increase trail miles by 4.3, 4.5, 4.9 and 4.9, respectively (24% to 27% increase). Alternative D would increase trail miles within WPG by approximately 18.3 miles (102% increase). See Figure 11.

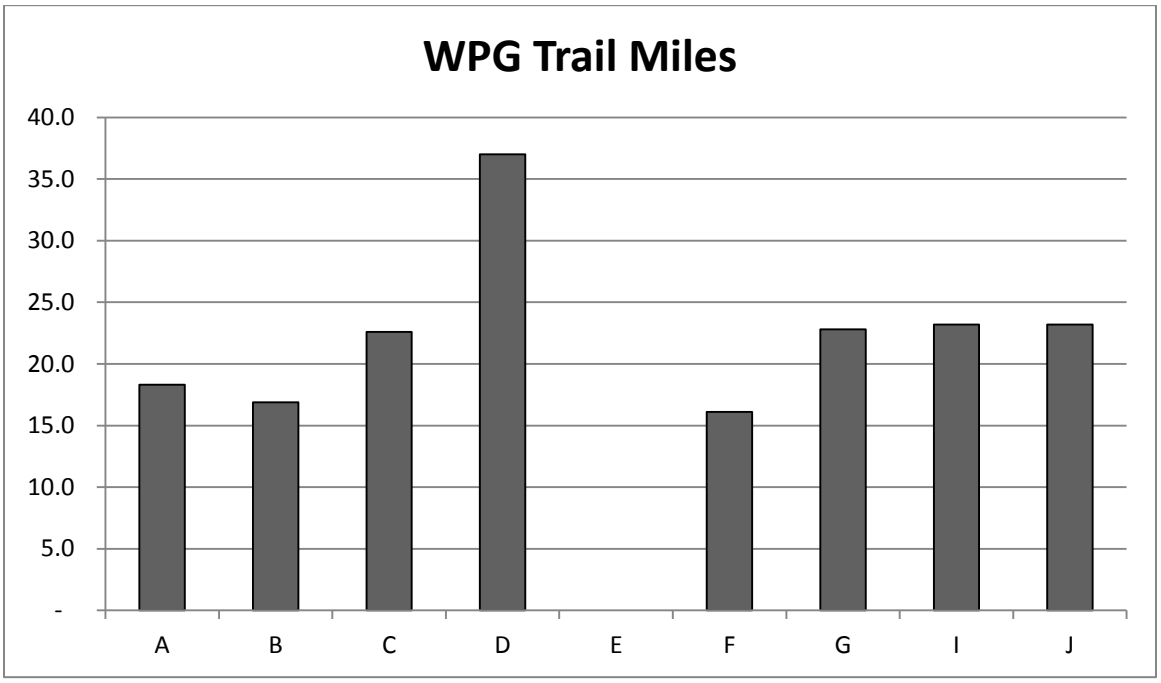

Figure 11. WPG Trail Miles by Alternative.

Comparing combined road and trail mileage to Alternative A, Alternative E would reduce OHV routes by 17.7 miles (42% reduction). Alternative C would reduce the OHV routes by 3.1 miles (7% reduction). Alternative G would reduce OHV routes by 2.5 miles (6% reduction). Alternatives I and J would reduce OHV routes by 5 miles (2% reduction). Alternatives B and F would reduce OHV routes by 0.5 miles and 0.9 miles, respectively (0.5 to 1% reduction). Alternative D would increase OHV routes by 19.4 miles (47% increase). See Figure 12.

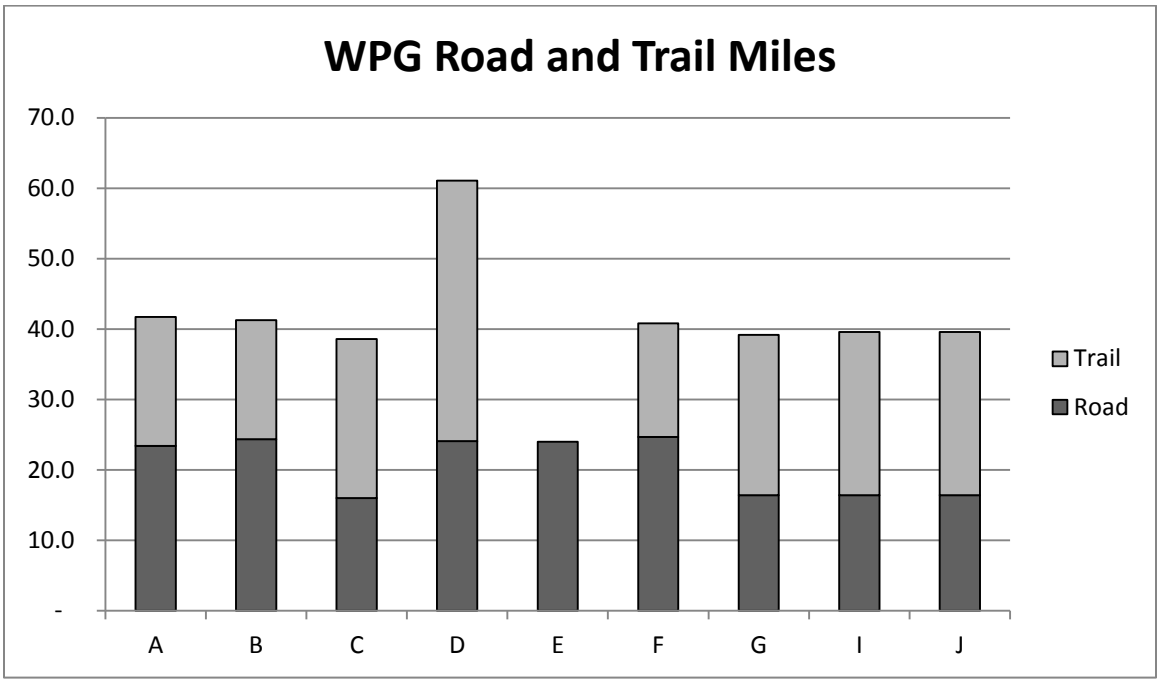

Figure 12. WPG Road and Trail Miles by Alternative.

Road obliteration and converting roads to trails would reduce the road mileage of the Forest transportation system. Alternative C would remove 9.6 miles from the transportation system. Alternative B would remove 6.5 miles of road; Alternatives G, I and J would each remove 5.2 miles. Alternative D would reduce the road mileage of the Forest transportation system by 3.1. Implementation of Alternative A, E or F would make no change in the system road mileage. See Figure 13.

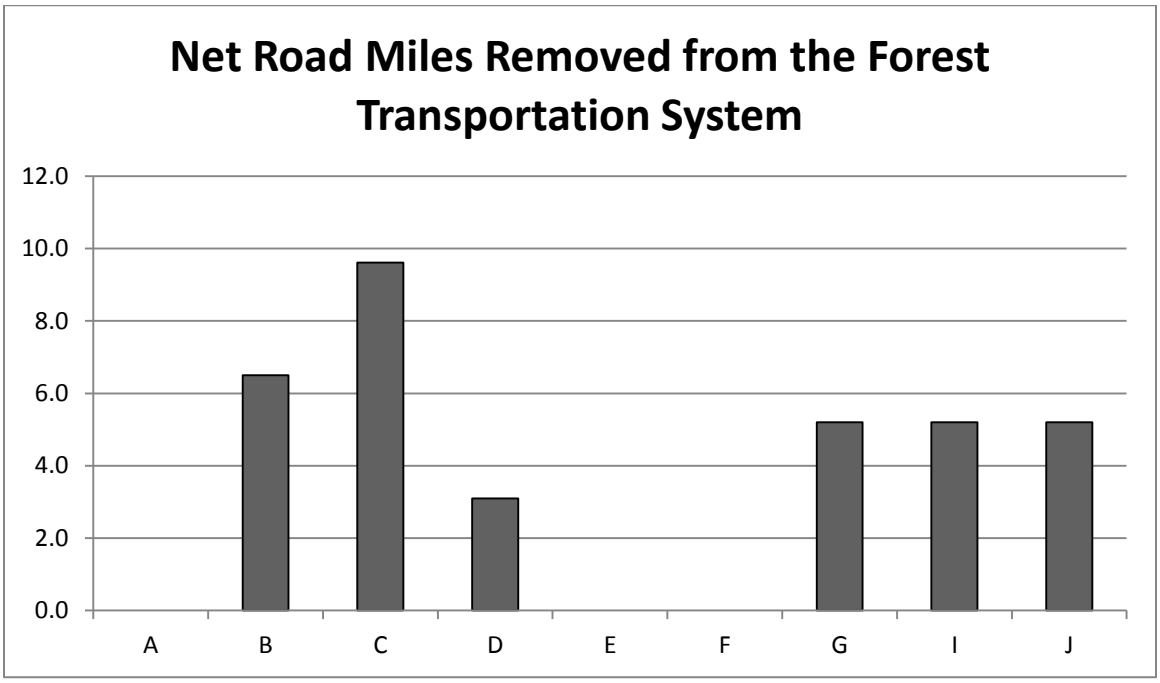

Figure 13. Road Miles Removed by Alternative.

Changes in road maintenance levels would be accompany new road construction, road obliteration, converting road(s) to trail(s), closing open roads, and opening closed roads. There would be no change in maintenance level 3 road miles. Maintenance level 1 and level 2 changes are shown by alternative in Table 30.

Table 30. Change in Maintenance Level by Alternative

Alternative	Change in Miles	
	Maintenance Level 1	Maintenance Level 2
A	0.0	0.0
B	-1.4	-5.1
C	4.2	-13.8
D	3.0	-6.1
E	0.0	0.0
F	0.0	0.0
G	3.5	-8.7
I	3.3	-8.5
J	3.3	-8.5

Alternative C would reduce maintenance level 2 roads by 13.8 miles. Alternative G would reduce level 2 roads by 8.7 miles; Alternatives I and J by 8.5 miles; Alternative D by 6.1 miles; Alternative B by 5.1 miles. Alternatives A, E and F would not change the maintenance level 2 road mileage of the Forest transportation system. See Figure 14.

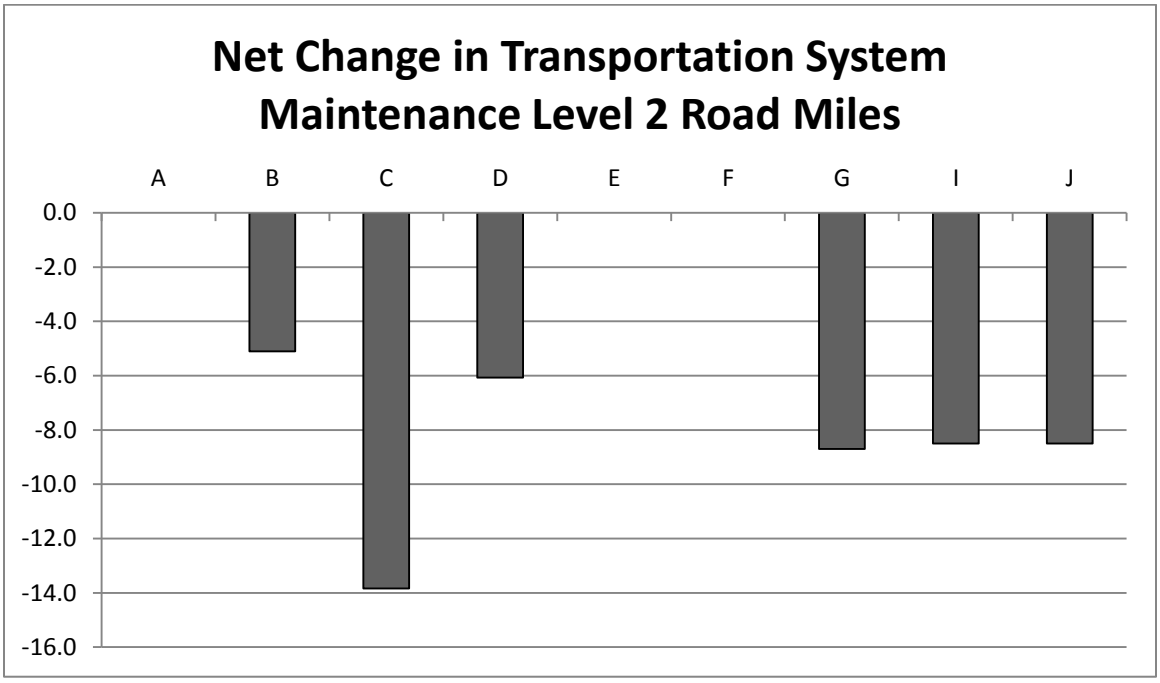

Figure 14. Change in Maintenance Level 2 Road Miles by Alternative.

Two spur (camp) roads providing motorized access to designated dispersed campsites may be affected by the project. Alternative C would obliterate the parent road of spur 48320AC which serves one campsite; Alternatives B and D would reroute the parent road of spur 277AC which also serves one campsite. Under these alternatives, the campsites would remain available; however, motorized access would no longer be provided.

New trail construction and trail obliteration would result in a net change in the number of Forest transportation system trail miles. Alternative D would increase the number of trail miles by 18.7 miles. Alternatives I and J would add 4.9 miles of trail to the Forest transportation system. Alternatives C and G would add 4.3 and 4.5 miles, respectively. Alternative E would reduce trail mileage by 18.3 miles. Alternatives B and F would also reduce trail miles (1.4 and 2.2 respectively). There would be no change in trail mileage under Alternative A. See Figure 15.

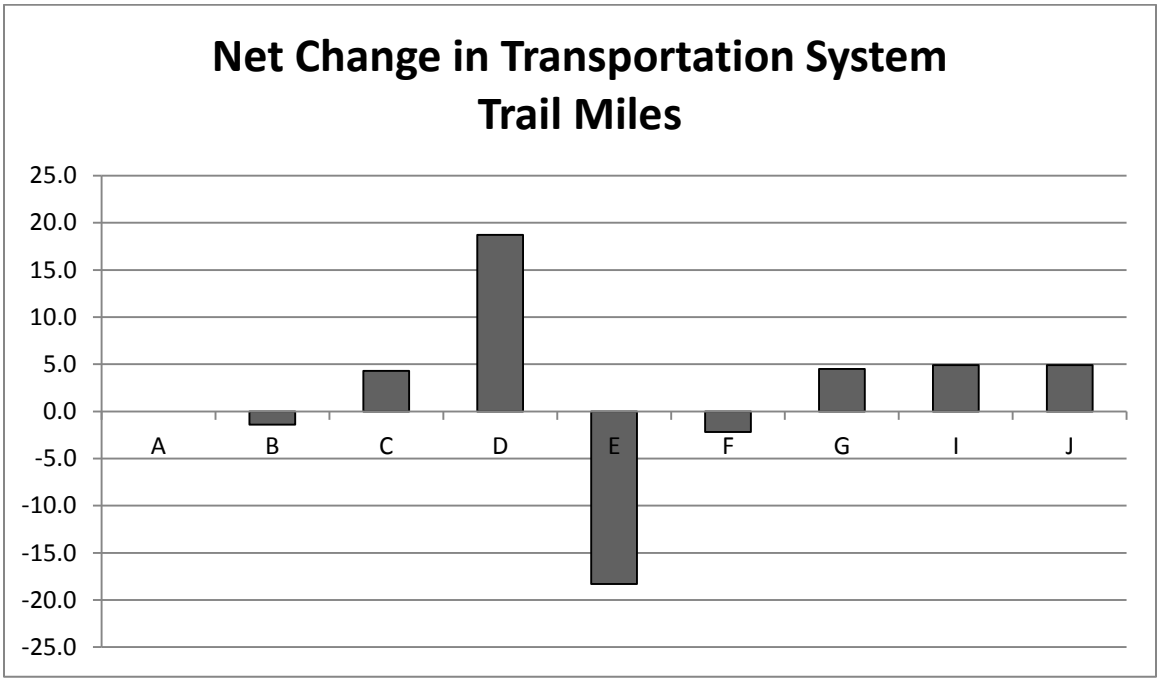

Figure 15. Change in Trail Miles by Alternative.

Implementation costs are itemized by activity in the following table (source: personal communications with Forest personnel and Trails Unlimited www.fs.fed.us/trailsunlimited/services/construction.shtml.)

Table 31. Cost Estimates by Activity

Activity	Unit	Cost ($)
Install culvert/concrete plank	Each	600
Install arch culvert	Each	500
Construct large arch culvert ($75,000 – $100,000 ea)	LF	1,300
Construct motorized trail bridge ($75,000 - $100,000 ea)	LF	1,250
Construct road bridge ($150,000 – $300,000 ea)	LF	2,500
Road obliteration	Mile	1,500
Motorized trail obliteration	Mile	1,000
Convert road to trail	Mile	1,000
Motorized trail construction (including TU BMPS)	Mile	12,000
Road reconstruction or construction	Mile	20,000
Trail reconstruction	Mile	6,000

Implementation activity quantities (other than annual maintenance) are itemized by each action alternative in the Table 32.

Table 32. Implementation Activity by Alternative

Implementation Activity (miles)	Alternative							
	B	C	D	E	F	G	I	J
New road construction	3.8	0.4	1.1	0	0	0.4	0.4	0.4
New trail construction	8.8	10.7	28.2	0	2.8	10.9	10.9	10.9
Road obliteration	6.5	5.6	2.7	0	0	1.2	1.2	1.2
Trail obliteration	9.8	10.4	9.8	18.3	5.0	10.5	10.1	10.1
Convert road to trail	0	4.0	0.3	0	0	4.0	4.0	4.0
Road reconstruction (bring up to standard)	12.4	4.0	12.1	12.0	12.7	4.4	4.4	4.4
Trail reconstruction (bring up to standard)	6.1	5.9	6.4	0	11.3	5.9	6.3	6.3
Structures to replace existing fords and new crossings (each):								
Arch culvert/Cement Plank/Culvert	243	223	325	109	203	237	238	238
Large arch culvert	23	23	27	21	28	26	26	26
Trail bridge	3	3	9	0	2	3	3	3
Road bridge	3	3	3	3	3	3	3	3

The cost to implement action alternatives ranges from $2,349,000 (Alternative E) to $3,978,000 (Alternative D), not including annual costs of maintenance. All action

alternatives include implementation costs to bring all routes up to standard (e.g., correcting cross-drain spacing, constructing cross drain structures such as rolling dips, water bars, and culvert installation). There would be no implementation cost associated with Alternative A (No Action). See Figure 16.

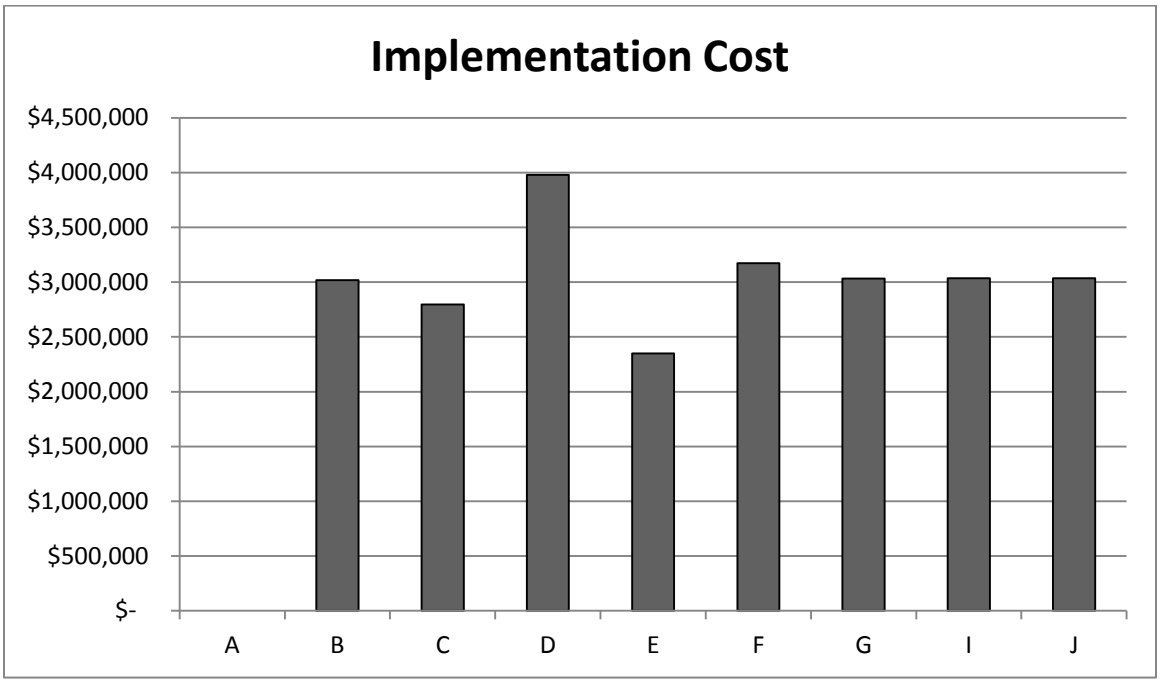

Figure 16. Implementation Cost by Alternative.

Indirect Effects

Maintenance Costs

Net change in the Forest transportation system route mileage and maintenance levels (for example from maintenance level 2 to maintenance level 1) would result in changes in annual maintenance costs. Alternative C would reduce the Forest's annual road maintenance costs (estimated at $225 per mile, twice per year) by $6,200. Alternative G would result in a reduction of $3,900; Alternatives I and J would result in a reduction of $3,800. Alternative D would reduce road maintenance costs by $2,700. Alternative B would result in a reduction of $2,300. There would be no change in road maintenance costs associated with Alternatives A (No Action), E and F. See Figure 17.

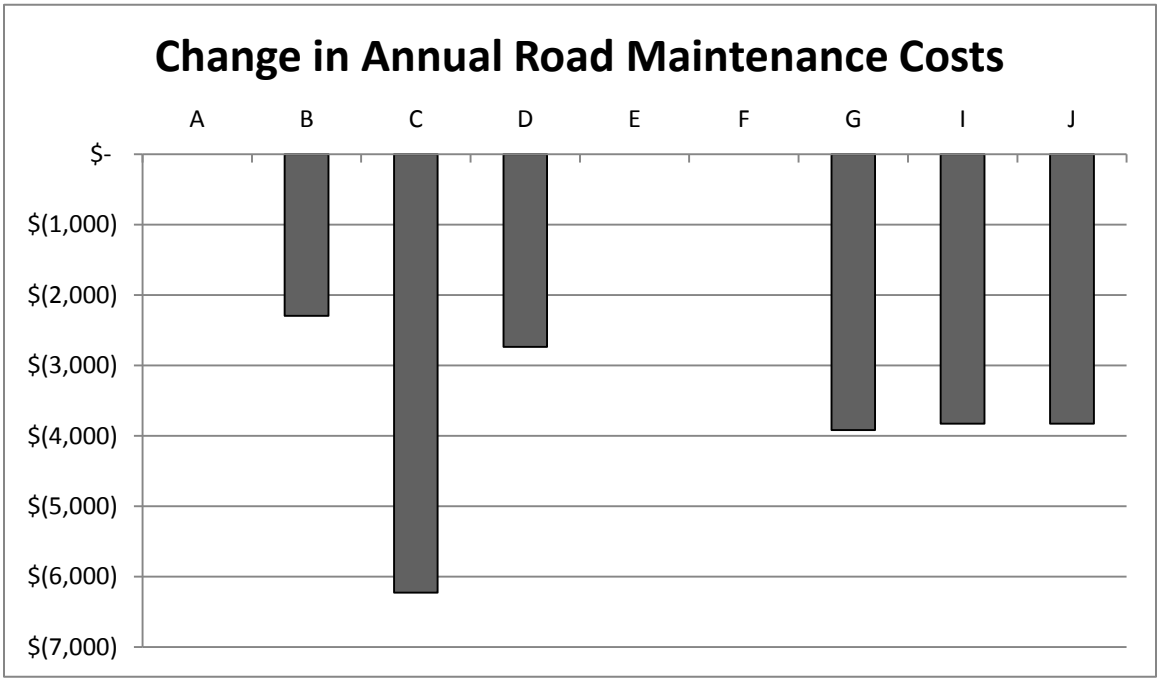

Figure 17. Annual Road Maintenance Cost Change by Alternative.

Annual trail maintenance costs are estimated to range from about $2500/mile to as much as $6000/mile for heavy maintenance. Alternative D would increase annual trail maintenance costs (compared to Alternative A) by $45,750 to 119,800 (the high end applying in each case only if all trail miles required heavy maintenance in a given year, a highly unlikely scenario). Alternatives I and J would require an additional $$12,250 to 29,400 for annual trail maintenance. Alternatives B and G would increase annual trail maintenance costs by $10,750 to $27,000. Alternative E would obliterate all motorized trails, resulting in a $45,750 to $109,800 decrease in annual trail maintenance costs. Alternatives B and F would also reduce annual maintenance costs, but by no more than $6000. There would be no change in annual trail maintenance costs associated with Alternative A (No Action). See Figure 18.

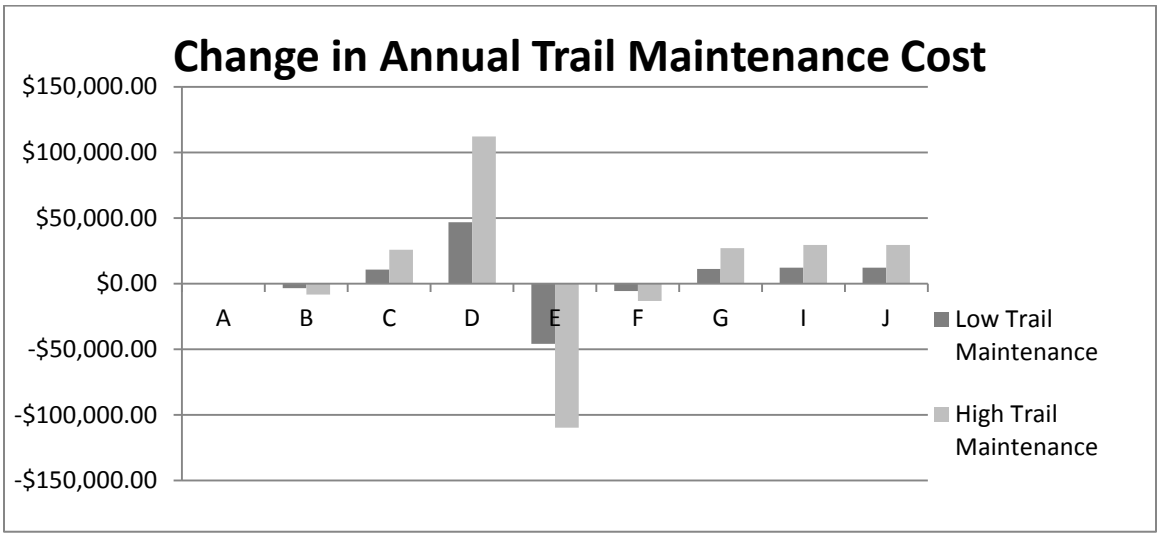

Figure 18. Annual Trail Maintenance Cost Change by Alternative.

The annual cost of maintaining the WPG road and trail complex would vary by alternative, ranging from $10,800 (Alternative E) to as much as $233,000 (Alternative D). The annual maintenance costs of Alternatives C and G would each range from about $64,000 to as much as $144,000 (depending on much heavy trail maintenance is required in a given year. Alternative I would result in total annual maintenance costs ranging from $65,380 to as much as $147,000, while J would range from as little as $30,880 every other year to more than $111,000 in years in which heavy trail maintenance was needed on virtually every mile of trail. Alternative A (no action) would result in annual maintenance costs of between $56,000 and $120,000; Alternative F annual costs would range from about $50,000 to about $108,000; and annual costs for Alternative B would range from about $53,000 to about $112,000. See Figure 19 for a graphical comparison.

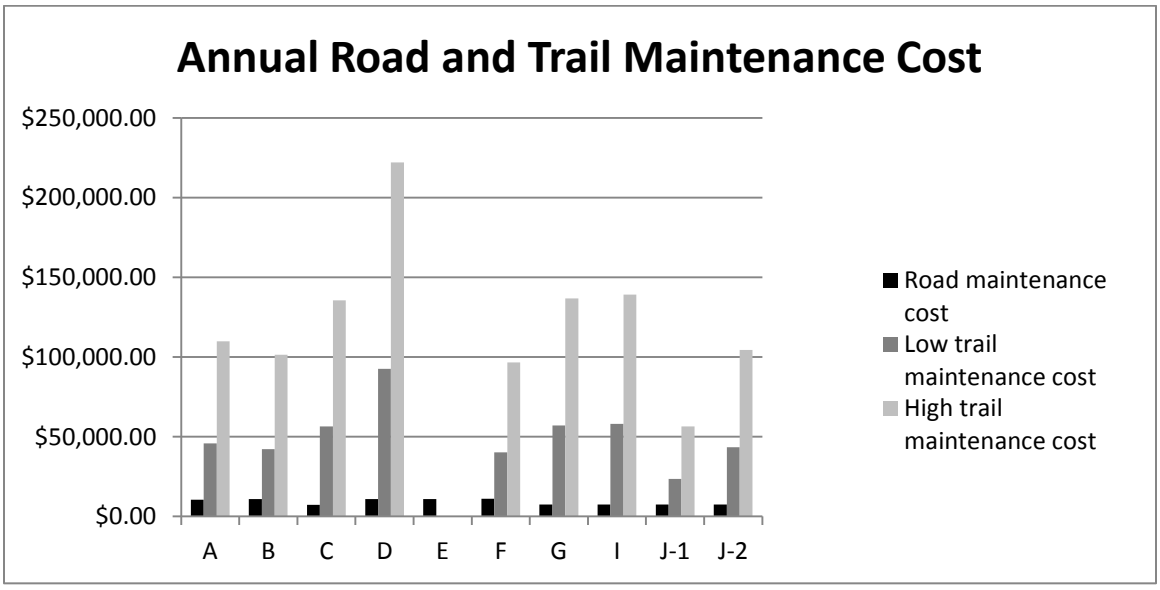

Figure 19. Annual Road and Trail Maintenance Cost by Alternative.

Cumulative Effects

A decision to implement the "Wolf Pen Gap Trail Complex Safety and Enhancement Proposal" was made in 2005. The project included the following actions related to transportation system effects, implemented through 2010:

- Close and decommission approximately 4.94 miles of existing road
- Construct approximately 2.54 miles of new road
- Close and decommission approximately 2.02 miles of existing OHV trail
- Construct approximately 1.72 miles of new OHV trail
- Add approximately 2.16 miles of existing road to the WPG Trail Complex
- Install gate on road 48320 north of road 48330 junction to seasonally close approximately 3.77 miles of road from March 1 – August 31
- Place an earthen mound approximately 0.75 mile from the end of road 48320

The effects of these management actions on the transportation system are reflected in the current conditions.

A decision to implement the "WPG Aquatic Habitat Improvement Project" was made in 2010. The project included one stream crossing improvement structure and less than 0.3 miles of road reconstruction to align with the new structure. This decision has not been implemented.

The *Wolf Pen Gap Trail Complex Interim Management Plan* was also developed in 2010. Implementation of the Interim Management Plan and Best Management practices (BMP's) has resulted in improved road and trail conditions.

In 2011, approximately 5 miles of trail were closed for short-term (emergency) resource protection under a Forest Supervisor Closure Order. This action is not reflected in the current conditions. All action alternatives would permanently close (obliterate) these trail miles; this reduction in trail miles is reflected in the transportation system direct and indirect effects.

For the last several years, there has been growing public support for charging a user fee for Wolf Pen Gap. Charging a user fee would provide additional resources for system maintenance. The forest intends to seek approval for implementing user fees through a separate administrative process.

No other present decisions or future pending decisions have been made that would affect the WPG transportation system.

Public Health and Safety

Current Conditions

Motorized mixed use occurs when a National Forest System road is designated for use by both highway-legal and non-highway-legal motor vehicles (FSM 7705). In general, the greater the disparity in the size of the vehicles involved in a crash, the greater the crash severity (FSH 7709). Mixed use occurs on 20.2 miles of WPG roads.

Accidents within WPG for FY 2009 through FY 2012 are summarized in the following table. No accidents were attributed to mixed use.

Table 33. WPG Accidents, 2009-2012

Fiscal Year	Number of Accidents	Vehicle Type
09	13	ATV
10	1	ATV
11	2	ATV
12	2	ATV

Issue 7. ***Mixed use of different kinds and sizes of vehicles on roads and trails may create a safety hazard.***

Direct Effects

There would be no direct effects on public health and safety resulting from ground disturbing activities such as route construction or obliteration.

Indirect Effects

Indirect effects on public health and safety would result from motorized use of the resulting road and trail system for all alternatives.

Except for Alternative E, all action alternatives would add a portion of FS Road 95 to the WPG complex. An engineering analysis is conducted for every maintenance level 3, 4 and 5 road proposed for mixed use designation. The engineer is required to analyze information on the road, including traffic volume and type, intersections with other roads and trails, and crash history. Each engineering report determines crash probability and crash severity. Measures are recommended to reduce safety risks associated with mixed use if there is a determination of medium or high risk for either crash probability or crash severity. An engineering analysis was conducted for FS Road 95 that resulted in a low risk for both crash probability and crash severity (project file).

Any reduction in the miles of motorized mixed use designation would reduce the risk of adverse effects on public health and safety. Conversely, any increase in the miles of motorized mixed use designation would increase the risk of adverse effects on public safety.

Alternative E would exclude all OHV use; mixed use miles within WPG would be zero. Alternative J would reduce mixed use by approximately 9 miles or 44% for year one of rotation, and by 12.7 miles or 63% for year two. Alternative C would reduce mixed use by 7.4 miles or 37%. Alternatives G and I would reduce mixed use by 7 miles or 35%. Alternative D would increase mixed use by 1 mile or 5%; Alternatives B and F would result in an increase of 1.3 miles of mixed use or 6%. See Figure 20.

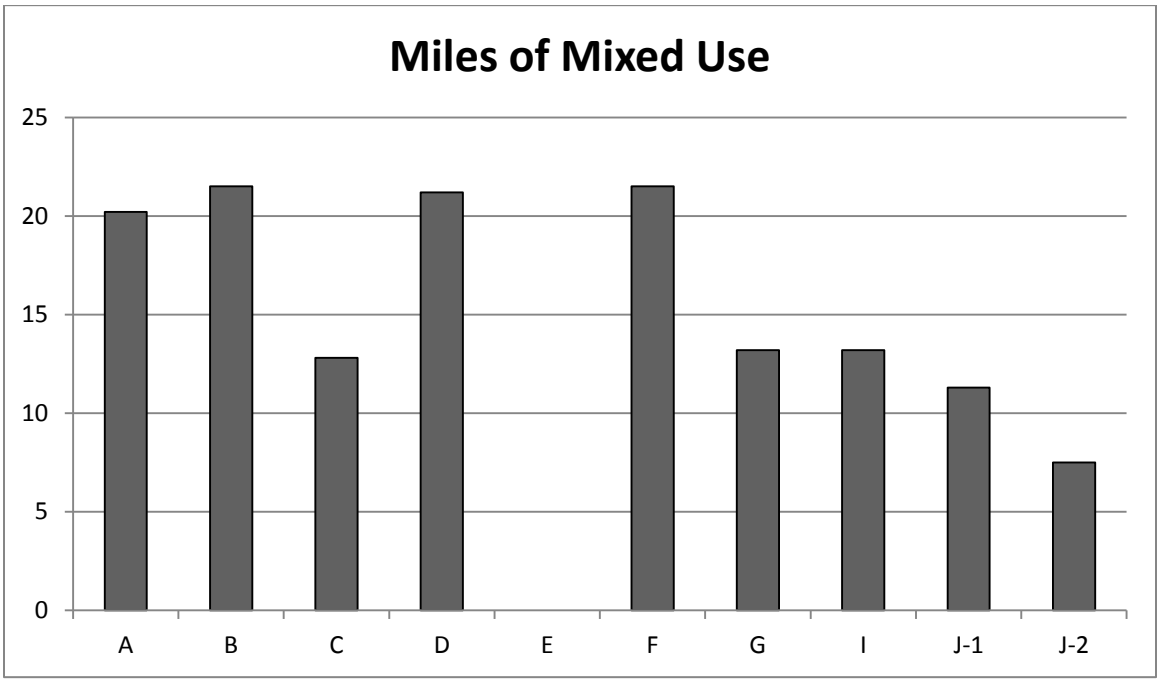

Figure 20. Miles of Mixed Use by Alternative.

Cumulative Effects

The effects of past management actions on the amount of motorized mixed use within WPG are reflected in the current conditions. No other present decisions or future pending decisions have been made that would affect public health and safety within WPG.

Air Quality and Noise

Current Conditions

Air quality is generally excellent. No heavy industries are located within or adjacent to the Forest so potential pollution is minimal. Caney Creek Wilderness is a Class I area, located approximately two miles to the south of WPG. In Class I areas, little additional air pollution is allowed. Class II areas allow a moderate level of additional air pollution to accommodate industrial/urban development. The remainder of the Forest is Class II (USDA Forest Service, 2005b).

Issue 3. ***Motorized use of the road and trail system may produce unwanted noise for local residents and other forest users.***

Effects

Air quality is affected by wildfires, vehicle emissions, dust from construction and use of motorized routes, and prescribed fires. With the exception of fires, the effect on air quality from these sources is relatively minor, as the area affected is relatively small and occurrence is widely scattered (USDA Forest Service, 2005b). In the case of a motorized road and trail system, like WPG, nuisance noise, vehicle exhaust gasses, and dust are concentrated within WPG.

Direct Effects

There would be no direct effects on air quality from Alternative A because no route construction or obliteration would occur. The remaining alternatives include new trail construction and/or road and trail obliteration. Dust would be limited to the area of ground disturbance and would be short-lived.

Indirect Effects

Indirect effects on air quality would result from motorized use of the resulting road and trail system for all alternatives. Although a decibel limit would be imposed for all action alternatives, use of the system would still create unwanted noise to other forest users.

Alternatives B, C, and I would impose seasonal use restrictions. Alternative J utilizes a rotation schedule. If use remains the same, thereby concentrating the number of users within a part of the year or on a part of the trail system, it would also concentrate air quality impacts from noise, exhaust and dust in time and space.

Alternative D would add approximately 19 miles of trail to the system. This would expand the area impacted by noise, vehicle exhaust gasses and dust from motorized use of the system. If use remains the same, expanding WPG would also diffuse these impacts. The size of the system resulting from the remaining alternatives would differ little from one another.

Alternative E would exclude OHV use; all motorized trails would be obliterated; limiting the system to 24 miles of highway legal only roads. This would reduce the amount of pollution (noise, vehicle exhaust gasses, and dust) from motorized use of the system.

Cumulative Effects

Because of the limited distance and time that noise, dust, and exhaust from vehicles is present, none of the alternatives are expected to result in cumulative effects.

Cultural Resources

Current Conditions

The National Historic Preservation Act of 1966 (NHPA) established the preservation of significant historic properties as a national policy and created a National Register of Historic Places (NRHP). Section 106 of the NHPA requires Federal agencies to take into account the effects of undertakings on properties included in or eligible for the NRHP.

Forty-three archeological sites were identified within WPG as a result of cultural resources inventory surveys. Based on scientific evaluation and consultation with the SHPO and Tribes, one of the sites was determined to be eligible for listing in the NHRP, 31 sites are ineligible, and 11 of the sites require more investigation to formally determine eligibility.

Direct Effects

An effect to a cultural resource is the "…alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." (36 CFR 800.16(i)) Any project implementation activity that disturbs the ground has potential to directly affect archeological sites. Specific to the WPG Project, road and trail construction, obliteration, and route relocation activities could directly affect archeological sites.

All known sites would be avoided (see Technical Requirements, Chapter 2). Should unrecorded heritage resources be discovered during implementation, activities would halt immediately; the resource would be evaluated by an archaeologist, and consultation would be initiated with the SHPO, tribes and nations, and the ACHP, to determine appropriate actions for protecting the resource and mitigating adverse effects.

Indirect Effects

New motorized roads and trails added to the system could enhance public access to cultural sites, potentially increasing looting and intentional disturbance. A reduction in the amount of roads and trails available for motorized use would reduce public access to cultural sites. This reduction in access could protect easily seen historic buildings and structures from vandalism.

Cumulative Effects

No other Forest Service management decisions have been made that would affect cultural resources in the area; no other actions on private or state lands are known that would affect cultural resources in the area; no cumulative effects are anticipated.

Soils

Current Conditions

Wolf Pen Gap is within the Central Mountain subdivision of the Ouachita Mountains Physiographic Region. The topography of WPG ranges from level to nearly level narrow floodplains and terraces, to gently sloping to moderately steep hills and footslopes, to steep to very steep mountainsides. The mountains are oriented mostly in an easterly/westerly direction. Four major geologic formations underlie WPG: the Missouri Mountain Shale, Blaylock Sandstone, Arkansas Novaculite, and Stanley Shale (Haley, 1976). Slopes exceeding 60 percent and areas of boulders, rock outcrop, and talus are not unusual. The soils in the project area formed in material weathered from consolidated bedrock of the Cambrian through Pennsylvanian Periods of the Paleozoic Era.

The soils in WPG are very diverse. Due to the complex nature of the geology and terrain, the soils occur in an intricate and complex pattern; therefore, changing sharply over short lateral distances, and are often very contrasting in their properties and behavior. The soil map units are categorized as "complexes," reflecting this diversity and complexity (Olson, Soil Resource Inventory of the Ouachita National Forest, 2011). Complexes indicate that the soils could not be separated at the scale of field mapping (Soil Conservation Service, 1993), (USDA Natural Resources Conservation Service, 2011); however, this would be true at larger scales as well.

The soils have a wide range of characteristics: depths of less than 10 to more than 60 inches, somewhat excessively drained to somewhat poorly drained, slowly permeable to moderately rapidly permeable; and textures ranging from sandy loams to clays with rock fragments making up from less than 10% to more than 50% by volume of the soils.

The landforms in WPG vary widely, from nearly level to gently sloping floodplains and stream terraces, gently sloping to moderately sloping ridgetops, footslopes and toeslopes, and steep to very steep hillslopes and mountain slopes. Slope gradients range from 3% to more than 60%. Floodplains are temporarily inundated occasionally or frequently (Olson, Soil Resource Inventory of the Ouachita National Forest, 2011).

Most of the soils are classified in the soil order of Ultisol (Natural Resources Conservation Service, 2010) which indicates they are old, highly weathered, and generally low in fertility. Some Alfisols, which are somewhat more productive than Ultisols, are present

Effects

The impact of OHV use on soil resources is essentially two-fold. First, in the trail construction phase, there is a considerable footprint made on the forest floor, and this will affect resources well beyond soils. Second, where trails currently exist, they typically have not been designed in accordance with any official criteria. In fact, many of the trails are either old logging roads or trails connecting logging roads. This is the situation in WPG.

Direct Effects

Soil Productivity. Soil productivity, from the standpoint of timber production, is not a major priority in Wolf Pen Gap, but it is from the standpoints of sustaining soil health and stability, especially where trails can be obliterated. There is a legitimate concern that over-use and misuse of the trail system will continue to negatively impact the soil, resources chiefly from the standpoints of compaction and erosion, in two ways: first, OHVs tracking off of the trail onto the forest floor and second, OHV use on trails during periods when moisture conditions are at high levels.

Table 34 shows the number of acres removed from regular forest management due to OHV routes in WPG. While this in itself is not presented as a negative factor, it does reflect an effect of this type of recreation which translates into lost soil productivity.

Table 34. Acres of Soil Removed from Productivity

Route Type	Alternative								
	A	B	C	D	E	F	G	I	J
Roads	70.2	73.2	48	72.3	72.0	74.1	49.2	49.2	49.2
Trails	54.9	50.7	67.8	111.0	0	48.3	68.4	69.6	69.6
Totals	125.1	123.9	115.8	183.3	72.0	122.4	117.6	118.8	118.8

Indirect Effects

Soil Erosion. Soil erosion is the detachment and transport of individual soil particles by wind, water, or gravity. Soils are considered detrimentally eroded when soil loss exceeds the soil loss tolerance values. Ground disturbing management practices influence erosion principally because they remove vegetative ground cover and often concentrate and channel runoff water. A soil's susceptibility to erosion varies by soil type; however, OHV trails typically affect subsurface and subsoil layers as much or more than the topsoil due to shallow topsoil depths in the project area and the fact that most existing trail surfaces have been worn down or eroded beyond the original topsoil. Thus, erosion is approached twofold: within the parameters of the trail surface of existing trails and as an interpretation of the soil map unit where new trail construction (relocation) is planned.

Natural erosion rates from undisturbed forest soils are very low, generally in the neighborhood of 0.01 to 0.15 tons/acre/year. However, the soils have already been disturbed where roads and OHV trails exist and, together, they are the most common source of accelerated erosion that occurs in forested watersheds. Erosion rates tend to remain greater on these due to altered soil structure, reduced infiltration, and lack of vegetative cover, especially if they are not designed and constructed properly, as has been the case historically at WPG. Erosion control measures are an integral component of OHV trail design, construction and maintenance and will be implemented on all proposed work in the project area.

Hazard ratings for on-trail soil erosion are based on the soil erodibility factors K, slope, and content of rock fragments. The ratings apply to unsurfaced trails. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that little or no erosion is likely; *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed (Olson, Soil Survey of Polk County Arkansas, 2003).

Table 35. Miles of On-trail Soil Erosion by Hazard Rating

Hazard Rating	Alternative									
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J-1**	**J-2**
Slight	2.7	1.3	1.6	1.7	0	1.1	1.6	1.6	0.8	1.5
Moderate	2.8	3.0	4.0	8.7	0	3.3	4.1	4.1	1.6	2.8
Severe	12.7	12.6	17.0	26.6	0	11.6	17.1	17.5	7.0	13.1
Total	18.2	16.9	22.6	37.0	0	16.0	22.8	23.2	9.4	17.4

Soil Compaction. One of the major soil concerns when operating OHVs in the Ouachita Mountains is soil compaction, especially when it occurs on the forest floor. Compaction increases soil bulk density and decreases porosity as a result of the application of forces such as weight and vibration. Compaction can detrimentally impact both soil productivity and watershed conditions by causing increased overland flow during storm events and reduced plant growth due to a combination of factors including reduced amounts of water entering the soil and its reduced availability for plant growth, a restricted root zone, and reduced soil aeration. It is generally acknowledged that all soils are susceptible to soil compaction or decreased soil porosity. Soils are most susceptible to compaction when wet.

For OHV use, soil compaction is a chief consideration in two ways. First, it is an important component of trail stability and durability in that it is needed to enhance soil strength when developing a trail surface and drainage structures such as roll and dip (Poff & Associates, 2010). Second, soil compaction is undesirable on lands adjacent to the trail (on the forest floor). When these soils are compacted, they are more susceptible to lower infiltration rates and a corresponding increase in runoff and erosion. This will create concentrated flow which in turn increase trail instability and sedimentation in tributaries. In general, soils which are more susceptible to compaction will typically be more suitable for OHV trails.

The following tables show the compaction hazard ratings for the soil map units occupied by roads and trails in WPG.

Table 36. Miles of Road by Compaction Hazard Rating

Hazard Rating	Alternative									
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J-1**	**J-2**
Slight	6.8	4.8	4.6	6.8	7.0	7.0	4.5	4.5	3.1	4.5
Moderate	16.3	19.0	11.2	17.1	16.8	17.5	11.7	11.7	13.3	11.7
Mod High	0.3	0.6	0.2	0.2	0.2	0.2	0.2	0.2	0	0.2
High	0	0	0	0	0	0	0	0	0	0
Total	23.4	24.4	16.0	24.1	24.0	24.7	16.4	16.4	16.4	16.4

Table 37. Miles of Trail by Compaction Hazard Rating

Hazard Rating	Alternative									
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J-1**	**J-2**
Slight	3.1	3.0	4.2	7.9	0	2.6	4.2	0.1	0.1	3.2
Moderate	15.1	13.9	18.4	29.1	0	13.5	18.6	7.0	2.3	14.2
Mod High	0	0	0	0	0	0	0	0	0	0
High	0	0	0	0	0	0	0	0	0	0
Total	18.3	16.9	22.6	37.0	0	16.1	22.8	7.1	2.4	17.4

Soil Nutrients. Loss of soil nutrients can occur directly from soil erosion, soil displacement, or indirectly by biomass removal from harvesting timber, or from fire. Biomass removal in the form of timber harvest can result in nutrient deficits. None of these factors apply in this analysis area or from the proposed management actions being considered. Some reduction in nutrient capital is expected in the WPG due to two main factors: the loss of natural soil to trails and roads; and the indirect effects of both water and wind erosion and sediment deposition into other areas of the forest floor and tributaries. This will continue, and could potentially worsen during the life of the trail system. While efforts will be made to minimize the impacts of this, it nevertheless will take a toll on the nutrient status of the soil resources in WPG.

Soil Strength. Where soil characteristics affecting OHV use and management are concerned, soil strength is an important factor. The reason for this is that soil strength is the best indicator of the trafficability of a soil. Trafficability defines the ability of a soil to support a given vehicle type in traversing a specified terrain (Poff & Associates, 2010). If soil strength is not sufficient, then the trail will not adequately support OHV traffic on a sustainable basis.

Soil strength is influenced by soil texture, soil moisture content, bulk density, and to some extent, clay mineralogy. For soil texture, high sand content or high clay content will increase the likelihood of low strength; higher moisture content results in lower soil strength; as bulk density increases, soil strength increases; clays with smectitic or montmorillonitic minerologies will inherently have lower soil strength due to their instabilities through shrink/swell cycles. Fortunately, there are not any of these soil types in WPG.

Soil strength limitation ratings are inferred from the AASHTO engineering classification of soils which takes into account soil texture, rock fragment content, liquid limit, and the plasticity index (American Society for Testing and Materials, 2005). The table below shows, by alternative, how many miles of trail are in each rating category. The rating class terms indicate the extent to which the soils are limited by all of the soil features that affect soil strength. Not limiting indicates that the soil has features that are very conducive to soil strength. Somewhat limiting indicates that the soil has features that are moderately conducive to soil strength. The limitations can be overcome or minimized by special planning, design, or installation. Limiting indicates that the soil has one or more features that are not conducive to soil strength and it may require special designs, additional costs, and more frequent maintenance for trail sustainability (Olson, Soil Survey of Polk County Arkansas, 2003).

Table 38. Miles of Trail by Soil Strength Limitation Rating

	Alternative									
Rating Class	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J-1**	**J-2**
Not Limiting	2.7	2.1	2.5	6.5	0	2.4	2.5	2.5	1.1	2.1
Somewhat Limiting	4.0	7.2	10.2	16.5	0	6.3	10.4	10.7	4.1	7.8
Limiting	11.5	7.6	9.9	14.0	0	7.4	9.9	10.0	4.2	7.5
Total	18.2	16.9	22.6	37.0	0	16.1	22.8	23.2	9.4	17.4

Riparian Areas and Floodplains. Riparian areas, floodplains, and streamside management areas are considered special management areas (MA-9, Water and Riparian Communities). The management emphasis for these areas is on maintenance and improvements, and/or to improve "riparian dependent resources" (water, fisheries, aesthetics, riparian vegetation and dependent species). There are special Revised Plan design criteria for MA-9 which ensures compliance with State Best Management Practices (BMPs).

In accordance with current Best Management Practices (BMPs), trails and roads should be located no closer than 100 feet from a perennial stream or woodland seep or spring, or 30 to 50 feet (depending on slope gradient) from other defined channels (USDA Forest Service, 2005a). The following table shows, by alternative, the number of miles of trails and roads which are located within floodplains in WPG.

Table 39. Miles of Road and Trail Located within Floodplains

	Alternative									
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J-1**	**J-2**
Miles	10.1	8.4	8.1	9.7	8.7	10.6	8.3	8.3	7.5	8.2

Under Executive Order 11988 and Forest Service policy, the Ouachita National Forest has an obligation to consider impacts of management activities on 100-year floodplains (lands subject to flooding in a “100-year event”), and to ensure that management actions will not adversely alter the natural values of such floodplains. The management practices included in the alternatives are in compliance with Executive Order 11988 and Forest Service policy.

Wetlands. There are no jurisdictional wetlands within WPG. While there are small inclusionary areas of hydric soils, none of them are of sufficient size to delineate at the scales used in soil mapping. It is intended that these areas be managed to minimize or prohibit OHV use during periods of wet weather and high soil moisture conditions.

Soil Suitability for OHV Use. Soil suitability ratings for OHV use are based on specific inherent soil properties which most influence a soil's capacity to support OHV trails and roads. These soil and site properties include stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer; all of which govern a soil's erodibility, trafficability, dustiness and ease of revegetation.

The following table shows the soil suitability ratings by alternative. The rating categories are as follows: well suited indicates that the soil has features that are favorable for OHV trail and road use and has little to no limitations; moderately suited indicates that the soil has features that are moderately favorable for OHV trail and road use - one or more soil properties are less than desirable; poorly suited indicates that the soil has one or more properties that are unfavorable for OHV trail and road use. Overcoming the unfavorable properties may require special design, extra maintenance, and costly alteration (Olson, Soil Survey of Polk County Arkansas, 2003).

Table 40. Miles of Trail by Soil Suitability Rating for OHV Use

Suitability Rating	Alternative									
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J-1**	**J-2**
Well	0.3	0.1	0.2	0.2	0	0	0.1	0.1	0.1	0.1
Moderate	4.4	4.7	6.9	9.7	0	3.7	7.0	7.0	2.3	3.8
Poor	13.6	12.1	15.5	27.1	0	12.4	15.7	15.7	7.0	13.5
Total	18.3	16.9	22.6	37.0	0	16.1	22.8	22.8	9.4	17.4

The following table shows the road and trail miles to be obliterated by alternative. This is provided merely to illustrate and quantify the positive aspect of removing poorly located trail and road segments from the system.

Table 41. Obliterated Road and Trail Miles by Alternative

Miles	Alternative								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
Road	0	6.5	5.6	2.7	0	0	1.2	1.2	1.2
Trail	0	9.8	10.4	9.8	18.3	5.0	10.5	10.1	10.1
Total	0	16.3	16.0	12.5	18.3	5.0	11.7	11.3	11.3

The following table shows the miles of trail, both existing and planned, which cross through soil map units that typically have very steep slopes and contain areas of unstable surfaces due to a high concentration of rock fragments on the surface (scree or talus). Rock diameters range from 3 inches to greater than 24 inches.

Table 42. Miles of Trail Routed in Map Units with Unstable Surfaces

	Alternative									
Miles	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J-1**	**J-2**
Trail	3.8	2.4	4.1	6.0	0	3.4	4.1	4.1	1.1	3.5

Cumulative Effects

The remainder of the design reconstruction actions listed in the *Wolf Pen Gap Trail Complex Interim Management Plan* may or may not be implemented, depending on the decision made for the WPG Project, and the timing of that decision's implementation. The effects of these actions would be no different than those described for this project; they would not be additive.

The cumulative effects on soil resources in WPG can be seen in part through the tables in the Direct Effects and Indirect Effects sections. The following will serve to highlight and emphasize key components which will likely be more consequential for the long term.

Soil Erosion. Given the inherent soil properties, the historic lack of proper trail design, and other factors such as slope, soil erosion is an important issue of far-reaching consequences for WPG. While trail and road relocation will result in ground disturbance and accelerated erosion in the short term, the benefits of improved soil stability and lower erosion rates should prove highly beneficial over the long term. With enhanced maintenance on the most susceptible portions of trails, together with relocation of those trail segments producing the most sediment being the highest priorities, erosion rates should decline over time.

Soil Compaction. Effects on soil compaction are to be mitigated through preventative efforts such as education, signage, and law enforcement presence. Continuous implementation of monitoring plans will identify user-created detours and paths and precipitate closure and rehabilitation of affected areas. Where compaction is necessary to improve soil strength and trafficability on designated trails, maintenance and new construction efforts will include the application of soil materials in layers and with adequate soil moisture conditions to ensure maximum compaction and trail stability.

Soil Nutrients. Long-term reduction in nutrient capital is expected in WPG due to two main factors: the loss of natural soil due to the presence of actively used trails and roads, and the cumulative effects of both water and wind erosion and sediment deposition into more undisturbed areas of the forest floor and tributaries. This will continue, and will likely worsen during the life of the trail system. The question remains – how much will it worsen? While efforts will be made to minimize these impacts, they nevertheless will take a toll on the nutrient status of the soil resources in the area, and this will to some extent affect the health of the vegetation.

Soil Strength. Soil strength will have a direct bearing on erosion in the trail system, and it will depend upon sufficient trail maintenance and proper construction. Since there is a direct corollary between soil strength and soil compaction, reference can be made to the soil compaction section for more details.

Riparian Areas and Floodplains. Management within these areas has strong implications for longer term effects to the trail system. Depending on alternative, from 7.5 to 10.6 miles of trails and roads are within floodplains, which may result in heightened risks to associated streams.

Water Resources and Quality

Current Conditions

WPG lies almost entirely in the Camp Creek subwatershed (80401010104 hydrologic unit code or HUC). It is a tributary within the Ouachita River Headwaters (804010101 HUC) watershed. The Camp Creek subwatershed is approximately 21,399 acres, of which the Forest Service has surface ownership of approximately 10,280 acres (48%). The Forest Service ownership is concentrated in the headwaters. There are no source waters (public water supplies) for surface water or ground water within the Camp Creek subwatershed.

Two streams occupy the Forest Service portion of the Camp Creek subwatershed—Gap Creek and Board Camp Creek. These streams have a unique drainage feature in that during their formation the east-west mountain ridge was eroded through or captured, forming gaps in three places. This natural erosion created a trellis drainage pattern which, in conjunction with steep slopes, can generate flashy runoff.

The *Wolf Pen Gap Trail Complex Interim Management Plan* was developed in 2010. Implementation of the plan and Best Management Practices (BMPs) has resulted in some improvement in road and trail conditions and facilitated coordination and collaboration among stakeholders. The existing road and trail system still includes some poorly located, improperly designed routes and is still connected to stream courses at some crossings.

Direct Effects

OHV Use

The most common direct effect from OHV use is when an OHV comes in direct contact with water. Since the forest floor is closed to OHV use, this only occurs at unimproved fords. When water is present in unimproved fords, each pass of an OHV flushes fine sediments directly into the channel. Currently, WPG routes require approximately 371 stream crossings (perennial, intermittent, and some ephemerals with defined stream channels), of which 239 are unimproved fords.

Figure 21. Recently crossed, unimproved ford.

Under Alternative A (No Action), the effects described above would continue because no unimproved fords would be replaced.

Each action alternative proposes replacement of all unimproved fords. The direct effects of OHV use at stream crossings would be removed once management actions are fully implemented.

Proposed Activities

The construction of structures to replace unimproved fords will have an adverse effect on water quality during the actual construction and maintenance (equipment in the channel). While detrimental, these actions would be short lived (less than a week except in the case of a few bridges) and would provide a much improved condition over time by eliminating OHV contact within channels.

Table 43 identifies the number and type of structures proposed to replace existing unimproved fords and proposed new crossings by alternative. Based on stream size (perennial, intermittent, or ephemeral) and proposed use (trail, road, or mixed), the following ford replacements are identified. Arches and concrete planks are generally used for trails; culverts and concrete planks are used for roads or mixed use; and large arches and bridges could be for either trail or road use depending on the alternative.

Table 43. Structures Proposed to Replace Existing Fords and New Crossings

	Alternative								
Structure	**A**[1]	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
Arches/Planks	97	133	136	224	0	96	138	139	139
Culverts/Planks	106	110	87	101	109	107	99	99	99
Large Arches	32	23	23	27	21	28	26	26	26
Bridge	4	6	6	12	3	5	6	6	6
Total	239	272	252	364	133	236	269	269	269

[1] Alternative A (No Action) shown only for comparison

Alternative E would require the fewest number of structures requiring construction for unimproved fords, followed by Alternative C. Alternative D has the most crossings and would require the greatest level of disturbance during construction and maintenance.

Indirect Effects

Actions proposed in the EA include road and trail construction, reconstruction, maintenance and obliteration near streams and at stream crossings. The type of vehicles allowed (OHV and/or highway legal vehicles) and the frequency of travel near streams also has an indirect effect on water quality.

Table 44 displays the resulting miles of roads and trails allowing OHV use that are proximal (within 100 feet) of the stream network using the NHD streams layer. Roads and trails that are in close vicinity to streams have a greater chance of an adverse effect on water quality. Sediment from the road or trail can be stored in the buffer only to be transported to the stream when larger storms or wet periods occur.

Table 44. Miles of OHV Use within 100 feet of a Major Stream by Alternative

	Alternative									
Route Miles	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J-1**	**J-2**
Road	4.9	2.7	1.7	2.6	0	4.9	2.2	2.4	1.9	1.7
Trail	1.0	0.5	0.7	1.0	0	1.0	0.7	0.7	0.8	0.2
Total	5.9	3.2	2.4	3.6	0	5.9	2.9	3.1	2.7	1.9

Alternative E has zero miles of road or trail that are close to streams and allow OHV use. From that perspective, this would be the most desirable alternative for water quality, followed by Alternative C which is the second most restrictive alternative with 2.4 miles of road and trail with OHV use that are within 100 feet of a stream.

Table 45. Miles of OHV Route Obliterated within 100 feet of a Major Stream by Alternative

	Alternative								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
Miles	0	3.5	3.4	1.6	1.0	0.1	1.2	1.2	1.2

Comparing alternatives that would obliterate or remove road and trail miles in the immediate vicinity of streams, Alternative B has the greatest reduction, followed by Alternative C. The remaining alternatives have much lower values. Obliterating roads and trails that are within the vicinity of streams has a positive effect on water quality and associated beneficial uses by removing a potential sediment source.

The obliteration of roads and trails also has the potential to adversely affect water quality. If a storm event occurs during the actual ground disturbance, or while the ground is exposed, more sediment can move into the stream channel. These effects are short lived (usually less than a week), and obliteration of routes would provide much improved conditions over time.

Cumulative Effects

The determination of cumulative effects is made from three sources of information; data from monitoring or inventory efforts, modeling, and site specific field review.

Monitoring, Inventory and Field Review

Aquatic monitoring primarily uses the Basin Area Stream Survey (BASS). This survey is a systematic classification and measurement of stream habitats. Biotic factors and water chemistry are also measured. This monitoring method allows for comparisons of paired reference and managed watersheds by ecoregion (Clingenpeel and Cochran 1992).

Comparing reference and managed streams to the streams within WPG, the streams associated with OHV use show evidence of decline in some physical parameters when compared within year, as well as trends over time (Clingenpeel J. A., 2012).

ACE Model

The Aquatic Cumulative Effects (ACE) model (Clingenpeel & Crump, A Manual for the Aquatic Cumulative Effects Model, 2005) is used to calculate the cumulative effects of management activities on water quality and associated beneficial uses. The model calculates sediment from terrestrial sources (various land uses) and linear sources (roads and trails). The model was modified to include use levels, the latest National Land Cover Data (NLCD) and slope classes. Ownership, slope, ecoregion, road surface, recreation use, and maintenance are factors included in the model. Risk levels are determined by comparing the relative abundance of fish community guilds to modeled outputs. Fish samples (with complete population counts) were compared to the modeled sediment loads for the associated watershed. Thresholds or risk levels were established based on fish community responses to increases in sediment. Risk criteria include ecoregion and slope classifications.

Use levels were determined from several sources. Initially, forest recreation and hydrology personnel identified broad categories of OHV use across the forest. This was refined through District and Law enforcement review. Four use levels were determined; low use is less than 2,000 OHV users per year, moderate is 2,000 to 8,000 OHV users per

year, high is 8,000 to 12,000 OHV users per year, and very high is greater than 12,000 OHV users per year. Law enforcement spot check data were summarized in a spreadsheet and from that use levels for seasons (summer holidays, summer weekends, summer weekdays, winter hunting, etc.) were determined. Unfortunately, these data did not distinguish between OHV and licensed vehicles. Additional use counts were conducted in the summer of 2008 for high use areas. These data were combined with law enforcement spot check data to determine annual OHV use with seasons. Lastly, a series of trail counters were placed in WPG from March of 2010 to March of 2011 to determine use. Additional trail counter use data were collected in 2012.

Given these analysis methods, three risk levels[1] are identified by subwatershed and alternative:

> Low—there is no risk that effects would rise to a level threatening violation of any water quality standards or administrative limits. Effects are well understood, and mitigation in past projects has demonstrated effects are either not detectable or have no effect on beneficial uses.
>
> Moderate—environmental effects are measurable and observable for short periods of time following storm flow events. These effects are short term (less than a few weeks) and do not affect large portions of the watershed. Recovery is complete and beneficial uses are disrupted only for short periods in localized areas.
>
> High—environmental effects persist and can change the hydrologic system with observable changes for as long as the causing actions persist. Effects can threaten exceedence of environmental thresholds for periods of time (years). If causative actions persist over time, permanent adjustments can occur to the hydrologic system. Outcomes could include violation of a Wild and Scenic River Act, loss or impairment of an aquatic threatened or endangered species (Endangered Species Act), impairment of a public water source, and violation of the anti-degradation clause of the Clean Water Act.

The ACE model considers public and private activities within the subwatershed as well as past (historic condition), present (current condition) and future conditions (proposed actions) (Clingenpeel & Crump, A Manual for the Aquatic Cumulative Effects Model, 2005).

From the Ouachita NF 2010 Travel Management Project, the Camp Creek subwatershed was rated as having a risk level of High for all alternatives. Using the same process for this project, the results would be similar with all alternatives except for the most restrictive of the alternatives (Alternative E), which would be rated as representing a Moderate risk. However, because the actions proposed within this project are restricted to roads and trails (linear events), we can simplify the analysis and further refine the risk associated with the alternatives using this modified cumulative effects analysis.

[1] Risk level descriptions apply to subwatersheds across the Forest, including WPG.

Table 46 displays the total sediment yield from Forest Service roads and trails within WPG and Camp Creek subwatershed using the modified cumulative effects analysis. These yields model the current road and trail condition (Alternative A) and estimated reductions of sediment as a result of seasonal restrictions, road to trail conversions, closing roads and trails, relocating roads and trails, obliterating roads and trails, providing proper maintenance (Forest Technical Requirements and Design Criteria, including BMPs), and additional trail BMPs from Trails Unlimited.

The road and trail sediment yields taken from the extensive field survey conducted in the winter of 2012 of existing roads and trails within WPG. Over 47 miles were surveyed and then modeled for various combinations of use, maintenance, and design. Specific design criteria include proper crossdrain spacing, minimum trail width, and sediment basins. The roads and trails are assumed to be fully functional and frequently maintained for all alternatives except Alternative A.

For comparison, the sediment yield estimate for the Travel Management Project (USDA Forest Service, 2009) (MVUM) is shown as well as the sediment yield in 2001 when WPG was closed as a result of the 2000 ice storm. Stream surveys in 2001 found a slight recovery in physical parameters. Using the Ouachita NF Travel Management Project (MVUM) as a threshold, the dashed line is an aid for the reader to identify what alternatives would have a lower risk (alternatives that are below the line).

Table 46. Modeled Sediment Yield for WPG Road and Trails by Alternative

Route	**Alternative**											MVUM
Type	A	B	C	D	E	F	G	I	J-1	J-2	2001	2010
Road	906	862	456	678	341	749	611	611	596	574	385	402
Trail	528	192	133	538	0	183	271	281	208	220	163	166
Total	1,435	1,053	588	1,215	341	932	882	892	804	793	547	568

Alternative E falls below, and Alternative C is barely above the Ouachita NF Travel Management Project (MVUM) threshold and may be sustainable for water quality and aquatic biota. It should be noted that although Alternative I restricts OHV use to eight months out of the year, the estimated reduction in users does not result in a change in use level as defined on page 72.

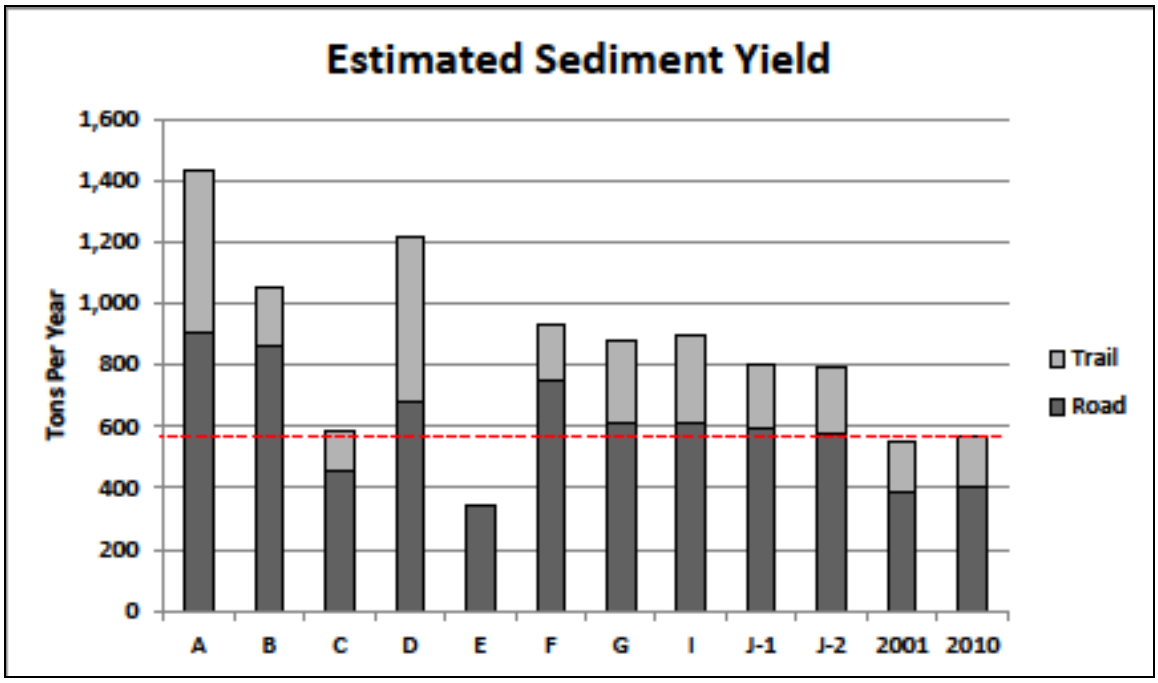

Figure 22. Annual tons of sediment from the WPG OHV complex.

The data displayed in Table 46 and Figure 22 are based on the following assumptions; 1) maintenance is complete and timely for all roads and trails, 2) roads and trails have all been reconstructed or constructed to forest standards, 3) user numbers do not exceed those estimated for each season of use, 4) illegal use by OHVs on highway only roads or the forest floor does not occur, 5) the alternative is fully implemented.

Groundwater

No direct, indirect or cumulative effects are anticipated for groundwater since all effects are limited to sediment and habitat loss and do not influence groundwater. No source waters are present within the Camp Creek Subwatershed.

Rare Upland and Forested Seep Communities

The table below lists the number of road and trail locations associated with special communities by alternative.

Table 47. Number of Route Locations Associated with Special Communities

	Alternative								
Community	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
Dry Acidic Glade and Barrens	0	0	0	8	0	0	0	0	0
Ouachita Mountain Forest Seep	10	14	14	18	9	11	10	10	10
Acidic Cliff and Talus	0	0	0	6	0	0	0	0	0
Total	10	14	14	32	9	11	10	10	10

Central Interior Highlands Dry Acidic Glade and Barrens

This system is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions. It occurs along moderate to steep slopes or valley walls of rivers along most aspects. Parent material includes chert, igneous and/or sandstone bedrock with well-drained to excessively well-drained, shallow soils interspersed with rock and boulders. These soils are typically dry during the summer and autumn, becoming saturated during the spring and winter. Grasses dominate this system, with stunted oak species and shrub species occurring on variable depth soils. This system is influenced by drought and infrequent to occasional fires. This habitat supports five animal and eight plant species of viability concern. This community is uncommon and is only .2 percent of the total NF acres.

Desired Condition: The desired condition is an open glade structure maintained by periodic fire. The fire regime should reflect that 50-85 percent of the dry acidic glades and barrens system and a 100-meter buffer are burned every 5-10 years, including an occasional growing season fire. Old growth conditions will develop and go through regeneration cycles naturally, supplemented by prescribed fire, in all the acres of this community, which occurs in small patches.

Alternative D is the only alternative which would directly impact any glades within the project area. Trail development within these areas would eliminate glade habitat and provide opportunity for the introduction of NNIS into the plant community. Altering this plant community could eliminate habitat for the community dependent species.

Central Interior Acidic Cliff and Talus

This system is found primarily in the Interior Highlands. Sandstone outcrops and talus ranging from moist to dry typify this system. It is typically sparsely vegetated; however, on moister sites with more soil development, several fern species and sedges (*Carex* spp.) may become established. Wind, fire, and water erosion are the major natural forces that influence this system. This habitat supports six animal species of viability concern. This community is uncommon and is only 0.3 percent of the total NF acres.

Desired Condition: The desired condition is an open, rocky, herbaceous-dominated system with sparse woody vegetation occasionally influenced by natural or prescribed fires.

Alternative D is the only alternative which would directly impact any cliff and talus community within the project area. Trail development within these areas would eliminate habitat and provide opportunity for the introduction of NNIS into the plant community. Altering this plant community could eliminate habitat for the community dependent species.

Ouachita Mountain Forest Seep

Forested seeps occur in the Ouachita Mountains of Arkansas and Oklahoma. Examples

may be found along the lower slopes of smaller valleys where rock fractures allow water to seep out of the mountainsides and into the riparian zones of larger creeks, sometimes extending upslope along small ephemeral drains. The soil remains saturated to very moist throughout the year. The vegetation is typically forested but is highly variable in canopy composition. Red maple, black tupelo, sweetgum, and white oak are common and typical; American beech and/or umbrella magnolia may be present. Canopy coverage may be moderately dense to quite open. The subcanopy is often well developed and characteristically includes American holly, umbrella magnolia, and ironwood. This habitat supports eight animal and four plant species of viability concern. This community is uncommon and is less than 0.1 percent of the total NF acres.

Desired Condition: The desired condition for this system is a largely undisturbed, mature community with a protective buffer 100 feet from the seep boundaries. Old growth seep communities develop and regenerate naturally in relatively small patches.

Currently, there are several forested seeps which have been interrupted by road and trails within the WPG project area. These roads have altered the plant community by disrupting the hydrology and creating sediment which is being deposited into the system. Road and or trail construction within these communities can alter the hydrology of the system and can permanently change the vegetation composition which could eliminate habitat for animals which are dependent on this system.

Spread of Non-native Invasive Species

Current Conditions

Non-native invasive (NNIS) plants are plants alien to the environment in which they have been introduced. Causes of introduction are associated with various anthropogenic practices such as agriculture, ornamental cultivation, soil restoration efforts, or through accidental import/release, etc. Since NNIS did not evolve within the host environment, they are not as susceptible to the host environments natural plant predators (insects and diseases). This lack of natural control allows NNIS to spread rapidly with little natural opposition and to cause economic or environmental harm or harm to human health. Due to this threat from NNIS the Southern Region developed the Southern Region Noxious Weed Strategy and Regional Forester's list of invasive exotic plant species of management concern. As part of the project area analysis, the Regional Forester's list was reviewed and from that list, it was determined through field surveys that 6 NNIS occur within the WPG project area: Silk Tree (mimosa) – *Albizia julibrissin*, Air Potato (climbing yam) – *Dioscorea batatas*, Sericea lespedeza – *Lespedeza cuneata*, Autumn olive – *Elaeagnus umbellate*, Nepalese browntop – *Microstegium vimineum*, and Mutiflora rose – *Rosa multiflora*.

There are no plans to treat or control invasive species within the scope of this project. Effects on sensitive plant species are discussed above.

The effects of NNIS spread on native species are addressed in the PETS section of this document (see below).

Proposed, Endangered, Threatened, & Sensitive (PETS) Species

Current Conditions

The PETS species list containing federally listed species and sensitive species from the Region 8 Regional Forester's Sensitive Species List that are known to occur on the Ouachita NF, the Forest Service's Sensitive Species list for the Ouachita NF, element occurrence records from the Arkansas Natural Heritage Commission (2007), the USDI-FWS list of Endangered and Threatened Wildlife and Plants, and site-specific Forest records were all examined for known PETS species locations within the influence of the project area.

There are no terrestrial federally endangered or threatened species known to occur within the WPG project analysis area, but the federally proposed (proposed for listed under the Endangered Species Act) northern long-eared bat is assumed to occur within the area. Also, there are three federally threatened aquatic species and one federally endangered species listed as occurring or potentially occurring within the influence of activities of the WPG project area. These aquatic species include one fish and three mussels.

There are six terrestrial and 14 aquatic sensitive species listed as occurring or potentially occurring within the influence of the project area. The terrestrial sensitive species include four plants, one insect, and one amphibian. The aquatic sensitive species include five fish, eight mussels, and one crayfish.

Table 48. PETS Species

Scientific Name	Common Name	Status
Terrestrial Species		
Myotis septentrionalis	Northern long-eared bat	Proposed
Carex latebracteata	Waterfall's sedge	Sensitive
Castanea pumila var. *ozarkensis*	Ozark chinquapin	Sensitive
Solidago ouachitensis	Ouachita Mountain goldenrod	Sensitive
Streptanthus squamiformis	Pineoak jewelflower	Sensitive
Speyeria diana	Diana fritillary	Sensitive
Plethodon caddoensis	Caddo Mountain salamander	Sensitive
Aquatic Species		
Percina pantherina	Leopard darter	Threatened
Lampsilis powellii	Arkansas Fatmucket	Threatened
Cumberlandia monodonta	Spectaclecase	Endangered
Quadrula cylindrica cylindrica	Rabbitsfoot	Threatened
Orconectes menae	A crayfish	Sensitive
Cyprogenia aberti	Western fanshell mussel	Sensitive
Lampsilis hydiana	Louisiana fatmucket	Sensitive
Lampsilis satura	Sandbank pocketbook	Sensitive
Obovaria jacksoniana	Southern hickorynut	Sensitive
Pleurobema cordatum	Ohio River pigtoe	Sensitive
Pleurobema rubrum	Pyramid pigtoe	Sensitive
Toxolasma lividus	Purple lilliput	Sensitive
Villosa arkansasensis	Ouachita creekshell	Sensitive
Lythrurus snelsoni	Ouachita shiner	Sensitive
Notropis perpallidus	Peppered shiner	Sensitive
Notropis ortenburgeri	Kiamichi shiner	Sensitive
Noturus taylori	Caddo madtom	Sensitive
Percina sp. nov.	Ouachita darter	Sensitive

Effects

Terrestrial - Plants

This section addresses effects on proposed, endangered, threatened, and sensitive plant species in terms of the following proposed management actions:

- **Designation of Roads and Trails for Motor Vehicle Use:** This section addresses the proposal to designate routes and trails for various recreational opportunities.

- **Ground Disturbing Activities:** This includes road and trail construction and/or reconstruction, converting roads to trails, road and trail obliteration, stream crossing bridges and culverts, foot trail construction, picnic facilities and shelter construction at existing vistas and trail heads.

- **Effects of seasonal OHV use:** Roads and Trails open to OHVs (as defined above), seasonally (*season varies by Alternative)*.

General effects: Ground disturbing activities such as road and trail construction (see list above) can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail.

Table 49. Number of road and trail locations associated with NNIS by alternative

	Alternative								
Species	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
Albizia julibrissin	2	2	2	0	2	2	0	0	0
Dioscorea batatas	1	1	1	0	1	1	0	0	0
Elaeagnus umbellata	4	4	4	5	4	4	4	4	4
Lespedeza cuneata	10	14	13	18	8	11	10	10	10
Microstegium vimineum	9	9	13	8	9	11	8	8	8
Rosa multiflora	1	1	1	1	1	1	1	1	1
Total	27	31	34	32	25	30	23	23	23

Plants are affected by OHV activities in several ways. Soil compaction can affects plant growth which can limit the size and abundance of the plants. Direct effects of above-ground portions of plants may be impacted through breakage or crushing. Dusting, which is essentially a blanket of dust raised by OHV traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The results of these impacts are a reduction in plant vigor (Ouren, et al., 2007). Other impacts include the introduction of non-native invasive species (NNIS) brought in on OHV s and transported from one area to another. The NNIS can out-compete native species which could result in loss of individuals or their habitat. An area where soil compaction occurs is often invaded by non-native invasive species which will out-compete native vegetation.

Waterfall's Sedge (*Carex latebracteata*)

Environmental Baseline

Waterfall's sedge is endemic to the Ouachita Mountains of southeastern Oklahoma and southwestern Arkansas. It is found in a variety of habitats such as shaley roadsides, dry shale woodlands, riparian areas, mesic oak-hickory forest, pine and pine hardwood forest, and mazarn shale and novaculite glades. It is found in Polk, Yell, Montgomery, Howard, Garland, Sevier and Pike counties in Arkansas, and LeFlore and McCurtain counties in Oklahoma. Waterfall's sedge is locally abundant along stream systems and north facing slopes of the Ouachita Mountains in Arkansas and Oklahoma. Populations vary in number from a few individuals to over a thousand plants (USDA Forest Service, 2005b). Flowering period is March and April. The following table shows the number of road and trail locations associated with Waterfall's sedge locations documented from field surveys and ANHC element occurrence data (2007).

Table 50. Number of Routes Associated with Waterfall's Sedge Locations by Alternative

	Alternative								
Source	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
ANHC	6	7	6	9	6	6	6	6	6
Field Survey	1	3	2	16	1	1	2	2	2
Total	7	10	8	25	7	7	8	8	8

Alternative A

This species is common within the WPG project area; therefore, not all locations were documented. There were 7 locations for *Carex latebracteata* documented during the field surveys and/or from the 2007 Element Occurrence Data Records. These sites reflect several numbers of individuals.

Alternative A reflects the current condition. Existing roads and trails are not suitable habitat for this species; therefore no direct impacts from ground disturbing activities are anticipated.

Flowering period for this species is March and April. Alternative A would continue to allow year round OHV use. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative A.

Currently, there are 27 locations of NNIS along existing roads and trails (see page 80). Cumulative impacts due to potential spread of NNIS would continue under the current roads and trails system. This could result in degradation and/or elimination of additional Waterfall's sedge habitat.

Alternative B – Proposed Action

This species is wide spread on the Forest and within the WPG project area. Many sites are along roads designated for OHV use. There were 10 locations for *Carex latebracteata* documented in the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and /or reconstruction. These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to establish itself in old abandoned road beds. Roads which are being obliterated may impact some individuals adjacent to the road bed, but could become re-established when the area is rehabilitated. Although there are trails which will be obliterated, the net loss of habitat would remain relatively the same due to new road and trail construction.

Flowering period for this species is March and April. Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The results of these impacts are a reduction in plant vigor (Ouren, et al., 2007). This Alternative has a season of use which is February 1 thru October 31. This limited season may slightly reduce the amount of dust and use due to the 3-month rest period. November thru January is typically a wetter period and dusting is less of a problem. The largest amount of dust would occur during the summer months which are the time of flowering, fruit development and general plant growth for Waterfall's sedge.

Currently, there are 31 locations of NNIS that occur along existing roads and trails, and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional Waterfall's sedge habitat.

Alternative C

There were 8 locations for *Carex latebracteata* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 81). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to establish itself in old abandoned road beds. Roads which are being obliterated may impact some individuals adjacent to the road bed but could become re-established when the area is rehabilitated.

Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). This alternative has three possible seasons of use. Waterfall's sedge flowers during the month of March and April. The season of use from March 15 thru August 31would have an approximate 6 month rest period and would reduce the amount of time the plants are exposed to dusting, but this season of use would not benefit this species reproduction or general growth since OHVs would be in use during typically the driest months of the year when dusting would be at its highest levels. The season of use from March 15 thru March 31 and June 1 thru November 30 would have similar results. The season of use of March 15 thru April 15, May 1 thru July 31, and September 1 thru October 15 would also have similar results.

Currently, there are 34 locations of NNIS that occur along existing roads and trails and s routes for roads and trails (see page 80). This alternative has the highest number of locations of NNIS. This is due to the additional road miles which will be obliterated and relocated. Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional Waterfall's sedge habitat.

Alternative D

There were 25 locations for *Carex latebracteata* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing road and trails or areas of new trail construction and/or relocation (see page 81). This is the highest number of sites affected compared to any of the alternatives. These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to establish itself in old abandoned road beds. Roads which are being obliterated may impact some individuals adjacent to the road bed but could become re-established when the area is rehabilitated. Alternative D would impact significantly more Waterfall's sedge sites than any other alternative due to the higher number of miles of trail being constructed.

Flowering period for this species is March and April. Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). This alternative has year round OHV use and impacts would be similar to Alternative A.

Currently, there are 32 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional Waterfall's sedge habitat. This alternative has the highest number of miles of roads and trails compared to other alternatives.

Alternative E

There were 7 locations for *Carex latebracteata* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads (see page 81). This alternative will not have OHV use on any roads and all trails would be obliterated.

Ground disturbing activities from trail obliteration can directly affect plants by destruction of the above-ground stems and through uprooting individuals. This species is known to establish itself in old abandoned road beds. Trails which are being obliterated may impact some individuals adjacent to the trail but could become re-established when the area is rehabilitated.

Flowering period for this species is March and April. Dusting would be greatly reduced in this alternative due to limiting road use to vehicular traffic and obliterating all trails. Dusting can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007).

Currently, there are 25 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts due to potential introduction of NNIS into new areas during ground disturbing activities and vehicular travel would continue and most likely expand under this alternative. This could result in degradation and/or elimination of additional Waterfall's sedge habitat.

Alternative F

This species is common within the WPG project area; therefore, not all locations were documented. There were 7 locations for *Carex latebracteata* documented during the field surveys and/or from the 2007 Element Occurrence Data Records (see page 81). These sites reflect several numbers of individuals. This alternative is very similar to Alternative A.

Alternative F reflects the current road and trail system with the exception of short-term trail closures that would be permanently decommissioned and two routes (Trail 836 and a portion of Trail 8) that would be relocated. No other changes to the transportation system would occur; currently, designated roads and motorized trails remain designated.

Ground disturbing activities from trail obliteration and relocation can directly affect plants by destruction of the above-ground stems and through uprooting individuals. This species is known to establish itself in old abandoned road beds. Trails which are being obliterated may impact some individuals adjacent to the trail but could become re-established when the area is rehabilitated.

Flowering period for this species is March and April. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative F would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative F.

Currently, there are 30 locations of NNIS along existing roads and trails (see page 80). Cumulative impacts due to potential spread of NNIS would continue under the current roads and trails system. This could result in degradation and/or elimination of additional Waterfall's sedge habitat.

Alternative G

There were 8 locations for *Carex latebracteata* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 81). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to establish itself in old abandoned road beds. Roads and trails which are being obliterated may impact some individuals adjacent to the road bed but could become re-established when the area is rehabilitated.

Flowering period for this species is March and April. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative G would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative G.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional Waterfall's sedge habitat.

Alternative I

Alternative I has a modified period of use which includes the flowering and fruiting period of the *Carex latebracteata*. There were 8 locations for *Carex latebracteata* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 81). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to establish itself in old abandoned road beds. Roads and trails which are being obliterated may impact some individuals adjacent to the road bed but could become re-established when the area is rehabilitated.

Flowering period for this species is March and April. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative I would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative I.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional Waterfall's sedge habitat.

Alternative J

Alternative J employs a rotation schedule whereby OHV use on trails would be rotated on a yearly basis. The trail system is divided into two different sections. There were 8 locations for *Carex latebracteata* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 81). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to establish itself in old abandoned road beds. Roads and trails which are being obliterated may impact some individuals adjacent to the road bed, but could become re-established when the area is rehabilitated.

Flowering period for this species is March and April. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative J would allow year round OHV use on trail sections open from that particular year. The section which would be in nonuse would allow relief from the dusting for one year which could allow the plant to flower and produce seed. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative J.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional Waterfall's sedge habitat.

Pineoak Jewelflower (*Streptanthus squamiformis*)

Environmental Baseline

This species is an annual that flowers in May and June, and is known from Oklahoma and Arkansas. The only locations known to occur on the Forest are on the Mena Ranger District and in the acquired lands in McCurtain County, Oklahoma. It can be found in clearings, early successional vegetation types, forested sites; on rocky sites; often with considerable slope; often associated with slopes and ravines adjacent to small streams. Seeds produced can number up to 60 and are dispersed by actions of man and nature (USDA Forest Service, 2005b).

The following table displays the number of road and trail locations associated with *Streptanthus squamiformis* locations documented from field surveys and ANHC element occurrence data (2007).

Table 51. Number of Routes Associated with *Streptanthus squamiformis* Locations by Alternative

	Alternative								
Source	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
ANHC	4	5	4	8	4	4	4	4	4
Field Survey	0	0	0	0	0	0	0	0	0
Total	4	5	4	8	4	4	4	4	4

Alternative A

This species is not common on the forest or within the WPG project area. There were 4 locations for *Streptanthus squamiformis* documented during the field surveys and/or from the 2007 Element Occurrence Data Records (Table 51). These sites reflect several numbers of individuals.

Alternative A reflects the current condition. Existing roads and trails are not suitable habitat for this species; therefore no direct impacts from ground disturbing activities are anticipated.

Streptanthus squamiformis flowers during May and June. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential. Alternative A would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative A.

Currently, there are 27 locations of NNIS along existing roads and trails (see page 80). Cumulative impacts due to potential spread of NNIS would continue under the current roads and trails system. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat.

Alternative B – Proposed Action

This species is not is not common on the Forest or within the WPG project area. There were 5 locations for *Streptanthus squamiformis* documented in the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or locations for new construction and/or reconstruction (see page 87). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to occur along roadsides and in areas of disturbance. Roads which are being obliterated may impact some individuals adjacent to the road bed but could become re-established when the area is rehabilitated. Although there are trails that will be obliterated, the net loss of habitat would remain relatively the same due to new road and trail construction.

Streptanthus squamiformis flowers during May and June. Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The results of these impacts are a reduction in plant vigor (Ouren, et al., 2007). This Alternative has a season of use which is February 1 thru October 31. This limited season would not reduce the amount of dust due to the 3-month rest period occurs during the dormant season. This species is an annual and would not be up in November thru January. The largest amount of dust would occur during the summer months which are the time of flowering, fruit development and general plant growth for *Streptanthus squamiformis*.

Currently, there are 31 locations of NNIS that occur along existing roads and trails, and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat.

Alternative C

There were 4 locations for *Streptanthus squamiformis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 87). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to occur along roadsides and in areas of disturbance. Roads which are being obliterated may impact some individuals adjacent to the road bed, but could become re-established when the area is rehabilitated.

Streptanthus squamiformis flowers during May and June. Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). This alternative has three possible seasons of use. The season of use from March 15 thru August 31would have an approximate 6 month rest period and would reduce the amount of time the plants are exposed to dusting, but this season of use would not benefit this species reproduction or general growth since OHVs would be in use during typically the driest months of the year when dusting would be at its highest levels. The season of use from March 15 thru March 31 and June 1 thru November 30 would have similar results. The season of use of March 15 thru April 15, May 1 thru July 31, and September 1 thru October 15 would also have similar results.

Currently, there are 34 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). This alternative has the highest number of locations of NNIS. This is due to the additional road miles which will be obliterated and relocated. Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat.

Alternative D

There were 8 locations for *Streptanthus squamiformis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new trail construction and/or relocation (see page 87). This is the highest number of sites affected compared to any of the alternatives. These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to occur along roadsides and in areas of disturbance. Roads which are being obliterated may impact some individuals adjacent to the road bed, but could become re-established when the area is rehabilitated. Alternative D would impact significantly more *Streptanthus squamiformis* sites than any other alternative due to the higher number of miles of trail being constructed.

Streptanthus squamiformis flowers during May and June. Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). This alternative has year round OHV use and impacts would be similar to Alternative A.

Currently, there are 32 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat. This alternative has the highest number of miles of roads and trails compared to other alternatives.

Alternative E

There were 4 locations for *Streptanthus squamiformis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads (see page 87). This alternative will not have OHV use on any roads and all trails would be obliterated.

Ground disturbing activities from trail obliteration can directly affect plants by destruction of the above-ground stems and through uprooting individuals. This species is known to occur along roadsides and in areas of disturbance. Trails which are being obliterated may impact some individuals adjacent to the trail, but could become re-established when the area is rehabilitated.

Streptanthus squamiformis flowers during May and June. Dusting would be greatly reduced in this alternative due to limiting road use to vehicular traffic and obliterating all trails. Dusting can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007).

Currently, there are 25 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts due to potential introduction of NNIS into new areas during ground disturbing activities and vehicular travel would continue and most likely expand under this alternative. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat.

Alternative F

There were 4 locations for *Streptanthus squamiformis* documented during the field surveys and/or from the 2007 Element Occurrence Data Records (see page 87). These sites reflect several numbers of individuals. This alternative is very similar to Alternative A.

Alternative F reflects the current road and trail system with the exception of short-term trail closures that would be permanently decommissioned and two routes (Trail 836 and a portion of Trail 8) that would be relocated. No other changes to the transportation system would occur; currently designated roads and motorized trails remain designated.

Ground disturbing activities from trail obliteration and relocation can directly affect plants by destruction of the above-ground stems and through uprooting individuals. This species is known to occur along roadsides and in areas of disturbance. Trails which are being obliterated may impact some individuals adjacent to the trail, but could become re-established when the area is rehabilitated.

Streptanthus squamiformis flowers during May and June. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative F would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative F.

Currently, there are 30 locations of NNIS along existing roads and trails (see page 80). Cumulative impacts due to potential spread of NNIS would continue under the current roads and trails system. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat.

Alternative G

There were 4 locations for *Streptanthus squamiformis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 87). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to occur along roadsides and in areas of disturbance. Roads and trails which are being obliterated may impact some individuals adjacent to the road bed, but could become re-established when the area is rehabilitated.

Streptanthus squamiformis flowers during May and June. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative G would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative G.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat.

Alternative I

Alternative I has a modified period of use which includes the flowering and fruiting period of the *Streptanthus squamiformis.* There were 4 locations for *Streptanthus squamiformis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 87). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to occur along roadsides and in areas of disturbance. Roads and trails which are being obliterated may impact some individuals adjacent to the road bed but could become re-established when the area is rehabilitated.

Streptanthus squamiformis flowers during May and June. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative I would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative I.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat.

Alternative J

Alternative J employs a rotation schedule whereby OHV use on trails would be rotated on a yearly basis. The trail system is divided into two different sections. There were 4 locations for *Streptanthus squamiformis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 87). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is known to occur along roadsides and in areas of disturbance. Roads and trails which are being obliterated may impact some individuals adjacent to the road bed, but could become re-established when the area is rehabilitated.

Streptanthus squamiformis flowers during May and June. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative J would allow year round OHV use on trail sections open from that particular year. The section which would be in nonuse would allow relief from the dusting for one year which could allow the plant to flower and produce seed. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative J.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Streptanthus squamiformis* habitat.

Ouachita Mountain Goldenrod (*Solidago ouachitensis*)

Environmental Baseline

This species is endemic to the Ouachita Mountains of Arkansas and Oklahoma and is known from over 40 locations on the Forest. It is known to occur in Polk, Yell, Montgomery, and Pike Counties in Arkansas, and LeFlore County in Oklahoma (USDA Forest Service, 2005b). Ouachita Mountain goldenrod is found in areas of deep shade or on north-facing slopes. Flowering period is September and October.

Table 52 displays the number of road and trail locations associated with *Solidago ouachitensis* locations documented from field surveys and ANHC element occurrence data (2007).

Table 52. Number of Routes Associated with Ouachita Mountain Goldenrod Locations by Alternative

Source	Alternative								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
ANHC	0	0	0	0	0	0	0	0	0
Field Survey	1	1	1	3	0	2	1	1	1
Total	1	1	1	3	0	2	1	1	1

Alternative A

This species is not common within the WPG project area. There is one location for *Solidago ouachitensis* documented during the field surveys and/or from the 2007 Element Occurrence Data Records (Table 52). These sites reflect several numbers of individuals.

Alternative A reflects the current condition. Existing roads and trails are not suitable habitat for this species; therefore, no direct impacts from ground disturbing activities are anticipated.

Flowering period for this species is September and October. Alternative A would continue to allow year round OHV use. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative A.

Currently, there are 27 locations of NNIS along existing roads and trails (see page 80). Cumulative impacts due to potential spread of NNIS would continue under the current roads and trails system. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat.

Alternative B – Proposed Action

This species is not widespread on the Forest or within the WPG project area. There is one location for *Solidago ouachitensis* documented in the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or reconstruction. These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is found in areas of deep shade or on north-facing slopes. The one location would be eliminated during trail construction. This species has a restrictive habitat preference. There is no information that shows this species can tolerate ground disturbance.

Flowering period for this species is September and October. Dusting, which is an essentially blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The results of these impacts are a reduction in plant vigor (Ouren, et al., 2007). This Alternative has a season of use which is February 1 thru October 31. This limited season may slightly reduce the amount of dust and use due to the 3-month rest period. The largest amount of dust would occur during the summer months, which is the time of plant development. Flowering and fruit development would be less affected since this species does not flower until after season closes.

Currently, there are 31 locations of NNIS that occur along existing roads and trails, and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat.

Alternative C

There were 3 locations for *Solidago ouachitensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 94). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is found in areas of deep shade or on north-facing slopes. One of the locations would be eliminated during trail construction. This species has a restrictive habitat preference. There is no information that shows this species can tolerate ground disturbance.

Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). This alternative has three possible seasons of use. *Solidago ouachitensis* flowers during the month of September and October. The season of use from March 15 thru August 31would have an approximate 6 month rest period and would reduce the amount of time the plants are exposed to dusting, this season of use would not benefit this species general growth since OHVs would be in use during typically the driest months of the year when dusting would be at its highest levels. Flowering and fruit development would be less affected since this species does not flower until after season closures. The season of use from March 15 thru March 31 and June 1 thru November 30 would have similar results, but would have additional effects to reproduction due to the flowering period. The season of use of March 15 thru April 15, May 1 thru July 31, and September 1 thru October 15 would also have similar results as the previous season.

Currently, there are 34 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). This alternative has the highest number of locations of NNIS. This is due to the additional road miles which will be obliterated and relocated. Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat.

Alternative D

There are 3 locations for *Solidago ouachitensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new trail construction and/or relocation (see page 94). This is the highest number of sites affected compared to any of the alternatives. These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is found in areas of deep shade or on north-facing slopes. One of the locations would be eliminated during trail construction. This species has a restrictive habitat preference. There is no information that shows this species can tolerate ground disturbance. Alternative D would impact significantly more *Solidago ouachitensis* sites than any other alternative due to the higher number of miles of trail being constructed.

Flowering period for this species is September and October. Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). This alternative has year round OHV use and impacts would be similar to Alternative A.

Currently, there are 32 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat. This alternative has the highest number of miles of roads and trails compared to other alternatives.

Alternative E

There were no locations for *Solidago ouachitensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads (see page 94). This alternative will not have OHV use on any roads and all trails would be obliterated.

Since there are no known locations associated with this alternative, there would be no effects to this species from ground disturbing activities or dusting.

Currently, there are 25 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts due to potential introduction of NNIS into new areas during ground disturbing activities and vehicular travel would continue and most likely expand under this alternative. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat.

Alternative F

This species is not common within the WPG project area. There were 2 locations for *Solidago ouachitensis* documented during the field surveys and/or from the 2007 Element Occurrence Data Records (see page 94). These sites reflect several numbers of individuals. This alternative is very similar to Alternative A.

Alternative F reflects the current road and trail system with the exception of short-term trail closures that would be permanently decommissioned and two routes (Trail 836 and a portion of Trail 8) that would be relocated. No other changes to the transportation system would occur; currently, designated roads and motorized trails remain designated.

Ground disturbing activities from trail obliteration and relocation can directly affect plants by destruction of the above-ground stems and through uprooting individuals. This species is found in areas of deep shaded or on north-facing slopes. One of the locations would be eliminated during trail construction. This species has a restrictive habitat preference. There is no information that shows this species can tolerate ground disturbance.

Flowering period for this species is September and October. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative F would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative F.

Currently, there are 30 locations of NNIS along existing roads and trails (see page 80). Cumulative impacts due to potential spread of NNIS would continue under the current roads and trails system. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat.

Alternative G

There is one location for *Solidago ouachitensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 94). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is found in areas of deep shade or on north-facing slopes. One of the locations would be eliminated during trail construction. This species has a restrictive habitat preference. There is no information that shows this species can tolerate ground disturbance.

Flowering period for this species is September and October. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative G would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative G.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat.

Alternative I

Alternative I has a modified period of use which includes the flowering and fruiting period of the *Solidago ouachitensis.* There is one location for *Solidago ouachitensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 94). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is found in areas of deep shade or on north-facing slopes. One of the locations would be eliminated during trail construction. This species has a restrictive habitat preference. There is no information that shows this species can tolerate ground disturbance.

Flowering period for this species is September and October. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative I would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative I.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new

areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat.

Alternative J

Alternative J employs a rotation schedule whereby OHV use on trails would be rotated on a yearly basis. The trail system is divided into two different sections. There is one location for *Solidago ouachitensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 94). These sites reflect several numbers of individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is found in areas of deep shade or on north-facing slopes. One of the locations would be eliminated during trail construction. This species has a restrictive habitat preference. There is no information that shows this species can tolerate ground disturbance.

Flowering period for this species is September and October. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative J would allow year round OHV use on trail sections open from that particular year. The section that would be in nonuse would allow relief from the dusting for one year, which could allow the plant to flower and produce seed. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative J.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Solidago ouachitensis* habitat.

Ozark Chinquapin (*Castanea ozarkensis*)

Environmental Baseline

Ozark chinquapin is imperiled throughout its entire range due to infestation with chestnut blight. Despite its status, it is both abundant and widespread throughout the Interior Highlands of Arkansas and Oklahoma. It is found in both early-successional and old growth vegetation types, and commonly occurs in dry deciduous and mixed hardwood-pine communities on rocky dry slopes and ridge tops. Due to the chestnut blight infestation, it now occurs largely as stump sprouts. It displays optimal growth rate where abundant sunlight reaches the forest floor (USDA Forest Service, 2005b). Flowering period is June and July.

The table below displays the number of roads and trails locations associated with *Castanea ozarkensis* locations documented from field surveys and ANHC element occurrence data (2007).

Table 53. Number of Routes Associated with Ozark Chinquapin Locations by Alternative

	Alternative								
Source	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
ANHC	1	1	1	3	1	1	1	1	1
Field Survey	2	2	3	11	1	1	3	3	3
Total	3	3	4	14	2	2	4	4	4

Alternative A

This species is not common within the WPG project area. There were 3 locations for *Castanea ozarkensis* documented during the field surveys and/or from the 2007 Element Occurrence Data Records (Table 53). These sites reflect several numbers of individuals.

Alternative A reflects the current condition. Existing roads and trails are not suitable habitat for this species; therefore no direct impacts from ground disturbing activities are anticipated.

Flowering period for this species is June and July. Alternative A would continue to allow year round OHV use. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative A.

Currently, there are 27 locations of NNIS along existing roads and trails (see page 80). Cumulative impacts due to potential spread of NNIS would continue under the current roads and trails system. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat.

Alternative B – Proposed Action

This species is not common within the WPG project area. There were 3 locations for *Castanea ozarkensis* documented in the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or reconstruction (see page 100). These sites reflect several individual trees.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is currently on the decline due to the chestnut blight.

Reproduction opportunities are minimal for this species. Flowering period is June and July. Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The results of these impacts are a reduction in plant vigor (Ouren, et al., 2007). This Alternative has a season of use which is February 1 thru October 31. This limited season may slightly reduce the amount of dust and use due to the 3-month rest period. November thru January is typically a wetter period and dusting is less of a problem. The largest amount of dust would occur during the summer months, which are the time of flowering, fruit development, and general plant growth for *Castanea ozarkensis*.

Currently, there are 31 locations of NNIS that occur along existing roads and trails, and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat.

Alternative C

There were 4 locations for *Castanea ozarkensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 100). These sites reflect several individuals.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. This species is currently on the decline due to the chestnut blight. Reproduction opportunities are minimal for this species.

Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). This alternative has three possible seasons of use. *Castanea ozarkensis* flowers during the months of June and July. The season of use from March 15 thru August 31would have an approximate 6 month rest period and would reduce the amount of time the plants are exposed to dusting, but this season of use would not benefit this species reproduction or general growth since OHVs would be in use during the typically driest months of the year when dusting would be at its highest levels. The season of use from March 15 thru March 31 and June 1 thru November 30 would have similar results. The season of use of March 15 thru April 15, May 1 thru July 31, and September 1 thru October 15 would also have similar results.

Currently, there are 34 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). This alternative has the highest number of locations of NNIS. This is due to the additional road miles which will be obliterated and relocated. Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground

disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat.

Alternative D

There were 14 locations for *Castanea ozarkensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new trail construction and/or relocation (see page 100). This is the highest number of sites affected compared to any of the alternatives. These sites reflect several individual trees.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is currently on the decline due to the chestnut blight. Reproduction opportunities are minimal for this species. Alternative D would impact significantly more *Castanea ozarkensis* sites than any other alternative due to the higher number of miles of trail being constructed.

The flowering period for this species is June and July. Dusting, which is essentially a blanket of dust raised by OHV and vehicular traffic, can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). This alternative has year round OHV use and impacts would be similar to Alternative A.

Currently, there are 32 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat. This alternative has the highest number of miles of roads and trails compared to other alternatives.

Alternative E

There were 2 locations for *Castanea ozarkensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads (see page 100). This alternative will not have OHV use on any roads and all trails would be obliterated.

Ground disturbing activities from trail obliteration can directly affect plants by destruction of the above-ground stems and through uprooting individuals. This species is currently on the decline due to the chestnut blight. Reproduction opportunities are minimal for this species. Trails which are being obliterated may impact some individuals adjacent to the trail, but could become re-established when the area is rehabilitated. The flowering period for this species is June and July. Dusting would be greatly reduced in this alternative due to limiting road use to vehicular traffic and obliterating all trails.

Dusting can disrupt the process of photosynthesis, and reduce the potential for the plant to be pollinated. The indirect effect of this impact is a reduction in plant vigor and reproduction potential (Ouren, et al., 2007).

Currently, there are 25 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts due to potential introduction of NNIS into new areas during ground disturbing activities and vehicular travel would continue and most likely expand under this alternative. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat.

Alternative F

There were 2 locations for *Castanea ozarkensis* documented during the field surveys and/or from the 2007 Element Occurrence Data Records (see page 100). These sites reflect individual trees. This alternative is very similar to Alternative A.

Alternative F reflects the current road and trail system with the exception of short-term trail closures that would be permanently decommissioned and two routes (Trail 836 and a portion of Trail 8) that would be relocated. No other changes to the transportation system would occur; currently, designated roads and motorized trails remain designated.

Ground disturbing activities from trail obliteration and relocation can directly affect plants by destruction of the above-ground stems and through uprooting individuals. This species is currently on the decline due to the chestnut blight. Reproduction opportunities are minimal for this species. Trails which are being obliterated may impact some individuals adjacent to the trail.

The flowering period for this species is June and July. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative F would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative F.

Currently, there are 30 locations of NNIS along existing roads and trails (see page 80). Cumulative impacts due to potential spread of NNIS would continue under the current roads and trails system. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat.

Alternative G

There were 4 locations for *Castanea ozarkensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 100). These sites reflect several individual trees.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is currently on the decline due to the chestnut blight. Reproduction opportunities are minimal for this species. Trails which are being obliterated may impact some individuals adjacent to the trail.

Flowering period is June and July. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative G would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative G.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat.

Alternative I

Alternative I has a modified period of use which includes the flowering and fruiting period of the Ozark chinquapin. There were 4 locations for *Castanea ozarkensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 100). These sites reflect several individual trees.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is currently on the decline due to the chestnut blight. Reproduction opportunities are minimal for this species. Trails which are being obliterated may impact some individuals adjacent to the trail.

Flowering period is June and July. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative I would continue to allow year round OHV use. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative I.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat.

Alternative J

Alternative J employs a rotation schedule whereby OHV use on trails would be rotated on a yearly basis. The trail system is divided into two different sections. There were 4 locations for *Castanea ozarkensis* documented during the field surveys and/or from the 2007 ANHC Element Occurrence Data Records that are along existing roads and trails or areas of new construction and/or relocation (see page 100). These sites reflect several individual trees.

Ground disturbing activities can directly affect plants by destruction of the above-ground stems and through uprooting individuals. It can also eliminate plant habitat for the life of the road or trail. This species is currently on the decline due to the chestnut blight. Reproduction opportunities are minimal for this species. Trails which are being obliterated may impact some individuals adjacent to the trail.

Flowering period is June and July. Dusting from vehicular and OHV use would continue and could directly impact this species by disrupting the photosynthetic processes, and reducing pollination potential. The indirect and cumulative impacts resulting from dusting are a reduction in plant vigor and reproduction potential (Ouren, et al., 2007). Alternative J would allow year round OHV use on trail sections open from that particular year. The section that would be in nonuse would allow relief from the dusting for one year which could allow the plant to flower and produce seed. Indirect impacts related to loss or degradation of habitat would remain unaltered by Alternative J.

Currently, there are 23 locations of NNIS that occur along existing roads and trails and along relocation routes for roads and trails (see page 80). Cumulative impacts will result from the potential spread of exiting populations of NNIS and transporting NNIS into new areas during ground disturbing activities and OHV and vehicular travel. This could result in degradation and/or elimination of additional *Castanea ozarkensis* habitat.

Terrestrial – Mammal, Insect and Amphibian

Potential terrestrial effects of activities are grouped by category according to influence on the habitat of the terrestrial PETS species occurring or potentially occurring within the influence of the WPG project area. These categories are: Designation of Roads and Trails for Motor Vehicle and/or OHV Use by Alternative, and Other Ground Disturbing Activities within WPG by Alternative. Ground disturbing activities include new road construction, new trail construction, trail and/or road obliteration, and stream-crossing bridges and culverts.

Northern Long-Eared Bat (*Myotis septentrionalis*)

Environmental Baseline

The range of the northern long-eared bat (NLEB) includes much of the eastern and north central United States, and all Canadian provinces from the Atlantic Ocean west to the southern Yukon Territory and eastern British Columbia. Within Arkansas, the

northern long-eared bat is known to occur in Baxter, Benton, Garland, Independence, Jackson, Marion, Montgomery, Newton, Pike, Polk, Scott, Stone, Washington, and Yell counties (Saugey et al., 1993). It was also found in abundance in Saline County (Perry, pers. comm.). In addition, all counties within the Ouachita National Forest in Arkansas and Oklahoma have recorded NLEB specimens (Sasse, pers. comm., and ODWC 2013, respectively). The northern long-eared was found in a mine within a quarter-mile of the project area in 1985 (Heath et. al, 1986). Northern long-eared bats are common across the Ouachita Mountains, and thought to be common in the WPG area (Perry, pers. comm.).

Northern long-eared bats spend the winter hibernating in caves and mines (hibernacula). They typically use large caves or mines with large passages and entrances, constant temperatures, and high humidity with no air currents. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible (USDI FWS 2013).

During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, such as caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. It has rarely been found roosting in structures such as barns and sheds (USDI FWS 2013).

Maternity colonies, with young, generally have 30 to 60 bats, although larger maternity colonies have been observed. Most females within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending upon where the colony is located within the species' range. Young bats start flying 18 to 21 days after birth. Adult northern long-eared bats can live up to 19 years (USDI FWS 2013).

Northern long-eared bats emerge at dusk to fly through the understory of forested hillsides and ridges feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation. This bat also feeds by gleaning motionless insects from vegetation and water surfaces (USDI FWS 2013).

Effects to Northern Long-eared Bat

Alternative A

Although little information is available on the effects of noise on the species, there is the possibility that noise from OHVs along the trail system could awaken nearby roosting bats and cause them to expend energy during the daytime to fly to another roost. Disturbance within roosting areas may also cause bats to abandon the area.

Direct effects to the northern long-eared bat could include disturbance and/or habitat degradation. This bat uses dead and dying trees as roosts and could be affected if the trees were removed due to a safety hazard. Northern long-eared bats are known to occur

on the Forest during maternity periods. Potential roost and foraging habitat could be impacted indirectly from noise from off highway vehicles (OHV) on trails (USDI FWS 2013). There would be no loss of roosting or foraging habitat per se.

Indirect effects include disturbance and/or habitat degradation. There are three mine adits within the project area and several near the project on NF land and private land. One of the adits is adjacent to the trail system and gated. One adit is being gated. The other adit is not near any roads or trails; therefore, access is limited. With year-round use of the trails and roads, there is the potential for late day disturbance in the spring and fall when the bats are near the mine adits.

Foraging by this bat is from dusk into the night hours. Roads and trails are used as foraging corridors along with stream channels. WPG is closed from dusk until dawn which should result in no impact on foraging.

Alternatives B, C, D, F, G, I, and J

Ground disturbing activities that will occur at various times include road and trail construction and or reconstruction, conversion of roads to trails, obliteration of road and trail templates, improvements to and/or installation of new stream crossings bridges and culverts, construction of foot trails, and construction of picnic facilities and shelters at existing vistas and trail heads. The table below shows estimated acres of timber removal for trail and road construction by alternative.

Table 54. Estimated acres of timber removal by alternative

Implementation Activity (miles)	Alternative						
	B	C	D	F	G	I	J
New road construction	3.8	0.4	1.1	0	0.4	0.4	0.4
New trail construction	8.8	10.7	28.2	2.8	10.9	10.9	10.9
Approximate acres of timber removed	20.2	9.3	24.5	2	9.4	9.4	9.4

Direct effects to the northern long-eared bat from trail and road construction include cutting trees when bats are present. This may cause death and injury to bats and their young during the maternity period (Wisconsin DNR 2013) and may also disrupt roosting and maternity behavior. Tree removal could occur during a roosting period. This bat uses dead and dying trees as roosts and could be affected if tree were removed due to a safety hazard or as part of a construction activity.

Tree felling could cause the direct effect of displacing a bat roosting in a tree, or possibly cause mortality of a roosting adult or a non-volant juvenile bat that cannot fly away during felling. If tree felling occurred outside of the bat roosting window (March 15th – November 15th), there would be no direct effects to roosting bats because they would likely be within hibernacula.

Indirect effects of tree removal would include a very minor reduction in the amount of roost habitat in the new trail and road locations. The amount of tree removal in the Project Area and across the Ouachita National Forest annually is so slight compared to the large amount of roost tree habitat available across the entire 1.8 million acre ONF landscape that the potential impacts would be minor.

Although little information is available on the effects of noise on the species, there is the possibility that noise from OHVs along the trail system could awaken nearby roosting bats and cause them to expend energy during the daytime to fly to another roost. Disturbance within roosting areas may also cause bats to abandon the area.

Indirect effects to the northern long-eared bat could include disturbance and/or habitat degradation. Timber harvest (from trail and road construction) can remove or alter (improving or degrading) summer roosting and foraging habitat. This bat uses dead and dying trees to roost and could be affected if trees were removed for any reason. Northern long-eared bats are known to occur on the forest during maternity periods. Potential roost and foraging habitat could be impacted indirectly from noise from off-highway vehicles on trails (USDI FWS 2013).

There are three mine adits within the project area and several near the project on NF land and private land. One of the adits is adjacent to the trail system and gated. One adit is in the process of being gated. The other adit is not near any roads or trails, and access is limited. With the seasonal and year-round use of the trails and roads (depending on alternative), there is the potential for late day disturbance in the spring and fall when the bats are near the mine adits.

Although the bats are known to move their roost site every few nights, they have fidelity to roost sites in the same area. Removal of trees along new trail corridors could result in direct loss of roosting and foraging habitats and changes in forest structure and insect distribution and abundance, which may impact local populations.

Foraging by this bat is done from dusk into the night hours. Roads and trails are used as foraging corridors along with stream channels. WPG is closed from dusk until dawn which should not impact foraging; there should be no impact from OHV use on foraging.

Alternative E

Under this alternative, all trails would be closed. With the trails closed, noise should not be an issue; therefore, there should be no disturbance to roosting bats. With no trail or road construction, there should be no habitat degradation or impact during maternity season. None of the mine adits within the project area are adjacent to any roads which would remain open; therefore, there should be no disturbance to the bats during swarming periods.

Foraging by this bat is done from dusk into the night hours. Roads and trails are used as foraging corridors along with stream channels. With the trails closed, there should be no

impact to foraging. Although the roads will be open year round, there should be very limited travel on the roads. Therefore, any impact to foraging bats should be minimal.

Cumulative Effects

Numerous land use activities that affect the northern long-eared bat and that could occur within the action area include: timber harvest, recreational use, and development associated with road, residential, industrial and agricultural development and related activities. Currently, no additional timber harvest is planned to occur within the project area. Additionally, vegetation management, land development, and other activities have occurred or will occur within the temporal scope of analysis on private land with the analysis area, but private lands will also to contribute some potential roost trees at the landscape level.

White-Nose Syndrome (WNS) has been detected in bat species from Canada to northern Alabama to Oklahoma, including northern long-eared bats in Ark. Best available scientific information about WNS is available at: http://www.whitenosesyndrome.org/. WNS has not been linked in any way to activities proposed in the Project Area.

In summary, the Proposed Action and action alternatives would not add any negative cumulative effects to NLEBs on the ONF or their habitat. The project is not expected to meaningfully contribute to negative cumulative effects attributable to all other foreseeable actions in the analysis area over the next ten years, and would not alter the resources to irreversible or irretrievable commitments that might foreclose options to maintain viable populations of NLEBs on the Ouachita NF.

Diana Fritillary *(Speyeria diana)*

Environmental Baseline

The Diana fritillary has undergone a range-wide decline, and is no longer known to occur over a substantial portion of its historic range, with only scattered occurrences in Arkansas. However, recent sightings indicate that it is more common than known records show. Diana fritillary adults feed on nectar, and the larvae are known to feed on violets. Female adults are generally found in moist, wooded ravines and valleys, while the males wander widely in search of females in a variety of habitats far from suitable breeding habitat. According to recent sightings within the Ouachita and Ozark Mountains, Diana fritillary adults are most frequently found in forested areas with nectar sources, particularly in fire-maintained communities.

A high proportion (generally more than 50 percent) of secure populations and/or habitat is on the Ouachita National Forest. Therefore, the species is significantly dependent on the Forest populations and/or habitats.

Caddo Mountain Salamander (*Plethodon caddoensis*)

Environmental Baseline

The range of the Caddo Mountain salamander is known to occur in the Caddo and Cossatot Mountains, and is primarily found on the cool, moist, north-facing slopes that support more mesic vegetation than south-facing slopes. These areas generally exhibit the exposed rocky talus on slopes in mixed pine-oak forests, protected hillsides, ravines and riparian areas. This species has also been found to use abandoned mining shafts to escape summer-fall dry periods and for reproduction (Trauth, 1998). The use of drifts (horizontal or nearly horizontal mine passageway) as refuge to escape heat and dryness during summer and fall was first reported by Saugey *et al.* (1985). Despite its limited distribution, the salamander seems to be fairly abundant in those areas where suitable living conditions occur.

Plummer conducted surveys in 1982, adding site records on both the Womble and Mena Ranger Districts. Surveying abandoned mines on the Ouachita National Forest resulted in discovery of new sites when surveyed from 1985-1988 and in 1997 (Trauth, 1998). In 1986, the Ouachita National Forest began informal discussions with the USFWS (Jackson, MS, Endangered Species Field Station) and requested field assistance from the Arkansas Natural Heritage Commission concerning preservation of critical mine aggregation sites and protection of their vulnerable population. A Memorandum of Understanding on Caddo Mountain salamander conservation was developed with these agencies after a status review was conducted by the USFWS. Placement of gates at sensitive sites was planned and implemented. Known locations of the Caddo Mountain salamander in the Caddo and Cossatot Mountain areas are inventoried regularly.

Effects to Diana Fritillary and Caddo Mountain Salamander

Alternative A

The 'No Action' A alternative allows for the second highest total WPG routes of 41.7 miles including the third highest number of miles available within WPG for road highway and OHV traffic year round (20.2 miles), the second highest number of miles for road highway only traffic year round (3.2 miles), as well as fourth highest for trail OHV traffic year round (18.3 miles). There are no ground disturbing activities including miles of new road or trail construction, miles of trail and road obliteration or stream crossing bridges and culverts planned for this alternative.

No additional direct, indirect or cumulative impacts or benefits to Diana fritillaries or Caddo Mountain salamanders are anticipated from designation of roads and trails for motor vehicle and/or OHV use by alternative A, and other ground disturbing activities within WPG since no actions would be taken and the current system and use patterns of Forest road and trail use would remain the same.

There would be continued direct impacts to individuals from OHV/vehicle encounter mortality, indirect impacts from noise, dusting and habitat fragmentation and degradation. Cumulatively, these indirect impacts may lead to declines in salamander numbers but to what extent is unclear and would depend on overall suitability of existing habitats.

Alternative B

The 'Proposed Action' B alternative allows for the third highest total WPG routes of 41.3 miles including the next to the lowest number of miles available within WPG for road highway and OHV traffic year round (6.1 miles), the lowest number of miles for road highway only traffic year round (2.9 miles), the highest number of miles for road highway year round and seasonal OHV traffic (14.3 miles), the highest number of miles for seasonal road highway and OHV traffic (1.1 miles), with seasonal OHV traffic (16.9 miles). Ground disturbing activities include 3.8 miles of new road construction, 8.8 miles of new trail construction, 6.5 miles of road obliteration and 9.8 miles of trail obliteration with a total of 272 stream crossing bridges and culverts planned for this alternative. Seasonal use only is allowed on 32.3 miles (78%) of roads and trails in WPG from February 1 through October 31 (39 weeks) which allows closure of certain roads and trails to OHV/vehicle traffic for 13 weeks (25%) of the year from November 1 through January 31.

Direct impacts to Diana fritillaries or Caddo Mountain salamanders would include fatalities from OHV/vehicle encounters as well as crushing eggs and larvae during road/trail obliteration and construction. Indirect impacts would include loss of habitat and habitat connectivity, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic that could interfere with reproduction efforts and feeding activities. Cumulatively, these indirect impacts may lead to declines in salamander numbers but to what extent is unclear and would depend on overall suitability of existing habitats. Seasonal closure of 78% of the roads/trails for 13 weeks of the year allows for some benefits to Diana fritillaries and Caddo Mountain salamanders due to the lowered potential for direct mortality from OHV/vehicle encounters, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic.

Alternative C

The 'Additional Resource Protection' C alternative allows for next to the lowest total WPG routes of 38.6 miles except for Alt. E-No OHV's, including the next to the lowest number of miles available within WPG for road highway and OHV traffic year round (5.6 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), the second highest number of miles for road highway year round and seasonal OHV traffic (7.2 miles), with seasonal only OHV traffic (22.6 miles). Ground disturbing activities include 0.4 miles of new road construction, 10.7 miles of new trail construction, 5.6 miles of road obliteration and 10.4 miles of trail obliteration with a total of 252 stream crossing bridges and culverts planned for this alternative. Thirty miles (76%) of the WPG routes would be only open seasonally for OHV access for 24-26 weeks of the year.

The three options for seasonal closure are:

1. March 15 – August 31 (All of Spring and Summer season)
2. March 15 – March 31; June 1 – November 30 (Two weeks of Spring; Summer and Fall)
3. March 15 – April 15; May 1 – July 31; September 1 – October 15 (Most of Spring and Summer with some Fall season)

Direct impacts to Diana fritillaries or Caddo Mountain salamanders would include fatalities from encounters with OHVs/motorized vehicles as well as crushing eggs and larvae during road/trail obliteration and construction. Indirect impacts would include loss of habitat and habitat connectivity, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic that could interfere with reproduction efforts and feeding activities. Cumulatively, these indirect impacts may lead to declines in salamander numbers, but to what extent is unclear, and would depend on overall suitability of existing habitats.

There would be some benefit to these species from the overall fewer miles of routes within WPG, making this alternative next to the most beneficial to Diana fritillaries or Caddo Mountain salamanders. The seasonal closure of 76% of the roads/trails for 24-26 weeks of the year allows for the most benefits by alternative to Diana fritillaries and Caddo Mountain salamanders due to the lowered potential for direct mortality from OHV/vehicle encounters, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic.

Alternative D

The 'Additional OHV Miles' D alternative allows for the highest total WPG routes of 61.1 miles including the second highest number of miles available for highway and OHV traffic year round (21.2 miles), the lowest number of miles for road highway only traffic year round (2.9 miles), as well as the highest for trail OHV traffic year round (37 miles). Ground disturbing activities include 1.1 miles of new road construction, 28.2 miles of new trail construction, 2.7 miles of road obliteration and 9.9 miles of trail obliteration, with a total of 364 stream crossing bridges and culverts planned for this alternative.

Direct impacts to Diana fritillaries or Caddo Mountain salamanders would include fatalities from encounters with OHVs/motorized vehicles as well as crushing eggs and larvae during road/trail obliteration and construction. Indirect impacts would include loss of habitat and habitat connectivity, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic that could interfere with reproduction efforts and feeding activities. Cumulatively, these indirect impacts may lead to declines in salamander numbers, but to what extent is unclear, and would depend on overall suitability of existing habitats.

Alternative E

The 'No OHV Use' E alternative allows for the lowest total WPG routes of 24 miles with no OHV traffic allowed including the lowest number of miles available for highway and

OHV traffic year round (0 miles) as well as the lowest for trail OHV traffic year round (0 miles). Ground disturbing activities include no miles of new trail construction, and 18.3 miles of trail obliteration with a total of 133 stream crossing bridges and culverts planned for this alternative.

Direct impacts to Diana fritillaries or Caddo Mountain salamanders would include fatalities from encounters with OHVs/motorized vehicles as well as crushing eggs and larvae during road/trail obliteration and construction. Indirect and cumulative impacts would include loss of habitat and habitat connectivity, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic that could interfere with reproduction efforts and feeding activities. This alternative would provide the most potential benefit to these species from fatal encounters with OHVs/motorized vehicles as well as crushing eggs and larvae during road/trail obliteration and construction and habitat loss/degradation due to the overall fewer miles of routes within WPG.

Alternative F

The 'Minimal Change' F alternative allows for the third highest total WPG routes of 40.8 miles including the highest number of miles available for highway and OHV traffic year round (21.5 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), as well as the lowest number of miles in alternatives that allow for trail OHV traffic year round (16.1 miles) with. Ground disturbing activities include 2.8 miles of new trail construction and 5.0 miles of trail obliteration with a total of 236 stream crossing bridges and culverts planned for this alternative.

Direct impacts to Diana fritillaries or Caddo Mountain salamanders would include fatalities from encounters with OHVs/motorized vehicles as well as crushing eggs and larvae during road/trail obliteration and construction. Indirect and cumulative impacts would include loss of habitat and habitat connectivity, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic that could interfere with reproduction efforts and feeding activities.

Alternatives G

The alternative allows for the fourth highest total WPG routes of 39.2 miles, the fourth highest number of miles available for highway and OHV traffic year round (13.2 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), as well as the second highest for trail OHV traffic year round (22.8 miles). Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration, 10.5 miles of trail obliteration, and 3.5 miles of road converted to trail, with a total of 269 stream crossing bridges and culverts planned for this alternative.

Direct impacts to Diana fritillaries or Caddo Mountain salamanders would include fatalities from encounters with OHVs/motorized vehicles as well as crushing eggs and larvae during road/trail obliteration and construction. Indirect and cumulative impacts would include loss of habitat and habitat connectivity, noise and dust pollution, and

detrimental impacts to habitat, as well as disturbance from traffic that could interfere with reproduction efforts and feeding activities.

Alternative I

The 'Modified Season' I alternative allows for the fifth highest total WPG routes of 39.6 miles, next to the lowest number of miles available within WPG for road highway and OHV traffic year round (5.6 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), and the second highest number of miles for road highway year round and seasonal OHV traffic (7.6 miles), with seasonal only OHV traffic (22.8 miles). Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration 10.1 miles of trail obliteration, and 3.3 miles of road converted to trail, with a total of 270 stream crossing bridges and culverts planned for this alternative. Almost 31 miles (~78%) of the WPG routes would be only open seasonally for OHV access for approximately 32 weeks of the year. For routes designated as "WPG Seasonal OHV," OHV use would be limited to the following time periods:

1. 2nd Friday of March – October 31
2. Three days before Thanksgiving through two days after Thanksgiving
3. December 25 through January 2

Direct impacts to Diana fritillaries or Caddo Mountain salamanders would include fatalities from encounters with OHVs/motorized vehicles as well as crushing eggs and larvae during road/trail obliteration and construction. Indirect and cumulative impacts would include loss of habitat and habitat connectivity, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic that could interfere with reproduction efforts and feeding activities.

Alternative J

The 'Rotation' J alternative employs a rotation schedule where year-round OHV use would be alternated on an annual basis between roughly the east and west halves of the road and trail system. Portions of Trails 6 and 8 would remain open each year to provide access to the system. Since the effects would be comparable for each area, this analysis combines some aspects of the numbers of miles.

The 'Rotation' J alternative allows for the second highest total WPG routes of 59.6 miles with 25.8-J1 and 33.8-J2. Alternative J allows 11.3 and 7.5 (J1 & J2, respectively) miles available within WPG for road highway and OHV traffic year round, the next to the highest number of miles for road highway only traffic year round (5.1-J1 & 8.9-J2 miles). Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration 10.1 miles of trail obliteration, and 3.3 miles of road converted to trail, with a total of 270 stream crossing bridges and culverts planned for this alternative.

Direct impacts to Diana fritillaries or Caddo Mountain salamanders would include fatalities from encounters with OHVs/motorized vehicles as well as crushing eggs and larvae during road/trail obliteration and construction. Indirect and cumulative impacts

would include loss of habitat and habitat connectivity, noise and dust pollution, and detrimental impacts to habitat, as well as disturbance from traffic that could interfere with reproduction efforts and feeding activities.

Aquatic

The projected risks by alternative to aquatic habitat within the project/analysis area and risks to aquatic PETS species are discussed as a group. All activities (Designation of Roads and Trails for Motor Vehicle and/or OHV Use by Alternative, and Other Ground Disturbing Activities within WPG by Alternative) are included in the ACE/WEPP analysis including the seasonal OHV closures, which is used for comparisons of sedimentation and risks of potential impacts to the aquatic PETS species by alternative.

Data sources include the Basin Area Streams Surveys and Long-term Streams Survey Records which incorporate long-term stream monitoring efforts, and fish collection records from Dr. Henry W. Robison in Arkansas.

Leopard Darter (*Percina pantherina*)

Environmental Baseline

The federally threatened leopard darter is endemic to the Little River system in Arkansas and Oklahoma. While often quite abundant in its preferred habitats, the leopard darter habitat is usually restricted and can be quite disjunct. The leopard darter is generally found to occur in small to moderate-sized clear upland streams and rivers of moderate gradient. During non-spawning periods, it is usually found in pools of creeks and rivers favoring the cobble, small boulder habitat in the shallow areas of pools near the end of riffles. They are known to seek out the deep, cool pools during the hottest summer months (USDA Forest Service, 2005b).

This species is fairly rare in all watersheds where it is known to occur (population is at very low density and/or at only a few local sites) and random events (accidents, weather events) may place persistence of the species within the watershed at risk. The extent and location of Ouachita National Forest lands with respect to the species is conducive to positively influencing the viability of the species within its range on the Forest. Most of the watersheds associated with the known locations of Leopard darters show to be particularly at high risk from sediment degrading the aquatic habitat.

The leopard darter has historically had very limited distribution, and is known to occur only in the Little River system (Red River drainage) of southeastern Oklahoma and southwestern Arkansas; upper Little River (above Pine Creek Reservoir), Glover River, Mountain Fork River (above Broken Bow Reservoir), Cossatot River (above Gillham Reservoir), and Robinson Fork of the Rolling Fork River. Unfortunately, this restricted range was further reduced by impoundments of three rivers, forming Lakes Gillham, Broken Bow, and Pine Creek. Leopard darter habitat below the dams was decimated by reservoir releases (NatureServe, 2012). None of the designated ‘Critical Habitat for the Leopard Darter’ occurs within the WPG project analysis area.

Arkansas Fatmucket (*Lampsilis powellii*)

Environmental Baseline

The federally threatened Arkansas fatmucket mussel lives only in Arkansas and is endemic to the Saline, Caddo, and upper Ouachita Rivers. Historically, this mussel species was found to be relatively common in preferred habitat; however, its frequency of detection and its population sizes have been consistently decreasing (USDA Forest Service, 2005b).

The U.S. Fish and Wildlife Service listed *Lampsilis powellii*, Arkansas fatmucket mussel, as threatened in 1990, and by 1992, had approved a species recovery plan. *Lampsilis powellii* was listed as threatened due to habitat modification and destruction. The USFWS initiated a 5-year status review in September 2006, and the USFWS – Arkansas Field Office and AGFC with assistance from the USDA Ouachita National Forest conducted a range wide status assessment for *L. powellii* during 2006 and 2007.

The Arkansas fatmucket has been described as intolerant of swift currents and impoundments. Individuals have been found to occur more often in mid-sized upper-river habitats of deeper pools and backwater areas with sufficient flow to remove silt and debris rather than shallow riffles and raceways. Christian et al. (2006) found this mussel more often in mid-channel pools as well as in deeper runs and glides and never found them to occur in riffle habitats.

Substrate supporting *L. powellii* has been described as small to medium size gravel with sand-gravel, gravel, sand, or cobble substrates, and not occurring in areas dominated by silt and/or bedrock. Substrate in areas supporting *L. powellii* during this survey were primarily gravel, very fine gravel, and coarse sand (based on the Wentworth scale) with smaller sand and silt classes being poorly represented (Christian, Farris, Harris, Barnett, & Seagraves, 2006).

Gravid females have been observed in January, February, and April; however, females have also been observed to be gravid from March to October 2003 and in April 2004. Fish host research has been extensive and the most successful fish hosts were *Micropterus punctulatus* (spotted bass) and *Micropterus salmoides* (largemouth bass). This species is currently known to inhabit the mainstems of three small to medium sized rivers, where it is found in deep pools, backwater areas with sand, sand-gravel, sand-cobble, or sand-rock substrates. It does not appear to persist in the areas of the river with strong current or in impounded areas (NatureServe, 2012).

This species is so rare and appears to be in decline in all watersheds where it is known to occur (population is at very low density and/or at only a few local sites), that random events (accidents, weather events) may place persistence of the species within the Forest at risk. Watersheds associated within the Ouachita River ecoregion are at particularly at high risk from sediment degrading the aquatic habitat.

Spectaclecase (*Cumberlandia monodonta*)

Environmental Baseline

The historic range of this mussel once included much of the Mississippi River system, but is now limited to a small percentage of this system. In Arkansas, the spectaclecase is found in the Upper Ouachita and Lower Ouachita-Smackover River drainages. The lone record of spectaclecase from the upper Ouachita River came from Dragover (from surveys done in the late 1990s or early 2000s), which is located approximately 30 miles downstream of the Board Camp Creek confluence.

The spectaclecase is a freshwater mussel with an elongate, arcuate, and compressed shell. It spawns twice a year in the spring and fall for relatively short periods of time. Reproduction may be triggered by a narrow range of water temperatures and may last only a few weeks (NatureServe, 2012).

The spectaclecase is an aggregating species that most often inhabits riverine microhabitats that are sheltered from the main force of the current. It is also found in substrates from mud and sand to gravel, cobble, and boulders in shallow riffles and shoals with slow to swift currents; firm mud between larger rocks in slow moving water adjacent to swift currents; tree stumps, root masses and in beds of rooted vegetation; and under slab boulders or bedrock shelves. They rarely move except to burrow deeper and may die if stranded during periods of drought.

Larvae (glochidia) are thought to be parasitic on fish, but a verified host for spectaclecase's glochidia has yet to be found (NatureServe, 2012). Baird (Baird, 2000) did find that one individual each of bigeye chub (*Notropis amblops*) and shorthead redhorse (*Moxostoma macrolepidotum*) carried Cumberlandia glochidia. However, it is not yet known whether these species are suitable hosts, and neither of these species is known to occur within the upper Ouachita River system.

The habitat of the spectaclecase has been reduced by over 50% with populations continuing to decline due to habitat loss and poor to no viability in populations that still exist. The probable reasons for population declines and for loss of habitat are: loss of fish hosts, hypolimnetic release from reservoirs, river modification, siltation, and pollution (NatureServe, 2012).

Rabbitsfoot (*Quadrula cylindrica cylindrica*)

Environmental Baseline

Limiting factors include modification of hydrology associated with aquatic systems, increases in sedimentation from soil disturbing activities within the watershed, and interactions with non-native species. The rabbitsfoot freshwater mussel is considered to be widespread, but uncommon in the Ouachita and Saline drainages. The typical habitat for this mussel species is small to medium rivers with moderate to swift currents, and in smaller streams, it inhabits bars or gravel and cobble close to the fast current. It has been found in medium to large rivers in sand and gravel up to 3 meters deep in the substrate. Specimens are often found fully exposed lying on their sides on top of the substrate

despite their streamlined appearance. This species has a spotty distribution, and is only known to occur in large rivers in the Glover and upper Ouachita River systems on the Forest. Degraded water quality by sediment and/or non-point pollution can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species (USDA Forest Service, 2005b).

Sensitive Aquatic Species

A Crayfish *(Orconectes menae)*

Environmental Baseline

Endemic to the Ouachita Mountains, *Orconectes menae* is distributed throughout the tributaries of the Ouachita River in Polk and Montgomery, Arkansas, and in the Red River drainages of LeFlore and McCurtain counties, Oklahoma. This species has been taken from under rocks in shallow, clear, flowing streams within the Kiamichi Headwaters, Irons Fork and Little Missouri Headwaters watersheds. It is considered rare, and in need of more field research.

Western Fanshell (*Cyprogenia aberti*)

Environmental Baseline

Limiting factors include modification of hydrology associated with aquatic systems, increases in sedimentation from soil disturbing activities within the watershed, and interactions with non-native species.

Ongoing taxonomic work indicates that this complex may be comprised of more than one species, possibly up to five. Ouachita populations occur in the Ouachita, Caddo, Little Missouri, and lower Saline River systems. It is found to be fairly widespread, but is spotty and uncommon. The western fanshell has been found more rarely in recent years and is considered to be declining across its range (Harris, et al., 2009) (USDA Forest Service, 2005b).

The species is a regional endemic that has experienced significant declines in the last 30 years, has been extirpated from a portion of its range, and is quite rare throughout most of its remaining range. This species has a spotty distribution within the Forest and is known to occur in large creeks to large rivers within only six watersheds. Habitat degradation from sediment can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species (USDA Forest Service, 2005b).

Louisiana Fatmucket (*Lampsilis hydiana*)

Environmental Baseline

Limiting factors include modification of hydrology associated with aquatic systems, increases in sedimentation from soil disturbing activities within the watershed, and interactions with non-native species. This species is relatively common and abundant in the Ouachita River and tributaries. There are taxonomic questions to be resolved for this species that could change its status and rank (Harris, et al., 2009) (USDA Forest Service, 2005b).

Degraded water quality by sediment and/or non-point pollution can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species. This species has widespread distribution within the Forest, and is known to occur in small to large rivers. Hydrologic modifications, such as dams, water diversions, gravel mining and fish-barrier restricting stream crossings can impact this declining species. Habitat degradation from sediment can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species.

Sandbank Pocketbook (*Lampsilis satura*)

Environmental Baseline

Limiting factors include modification of hydrology associated with aquatic systems, increases in sedimentation from soil disturbing activities within the watershed, and interactions with non-native species. The pocketbook freshwater mussel complex is in an ongoing taxonomic investigation that indicates the Ouachita River occurrences may be a discrete species (Harris, et al., 2009) (USDA Forest Service, 2005b). Degraded water quality by sediment and/or non-point pollution can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species. This species has a spotty distribution within the Forest, and is known to occur in large rivers.

Southern Hickorynut (*Obovaria jacksoniana*)

Environmental Baseline

Limiting factors include modification of hydrology associated with aquatic systems, increases in sedimentation from soil disturbing activities within the watershed, and interactions with non-native species. This freshwater mussel species is locally common, and its center of distribution is in the big river portion of the Ouachita River primarily downstream from the Forest. While fairly widely distributed, this species is not abundant anywhere. This species has a spotty distribution within the Forest, and is known to occur in large rivers. Degraded water quality by sediment and/or non-point pollution can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species (Harris, et al., 2009) (USDA Forest Service, 2005b).

Pyramid Pigtoe (*Pleurobema rubrum*)

Environmental Baseline

Limiting factors include modification of hydrology associated with aquatic systems, increases in sedimentation from soil disturbing activities within the watershed, and interactions with non-native species. This riverine mussel species is extremely abundant in the lower Ouachita and lower Saline Rivers that are downstream from the forest. The upper Ouachita and upper Saline Rivers' populations are peripheral to its range. This species has a spotty distribution within the forest, and is known to occur in large rivers. Historically, this species was distributed throughout the Mississippi, Wabash, Tennessee, and Ohio River systems. Today the species is widely but very sporadically distributed. It has apparently been extirpated from much of its former range. Degraded water quality by sediment and/or non-point pollution can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species (Harris, et al., 2009) (USDA Forest Service, 2005b).

Purple Liliput (*Toxolasma lividus*)

Environmental Baseline

Limiting factors include modification of hydrology associated with aquatic systems, increases in sedimentation from soil disturbing activities within the watershed, and interactions with non-native species. The purple liliput mussel is considered uncommon, but usually found in the headwaters of Ouachita and Saline Rivers. Population numbers appear to be very low, potentially indicating a decline. Populations and suitable habitat availability have suffered considerable declines. Recent collections of a similar *Toxolasma* sp. from the Ouachita Mountains in Arkansas may represent a different species; taxonomic clarification may raise the Forest importance. This species has a spotty distribution in large rivers within the forest. Degraded water quality by sediment and/or non-point pollution can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species (Harris, et al., 2009) (USDA Forest Service, 2005b).

Ouachita Creekshell (*Villosa arkansasensis*)

Environmental Baseline

Limiting factors include modification of hydrology associated with aquatic systems, increases in sedimentation from soil disturbing activities within the watershed, and interactions with non-native species. The Ouachita creekshell mussel is an endemic to the Ozark Region of Arkansas and Oklahoma, and also occurs in Glover River, Oklahoma. This species has a spotty distribution in large river systems within the Ouachita NF. It is common in the forks of the Saline River, and also found in upper Ouachita River mainstem and South Fork Ouachita. This species has become rarer across its range, and found to occur at fewer sites and in lower numbers than in previous surveys.

As possibly long term over-wintering brooders, the females become gravid in October. Saline and Ouachita rivers host fish suitability trials revealed four suitable host fish; shadow bass (*Ambloplites ariommus*), Creole darter (*Etheostoma collettei*), greenside darter (*E. blennioides*), and green sunfish (*Lepomis cyanellus*). Degraded water quality by sediment and/or non-point pollution can impact this declining species. The non-native invasive zebra mussel and Asian clam are detrimental to this species (Harris, et al., 2009) (USDA Forest Service, 2005b).

Ouachita Shiner (*Lythrurus snelsoni*)

Environmental Baseline

The Ouachita shiner is endemic to the Little River System in Arkansas and Oklahoma, and may be more abundant and widespread than initial surveys indicated. Some of the most optimal habitat has been inundated by United States Army Corps of Engineers (USACE) impoundments with subsequent loss of downstream populations. It is known to occur above the Fall Line in the Little River system (Red River drainage) of southeastern Oklahoma and southwestern Arkansas (Ouachita Mountains). In Arkansas, this species is confined to the upper portions of the Mountain Fork and Cossatot rivers. Range-wide, Forest habitats within the upper Little River support the largest and most robust populations (USDA Forest Service, 2005b).

Kiamichi Shiner (*Notropis ortenburgeri*)

Environmental Baseline

The uncommon Ouachita Mountain endemic Kiamichi shiner is confined to western Arkansas, south of the Arkansas River in the Poteau, Fourche LaFave, Petit Jean, Ouachita and Little river systems, and is generally found to be locally abundant. It inhabits pools over gravel, rubble or boulder substrates in small to moderate-sized clear upland streams of moderate gradient. Uncommonly occurs in upland streams draining the Ouachita Mountains of west-central and southwestern Arkansas and eastern Oklahoma, including portions of Arkansas and Ouachita drainages and Kiamichi and Little river systems of Red River drainage (USDA Forest Service, 2005b) (NatureServe, 2012).

Peppered Shiner (*Notropis perpallidus*)

Environmental Baseline

This uncommon fish is an aquatic endemic to the Ouachita and Little rivers systems and is restricted to the Saline, Antoine, Caddo, Little Missouri and upper Ouachita Rivers in Arkansas, and in the Kiamichi and Little Rivers in Oklahoma. Overall distribution and population dynamics are poorly known. Peppered shiners are commonly found to occur in pools and slow runs of warm, clear, small to medium rivers primarily in deeper (more than 50 cm), and slower current (less than 0.3 cm/sec) areas with gravel substrate, and typically in lees of islands frequently near aquatic plants and other obstructions out of main current (NatureServe, 2012).

Robison (Robison, 2006) found only 6 specimens of the peppered shiner in the upper Ouachita River mainstem from only 2 localities of the 15 sampled. During this 2-year study, Robison was able to document the continued presence of the peppered shiner in only 2 of the 8 river systems in Arkansas from which it was collected historically, the Ouachita mainstem and the Saline River systems. Small population size and low densities make it imperative that a careful watch be maintained on this species in the future.

Caddo Madtom (*Noturus taylori*)

Environmental Baseline

This miniature catfish is an endemic to the south-central Ouachita Mountains (Upper Caddo, Little Missouri & Ouachita rivers). It is found to be relatively abundant in the Caddo, but uncommon in the Little Missouri and Ouachita rivers. The Caddo madtom is a headwater stream specialist; habitat includes shallow, gravel-bottomed pools or shoals near shorelines of clear, small to medium upland rivers, especially well-compacted gravel areas below gravel riffles, where this madtom occurs under rocks, beneath large gravel, or among rubble.

Species that specialize on headwater habitats might be particularly vulnerable to local extirpation because natural recolonization from adjacent rivers is unlikely (Turner & Robison, 2006). The Caddo madtom spawns on the underside of flat rocks in shallow streams which results in a high susceptibility to negative impacts of increases in sediment (USDA Forest Service, 2005b) (NatureServe, 2012).

Ouachita Darter (*Percina* sp. nov.)

Environmental Baseline

The Ouachita darter is known only from the upper Ouachita River above Lake Ouachita and the Little Missouri River from below Lake Greeson to its confluence with the Ouachita River. The population in the lower Caddo River apparently was extirpated by the tailwater impacts of DeGray Reservoir. This fish species generally prefers clear, silt-free upland streams, large creeks and small rivers with cobble and gravel bottoms. It occasionally occurs in pools, including moderate to strong current of raceway areas of pools in spring, at depths of 30-90 cm; during low flow in late summer and early fall, occurs in deeper parts of pools in little or no current, often over a sandy bottom and frequently near vegetation. In the lower Little Missouri River, the Ouachita darter occurs in an area of greater siltation and turbidity than all other known localities (NatureServe, 2012).

Effects

The potential risks of direct, indirect and cumulative effects of activities by alternative on the aquatic habitat and population trends of the aquatic PETS species known to occur within the influence of the effects from the project area are summarized here. Scientific literature evaluating the effects of sedimentation on fish and freshwater mussels provides

substantive support for adverse biological effects to individuals and adverse physical effects to their habitats associated with sedimentation.

The accelerated accumulation of sediments in aquatic ecosystems leads to a decline in surface water quality and biodiversity (Newcombe and Macdonald 1991). Sediments fill the interstices of gravel and cobble stream bottoms, greatly decreasing the spawning areas for many fish species and the habitat for macroinvertebrates, which serve as food for many fish species. Many Southeastern aquatic species, including freshwater mussels, are particularly sensitive to this type of habitat degradation (Castro and Reckendorf 1995).

The Aquatic Cumulative Effects (ACE) model and the Water Erosion Prediction Project (WEPP) model were utilized in conjunction to reveal potential differences in the annual cumulative sediment yield in tons by alternative. The Aquatic Cumulative Effects (ACE) model (Clingenpeel & Crump, A Manual for the Aquatic Cumulative Effects Model, 2005) is used to calculate the cumulative effects of management activities on water quality and associated beneficial uses. The model calculates sediment from terrestrial sources (various land uses) and linear sources (roads and trails).

The WEPP model, a process-based, distributed parameter, continuous simulation, erosion prediction model, was used in analyzing the amount of sediment by alternative from road and trail systems, as well as ground disturbing activities such as new road/trail construction, road/trail obliteration, installation of stream crossing structures, as well as the implementation of Best Management Practices (BMPs) within the WPG project analysis area.

As previously shown in the Water Quality section, the table and figure below display the potential annual sediment yield (tons/year) by alternative based on planned activities and is included in the analysis for aquatic species. For comparison, the sediment yield estimate for the Travel Management Project (USDA Forest Service, 2009) (MVUM) is shown as well as the sediment yield in 2001. Stream surveys in 2001 found a slight recovery in physical parameters. Using the Ouachita NF Travel Management Project (MVUM) as a threshold, the dashed line is an aid for the reader to identify what alternatives would have a lower risk (alternatives that are below the line).

Table 55. Sediment Yield from WPG Roads and Trails by Alternative[1]

Route Type	Alternative											MVUM 2010
	A	B	C	D	E	F	G	I	J-1	J-2	2001	
Road	906	862	456	678	341	749	611	611	596	574	385	402
Trail	528	192	133	538	0	183	271	281	208	220	163	166
Total	1,435	1,053	588	1,215	341	932	882	892	804	793	547	568

1-The sediment yield values' usefulness is limited to their comparative value; they should not be taken as accurate estimates of actual expected sedimentation.

Alternative E falls below, and Alternative C is barely above the Ouachita NF Travel Management Project (MVUM) threshold and may be sustainable for water quality and aquatic biota.

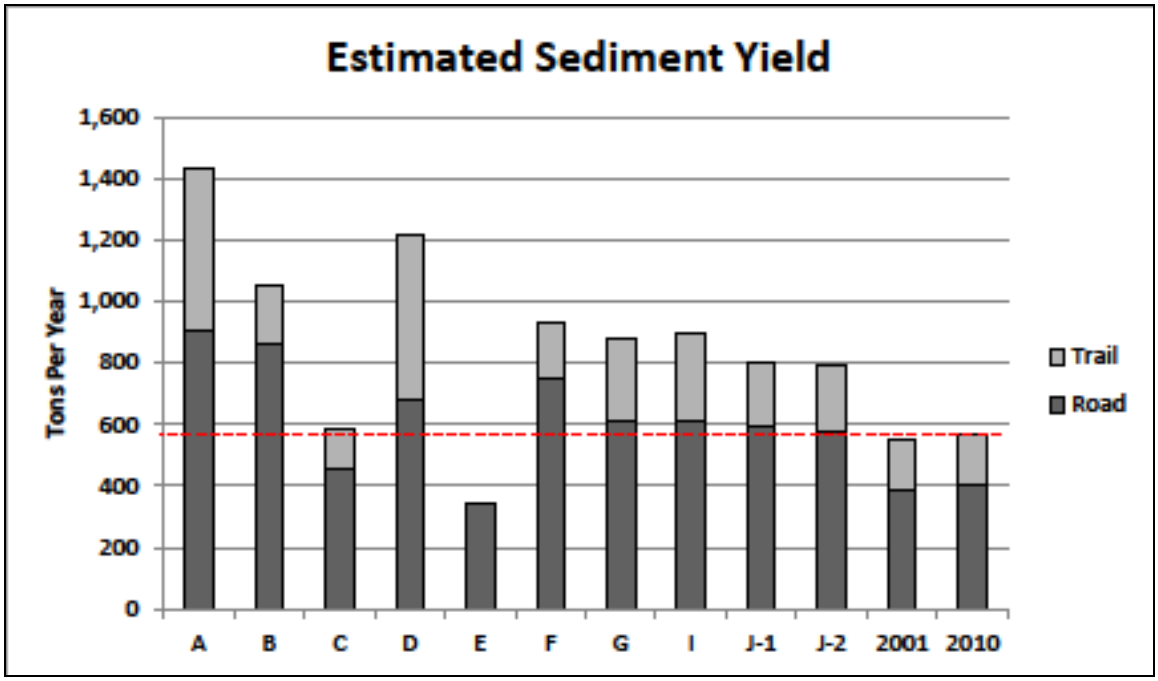

Figure 23. Annual tons of sediment from the WPG OHV complex.

Alternative A

The 'No Action' A alternative allows for the second highest total WPG routes of 41.7 miles, including the third highest number of miles available within WPG for road highway and OHV traffic year round (20.2 miles), the second highest number of miles for road highway only traffic year round (3.2 miles), as well as fourth highest for trail OHV traffic year round (18.3 miles). This alternative results in the second third highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

There are no ground disturbing activities including miles of new road/trail construction, miles of trail and road obliteration or stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' this alternative results in the highest overall risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative B

The 'Proposed Action' B alternative allows for the third highest total WPG routes of 41.3 miles, including the third lowest number of miles available within WPG for road highway and OHV traffic year round (6.1 miles), the lowest number of miles for road highway only traffic year round (2.9 miles), the highest number of miles for road highway year round and seasonal OHV traffic (14.3 miles), the highest number of miles for seasonal road highway and OHV traffic (1.1 miles), and the third highest number of miles of seasonal OHV traffic (16.9 miles). This alternative results in the third highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

Ground disturbing activities include 3.8 miles of new road construction, 8.8 miles of new trail construction, 6.5 miles of road obliteration and 9.8 miles of trail obliteration with a total of 272 stream crossing bridges and culverts planned for this alternative. Seasonal Use only is allowed on 32.3 miles (78%) of roads and trails in WPG from February 1 through October 31 (39 weeks), which allows closure of certain roads and trails to OHV/vehicle traffic for 13 weeks (25%) of the year from November 1 through January 31. Some beneficial effects would occur from the seasonal closure. According to the 'annual sediment yield in tons by alternative,' this alternative results in the third highest overall risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation compared to Alternative E, which is the no OHV alternative.

Alternative C

The 'Additional Resource Protection' C alternative allows for the second to the lowest total WPG routes of 38.6 miles next to Alt. E-No OHV's, with next to the lowest number of miles available within WPG for road highway and OHV traffic year round (5.6 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), and the second highest number of miles for road highway year round and seasonal OHV traffic (7.2 miles), with seasonal only OHV traffic (22.6 miles). Alternative C results in next to the lowest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

Ground disturbing activities include 0.4 miles of new road construction, 10.7 miles of new trail construction, 5.6 miles of road obliteration 10.4 miles of trail obliteration and 4.0 miles of road converted to trail with a total of 252 stream crossing bridges and culverts planned for this alternative. Thirty miles (76%) of the WPG routes would be only open seasonally for OHV access for 24-26 weeks of the year. The three options for open seasons for trail use are:

1. March 15 – August 31 (All of Spring and Summer season)
2. March 15 – March 31; June 1 – November 30
   (Two weeks of Spring; Summer and Fall)
3. March 15 – April 15; May 1 – July 31; September 1 – October 15 (Most of Spring and Summer with some Fall season)

This alternative closes 30 miles of the trail system for 24-26 weeks of the year (~50%) allowing for beneficial effects including six months of suspended traffic. According to the 'annual sediment yield in tons by alternative,' this alternative results in next to the lowest risk to aquatic population trends from continued indirect and cumulative effects from sedimentation and degradation to aquatic habitat.

Alternative D

The 'Additional OHV Miles' D alternative allows for the highest total WPG routes of 61.1 miles, including the second highest number of miles available for highway and OHV traffic year round (21.2 miles), the lowest number of miles for road highway only traffic year round (2.9 miles), as well as the highest for trail OHV traffic year round (37 miles). This alternative results in the highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by vehicular traffic crossing streams.

Ground disturbing activities include 1.1 miles of new road construction, 28.2 miles of new trail construction, 2.7 miles of road obliteration 9.8 miles of trail obliteration and 0.3 miles of road converted to trail, with a total of 364 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' this alternative also results in the second highest risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative E

The 'No OHV Use' E alternative allows for the lowest total WPG routes of 24 miles with no OHV traffic allowed, including the lowest number of miles available for highway and OHV traffic year round (0 miles) as well as the lowest for trail OHV traffic year round (0 miles). This alternative results in the lowest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by vehicular traffic crossing streams.

Ground disturbing activities include 18.3 miles of trail obliteration with a total of 133 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' this alternative results in the lowest risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative F

The 'Minimal Change' F alternative allows for the fourth highest total WPG routes of 40.8 miles, including the highest number of miles available for highway and OHV traffic year round (21.5 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), as well as the lowest number of miles in alternatives that allow for trail OHV traffic year round (16.1 miles). This alternative results in the fourth highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by vehicular traffic crossing streams.

Ground disturbing activities include 2.8 miles of new trail construction, and 5.0 miles of trail obliteration, with a total of 236 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' this alternative also results in the fourth highest risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative G

The 'Modified Resource Protection' G alternative allows for the sixth highest total WPG routes of 39.2 miles, including the fourth highest number of miles available for highway and OHV traffic year round (13.2 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), as well as the second highest for trail OHV traffic year round (22.8 miles). This alternative results in the sixth highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by vehicular traffic crossing streams.

Ground disturbing activities include 10.9 miles of new trail construction, 1.2 miles of road obliteration and 10.5 miles of trail obliteration, with a total of 269 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' these alternatives also result in the sixth highest risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative I

The 'Modified Season' I alternative allows for the fifth highest total WPG routes of 39.6 miles with next to the lowest number of miles available within WPG for road highway and OHV traffic year round (5.6 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), and the second highest number of miles for road highway year round and seasonal OHV traffic (7.6 miles), with seasonal only OHV traffic (22.8 miles). Alternative I results in the fifth highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration 10.1 miles of trail obliteration and 3.3 miles of road converted to trail with a total of 270 stream crossing bridges and culverts planned for this alternative. Almost 31 miles (~78%) of the WPG routes would be only open seasonally for OHV access for approximately 32 weeks of the year. For routes designated as "WPG Seasonal OHV," OHV use would be limited to the following time periods:

1. 2nd Friday of March – October 31
2. Three days before Thanksgiving through two days after Thanksgiving
3. December 25 through January 2

According to the 'annual sediment yield in tons by alternative,' this alternative results in the fifth highest risk to aquatic population trends from continued indirect and cumulative effects from sedimentation and degradation of aquatic habitat.

Alternative J

The 'Rotation' J alternative employs a rotation schedule where year-round OHV use would be alternated on an annual basis between roughly the east and west halves of the road and trail system. Portions of Trails 6 and 8 would remain open each year to provide access to the system. Since the effects would be comparable for each area, this analysis combines some aspects of the numbers of miles.

The 'Rotation' J alternative allows for the second highest total WPG routes of 59.6 miles with 25.8-J1 and 33.8-J2. Alternative J allows 11.3 and 7.5 (J1 & J2, respectively) miles available within WPG for road highway and OHV traffic year round, the next to the highest number of miles for road highway only traffic year round (5.1-J1 & 8.9-J2 miles). Alternative J results in the second highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration 10.1 miles of trail obliteration and 3.3 miles of road converted to trail, with a total of 270 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative', this alternative would result in the second highest risk to aquatic population trends from continued indirect and cumulative effects from sedimentation and degradation of aquatic habitat.

Habitat and Management Indicator Species (MIS)

Current Conditions

The FEIS and Revised Forest Plan identify 24 management indicator species (MIS) that are representative of the full array of habitats needed by native plant and animal species inhabiting the national forest (USDA Forest Service, 2005a) (USDA Forest Service, 2005b). Table 56 lists the terrestrial and aquatic MIS that could be affected by the proposed project and the reason for selection.

Table 56. Management Indicator Species

Common Name	Scientific Name	Primary reason(s) for selection	Selected as MIS for Project (Yes/No)
Terrestrial MIS			
Northern Bobwhite	*Colinus virginianus*	Little to no habitat available within the analysis area.	No
Eastern wild turkey	*Meleagris gallapavo*	To help indicate effects of management on public hunting demand.	Yes
White-tailed deer	*Odocoileus virginianus*	To help indicate effects of management on public hunting demand.	Yes
Red-cockaded woodpecker	*Picoides borealis*	Not known to occur within the analysis area.	No
Prairie warbler	*Dendroica discolor*	Little to no habitat available within the analysis area.	No
Scarlet tanager	*Piranga olivacea*	To help indicate effects of management on mature forest communities.	Yes
Pileated woodpecker	*Dryocopus pileatus*	To help indicate effects of management on snags and snag-dependent species.	Yes
Ponds and Lakes			
Bluegill	*Lepomis macrochirus*	Little to no habitat available within the analysis area.	No

Common Name	Scientific Name	Primary reason(s) for selection	Selected as MIS for Project (Yes/No)
Redear sunfish	*Lepomis microlophus*		No
Largemouth bass	*Micropterus salmoides*		No
Arkansas River Valley Streams			
Yellow bullhead	*Ameiurus natalis*	The Arkansas River Valley Ecoregion is outside of the analysis area.	No
Central stoneroller	*Campostoma anomalum*		No
Redfin darter	*Etheostoma whipplei*		No
Green sunfish	*Lepomis cyanellus*		No
Longear sunfish	*Lepomis megalotis*		No
Gulf Coastal Plain Ecoregion Streams			
Pirate perch	*Aphredoderus sayanus*	The Gulf Coast Plain Ecoregion is outside of the analysis area.	No
Central stoneroller	*Campostoma anomalum*		No
Creek chubsucker	*Erimyzon oblongus*		No
Green sunfish	*Lepomis cyanellus*		No
Longear sunfish	*Lepomis megalotis*		No
Ouachita Mountain Ecoregion Streams			
Central stoneroller	*Campostoma anomalum*	To help indicate effects of management on aquatic habitat and water quality in streams within the Ouachita Mountain Ecoregion.	Yes
Johnny darter	*Etheostoma nigrum*		No, not known to occur in analysis area
Orangebelly darter	*Etheostoma radiosum*		Yes
Redfin darter	*Etheostoma whipplei*		No, not known to occur in analysis area
Northern studfish	*Fundulus catenatus*		Yes
Northern hog sucker	*Hypentelium nigricans*		Yes
Green sunfish	*Lepomis cyanellus*		Yes

Common Name	Scientific Name	Primary reason(s) for selection	Selected as MIS for Project (Yes/No)
Longear sunfish	*Lepomis megalotis*		Yes
Striped shiner	*Luxilus chrysocephalus*		Yes
Smallmouth bass	*Micropterus dolomieu*		Yes
Channel darter	*Percina copelandi*		No, not known to occur in analysis area
Forest-wide			
Smallmouth bass	*Micropterus dolomieu*	To help indicate the effects of management on meeting public fishing demand in streams.	Yes

Projected risks to population trends for the terrestrial MIS species selected for this project will be discussed by alternative, based on the FEIS (USDA Forest Service, 2005b), as well as the "Summary and Analysis of Data Pertaining to Management Indicator Species for the Ouachita National Forest" (USDA Forest Service, 2008), and the Five-Year Review of the 2005 Forest Plan (USDA Forest Service, 2011). These documents summarize monitoring information for MIS species over the past decade, while providing an assessment of each MIS species' current status and conservation needs.

Potential terrestrial effects of activities are grouped by category according to influence on the habitat of the selected terrestrial MIS species. These categories are: Designation of Roads and Trails for Motor Vehicle and/or OHV Use by Alternative, and Other Ground Disturbing Activities within WPG by Alternative. Ground disturbing activities include new road construction, new trail construction, trail and/or road obliteration, and stream-crossing bridges and culverts. The effects on Eastern Wild Turkey and white-tailed deer are grouped together, and Scarlet Tanager and Pileated Woodpecker are analyzed together, since habitat needs and effects to habitat and population trends are similar for the two species grouped together.

The projected risks by alternative to aquatic habitat within the project/analysis area and risks to population trends of stream fish species are discussed as a group. All activities (Designation of Roads and Trails for Motor Vehicle and/or OHV Use by Alternative, and Other Ground Disturbing Activities within WPG by Alternative) are included in the 'annual sediment yield in tons by alternative' analysis, which is used for comparisons of sedimentation by alternative for the aquatic MIS.

Table 57. Ground Disturbing Activities within WPG by Alternative

	Alternative								
Activity	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
Route	**Miles**								
New Road Construction	0	3.8	0.4	1.1	0	0	0.4	0.4	0.4
New Trail Construction	0	8.8	10.7	28.2	0	2.8	10.9	10.9	10.9
Road Obliteration	0	6.5	5.6	2.7	0	0	1.2	1.2	1.2
Trail Obliteration	0	9.8	10.4	9.8	18.3	5.0	10.5	10.1	10.1
Convert Road to Trail	0	0	4.0	0.3	0	0	3.5	3.3	3.3
Total Miles	0	28.9	31.1	42.1	18.3	7.8	26.5	25.9	25.9
Structure Installation									**Quantity**
Arch Culvert/Concrete Planks	0	133	136	224	0	96	138	139	139
Culvert/Concrete Planks	0	110	87	101	109	107	99	99	99
Large Arch Culvert	0	23	23	27	21	28	26	26	26
Bridge	0	6	6	12	3	5	6	6	6
Total Structures	0	272	252	364	133	236	269	270	270

In addition to the actions listed above, some alternatives also include closure of existing open roads as shown in the table below.

Table 58. Road Closure within WPG by Alternative

	Alternative								
Activity	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**I**	**J**
Road closure (miles)	0	0	4.5	3.4	0	0	3.5	3.3	3.3

Alternative A

The 'No Action' A alternative allows for the second highest total WPG routes of 41.7 miles, including the third highest number of miles available within WPG for road highway and OHV traffic year round (20.2 miles), the second highest number of miles for road highway only traffic year round (3.2 miles), as well as fourth highest for trail OHV traffic year round (18.3 miles). There are no ground disturbing activities including miles of new road or trail construction, miles of trail and road obliteration or stream crossing bridges and culverts planned for this alternative.

Alternative B

The 'Proposed Action' B alternative allows for the third highest total WPG routes of 41.3 miles, including the next to the lowest number of miles available within WPG for road highway and OHV traffic year round (6.1 miles), the lowest number of miles for road highway only traffic year round (2.9 miles), the highest number of miles for road

highway year round and seasonal OHV traffic (14.3 miles), the highest number of miles for seasonal road highway and OHV traffic (1.1 miles), with seasonal OHV traffic (16.9 miles). Ground disturbing activities include 3.8 miles of new road construction, 8.8 miles of new trail construction, 6.5 miles of road obliteration and 9.8 miles of trail obliteration, with a total of 272 stream crossing bridges and culverts planned for this alternative. Seasonal Use only is allowed on 32.3 miles (78%) of roads and trails in WPG from February 1 through October 31 (39 weeks) which allows closure of certain roads and trails to OHV/vehicle traffic for 13 weeks (25%) of the year from November 1 through January 31. Some beneficial effects would occur from the seasonal closure such as a short reprieve from dust and noise pollution.

Alternative C

The 'Additional Resource Protection' C alternative allows for next to the lowest total WPG routes of 38.6 miles except for Alt. E-No OHV's, including the next to the lowest number of miles available within WPG for road highway and OHV traffic year round (5.6 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), the second highest number of miles for road highway year round and seasonal OHV traffic (7.2 miles), with seasonal only OHV traffic (22.6 miles). Ground disturbing activities include 0.4 miles of new road construction, 10.7 miles of new trail construction, 5.6 miles of road obliteration and 10.4 miles of trail obliteration, with a total of 252 stream crossing bridges and culverts planned for this alternative. Thirty miles (76%) of the WPG routes would be only open seasonally for OHV access for 24-26 weeks of the year. The three options for open seasons for trail use are:

1. March 15 – August 31 (All of Spring and Summer season)
2. March 15 – March 31; June 1 – November 30 (Two weeks of Spring; Summer and Fall)
3. March 15 – April 15; May 1 – July 31; September 1 – October 15 (Most of Spring and Summer with some Fall season)

This alternative closes 30 miles of the trail system for 24-26 weeks of the year (~50%) allowing for less disturbance to wildlife from trail use, as well as some beneficial effects including a substantial six-month reprieve from dust and noise pollution.

Alternative D

The 'Additional OHV Miles' D alternative allows for the highest total WPG routes of 61.1 miles, including the second highest number of miles available for highway and OHV traffic year round (21.2 miles), the lowest number of miles for road highway only traffic year round (2.9 miles), as well as the highest for trail OHV traffic year round (37 miles). Ground disturbing activities include 1.1 miles of new road construction, 28.2 miles of new trail construction, 2.7 miles of road obliteration and 9.9 miles of trail obliteration, with a total of 364 stream crossing bridges and culverts planned for this alternative.

Alternative E

The 'No OHV Use' E alternative allows for the lowest total WPG routes of 24 miles with no OHV traffic allowed, including the lowest number of miles available for highway and OHV traffic year round (0 miles) as well as the lowest for trail OHV traffic year round (0 miles). Ground disturbing activities include no miles of new trail construction, and 18.3 miles of trail obliteration, with a total of 133 stream crossing bridges and culverts planned for this alternative.

Alternative F

The 'Minimal Change' F alternative allows for the third highest total WPG routes of 40.8 miles including the highest number of miles available for highway and OHV traffic year round (21.5 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), as well as the lowest number of miles in alternatives that allow for trail OHV traffic year round (16.1 miles) with. Ground disturbing activities include 2.8 miles of new trail construction and 5.0 miles of trail obliteration, with a total of 236 stream crossing bridges and culverts planned for this alternative.

Alternatives G

The 'Modified Resource Protection' alternative allows for the fourth highest total WPG routes of 39.2 miles, the fourth highest number of miles available for highway and OHV traffic year round (13.2 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), as well as the second highest for trail OHV traffic year round (22.8 miles). Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration, 10.5 miles of trail obliteration and 3.5 miles of road converted to trail, with a total of 269 stream crossing bridges and culverts planned for this alternative.

Alternative I

The 'Modified Season' I alternative allows for the fifth highest total WPG routes of 39.6 miles with next to the lowest number of miles available within WPG for road highway and OHV traffic year round (5.6 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), and the second highest number of miles for road highway year round and seasonal OHV traffic (7.6 miles), with seasonal only OHV traffic (22.8 miles). Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration 10.1 miles of trail obliteration and 3.3 miles of road converted to trail, with a total of 270 stream crossing bridges and culverts planned for this alternative. Almost 31 miles (~78%) of the WPG routes would be only open seasonally for OHV access for approximately 32 weeks of the year. For routes designated as "WPG Seasonal OHV," OHV use would be limited to the following time periods:

1. 2nd Friday of March – October 31
2. Three days before Thanksgiving through two days after Thanksgiving
3. December 25 through January 2

Alternative J

The 'Rotation' J alternative employs a rotation schedule where year-round OHV use would be alternated on an annual basis between roughly the east and west halves of the road and trail system. Portions of Trails 6 and 8 would remain open each year to provide access to the system. Since the effects would be comparable for each area, this analysis combines some aspects of the numbers of miles.

The 'Rotation' J alternative allows for the second highest total WPG routes of 59.6 miles with 25.8-J1 and 33.8-J2. Alternative J allows 11.3 and 7.5 (J1 & J2, respectively) miles available within WPG for road highway and OHV traffic year round, the next to the highest number of miles for road highway only traffic year round (5.1-J1 & 8.9-J2 miles). Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration 10.1 miles of trail obliteration and 3.3 miles of road converted to trail, with a total of 270 stream crossing bridges and culverts planned for this alternative.

Terrestrial Vertebrate - Management Indicator Species

Eastern Wild Turkey (*Meleagris gallopavo*)

The Eastern Wild Turkey is a management indicator species selected to indicate the effects of management on meeting public hunting demand (USDA Forest Service, 2005a) (USDA Forest Service, 2005b). Sources of data include turkey poult surveys, spring turkey harvest data, habitat capability modeling using CompPATS and Landbird point survey data. In the 2005 Forest Plan, the minimum population objective is 3.3 turkeys per square mile (9,177 turkeys Forest-wide) after 10 years and 3.9 per square mile at 50 years. The number of turkey poults per hen has varied from 1.99 in 2006 to 1.4 poults per hen in 2009 in the Ouachita region of Arkansas. Although the 2010 totals were higher than the previous three years, the Eastern Wild Turkey trend detected on the Ouachita NF Landbird point surveys is similar to the drop in harvested birds and poults per hen and is statistically showing a declining trend. There is a clear downward trend for successful turkey reproduction (USDA Forest Service, 2005b) (USDA Forest Service, 2011).

Spring turkey harvest achieved a high of about 2,718 birds in FY 2006. Spring 2010 harvest was slightly more than the 2009 harvest. The Arkansas Game and Fish Commission addressed the turkey decline by adjusting the hunting season and eliminating the fall season entirely. A negative trend is also suggested for the turkey population based on habitat capability modeling. Habitat capability for 2010 is estimated at 14,610 turkeys compared to an estimated 16,204 turkeys in 2009, 18,370 in 2008, and 18,316 in 2007, showing a downward trend in habitat capability for the years FY 2006 to FY 2010. Although the estimated habitat capability is exhibiting a downward trend, it should support numbers exceeding the minimum population objective of 3.3 turkeys per square mile (9,177 turkeys) for the first period (10 years) of the Forest Plan (USDA Forest Service, 2011).

In addition, the drop-in turkey harvest, poults per hen, and birds detected on the Landbird points would indicate a reduction in the number of turkey. Still, habitat capability remains above the level projected in the 2005 Forest Plan. The sustained high levels of habitat capability would indicate that the drop in harvest levels, reductions in poults per hen, and birds detected on the Landbird points are due to factors other than habitat (USDA Forest Service, 2011).

White-tailed Deer (*Odocoileus virginianus*)

The white-tailed deer is an MIS that was selected to help indicate the effects of management on meeting the public hunting demand (USDA Forest Service, 2005a) (USDA Forest Service, 2005b). Data sources and monitoring techniques for this species include deer spotlight survey counts, harvest and population trend data from the Arkansas Game and Fish Commission and Oklahoma Department of Wildlife Conservation, CompPATS deer habitat capability model, and acreage of early successional habitat created by year. In the 2005 Forest Plan, the desired habitat condition is to sustain healthy populations of native and desired non-native wildlife and fish species (USDA Forest Service, 2005a).

The estimated habitat capability for deer for fiscal years 2006-2010 shows a downward trend; yet, it still exceeds the desired habitat capability of 48,250 acres for FY 2015. Habitat carrying capacity is calculated using acres within the Ouachita NF and is influenced by the amount of prescribed fire and early seral habitat created, including regeneration, thinning, timber stand improvement, mid-story removal, wildlife stand improvement, wildlife openings, and site preparation (USDA Forest Service, 2011).

Scarlet Tanager (*Piranga olivacea)*

The Scarlet Tanager is an MIS for the Ouachita NF, selected to help indicate the effects of management on mature forest communities. This species favors mature hardwood, and hardwood-pine, and is less numerous in mature mixed pine-hardwood and pine habitat types. It is relatively common in all of these habitats in the Ouachita Mountains. The Ouachita NF Landbird point data and habitat capability predictions using CompPATS wildlife model, and Field Sampled Vegetation (FSVeg) data were used to make a trend assessment. The Landbird point data collected from 2006-2010 indicate an overall stable to increasing forestwide trend for the Scarlet Tanager (USDA Forest Service, 2011).

Data support a stable trend on the Ouachita NF and the Ozark-Ouachita Plateau where mature hardwood and mixed types are represented. On the Ouachita NF, there are over 200,000 acres of hardwood and hardwood/pine forest types greater than 41 years old. The Scarlet Tanager and its habitat are secure within the Ouachita NF, and the continued long-term viability of this species is not in question.

Pileated woodpecker (*Dryocopus pileatus*)

The pileated woodpecker is an MIS selected to indicate the effects of management on snags and snag-dependent species (USDA FS 2005). This species prefers dense, mature to over-mature hardwood and hardwood-pine forest types. It is a primary excavator of cavities important to obligate secondary cavity nesters, and is a key indicator for the retention of a complete community of cavity nesting species.

The Ouachita NF Landbird point count data and habitat capability predictions using CompPATS wildlife model, and Field Sampled Vegetation (FSVeg) data were used as data sources for evaluating Pileated Woodpecker population trends. Population trends for the Pileated Woodpecker as indicated by Ouachita NF Landbird data and habitat capability data are mixed. Landbird monitoring data on the Ouachita NF indicate the long term trend to be stable to slightly decreasing for Pileated Woodpecker.

The CompPATS wildlife model estimates for the habitat capability, using all forest types, indicate a more defined decreasing trend for the last five years than Landbird data. These CompPATS wildlife model data are for pine, pine-hardwood, hardwood, and hardwood-pine stands with the greatest value being for stands greater than or equal to 41 years old. As these stands age, the habitat capability to support the Pileated Woodpecker should begin to stabilize.

The CompPATS wildlife model takes into account the conditions in all forest types, and it factors in management practices including prescribed fire and thinning. These data show a downward trend for the last five years, but a long-term upward trend. The overall situation should continue to improve as the unmanaged hardwood and hardwood-pine and the managed pine stands age. The current habitat capability that is estimated to support 11,580 birds exceeds the 2005 Forest Plan bird population objectives of 11,265 for FY 2015 (USDA Forest Service, 2005b) but is trending towards the FY 2015 desired capability (USDA Forest Service, 2011). The Pileated Woodpecker and its habitat are secure within the Ouachita NF, and the continued long-term viability of this species is not in question.

Effects to White-tailed deer and Eastern Wild Turkey, and to Scarlet Tanager and Pileated Woodpecker from Designation of Roads and Trails for Motor Vehicle and/or OHV Use by Alternative, and Other Ground Disturbing Activities within WPG by Alternative.

Alternative A

No additional direct, indirect or cumulative impacts or benefits to turkey and deer, or Scarlet Tanagers and Pileated Woodpeckers are anticipated from designation of roads and trails for motor vehicle and/or OHV use by alternative A, and other ground disturbing activities within WPG since no actions would be taken and the current system and use patterns of Forest road and trail use would remain the same with the second highest total WPG routes of 41.7 miles. Current population trends for turkey/deer and Scarlet Tanagers/Pileated Woodpeckers are expected to remain steady.

Alternative B

This alternative would provide the third highest total WPG routes of 41.3 miles. Direct impacts to turkey and deer would include fatalities from collisions, and disturbance to reproductive efforts such as nest disturbance and/or destruction. Indirect and cumulative impacts would include loss of habitat connectivity, noise and dust pollution, traffic disturbing wildlife, and detrimental impacts to habitat as the Arkansas Game & Fish Commission maintained food plots along FS RD 243 would be abandoned.

Seasonal Use only is allowed on 32.3 miles (78%) of roads and trails in WPG from February 1 through October 31 (39 weeks) which allows closure of certain roads and trails to OHV/vehicle traffic for 13 weeks (25%) of the year from November 1 through January 31. Some beneficial effects would occur from the seasonal closure such as a reprieve from dust and noise pollution.

There are no expected direct impacts to Scarlet Tanagers and Pileated Woodpeckers; however indirect and cumulative impacts include noise and dust pollution, as well as disturbance from traffic that could interfere with reproduction efforts as well as feeding activities. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

Alternative C

This alternative would provide next to the lowest total WPG routes of 38.6 miles. Direct impacts to turkey and deer would include fatalities from collisions, and disturbance to and/or destruction of reproductive efforts such as nest destruction. Indirect and cumulative impacts would include loss of habitat connectivity, noise and dust pollution, traffic disturbing wildlife, and detrimental impacts to habitat as the Arkansas Game & Fish Commission maintained food plots along FS RD 243 would be abandoned.

There are no expected direct impacts to Scarlet Tanagers and Pileated Woodpeckers; however indirect and cumulative impacts include noise and dust pollution, as well as disturbance from traffic that could interfere with reproduction efforts as well as feeding activities. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

Thirty miles (76%) of the WPG routes would be only open seasonally for OHV access for eight months of the year. The three options for open seasons for trail use are:

1. March 15 – August 31 (All of Spring and Summer season)
2. March 15 – March 31; June 1 – November 30 (Two weeks of Spring; Summer and Fall)
3. March 15 – April 15; May 1 – July 31; September 1 – October 15 (Most of Spring and Summer with some Fall season)

This alternative closes 30 miles of the trail system for 24-26 weeks of the year (~50%) allowing for less disturbance to wildlife from trail use, as well as some beneficial effects including a substantial reprieve from dust and noise pollution. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

Alternative D

This alternative would provide the highest total WPG routes of 61.1 miles. Direct impacts to turkey and deer would include fatalities from collisions, and disturbance to and/or destruction of reproductive efforts such as nest destruction. Indirect and cumulative impacts would include loss of habitat connectivity, noise and dust pollution, and traffic disturbing wildlife.

There are no expected direct impacts to Scarlet Tanagers/Pileated Woodpeckers; however, indirect and cumulative impacts include noise and dust pollution, as well as disturbance from traffic that could interfere with reproduction efforts as well as feeding activities. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

Alternative E

This alternative would provide the lowest total WPG routes of 24 miles with no OHV traffic allowed. Direct impacts to turkey and deer would include fatalities from collisions, and disturbance to and/or destruction of reproductive efforts such as nest destruction. Indirect and cumulative impacts would include loss of habitat connectivity, noise and dust pollution, and traffic disturbing wildlife.

There are no expected direct impacts to Scarlet Tanagers and Pileated Woodpeckers; however, indirect and cumulative impacts include noise and dust pollution, as well as disturbance from traffic that could interfere with reproduction efforts as well as feeding activities. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

Alternative F

This alternative would provide the fourth highest total WPG routes of 40.8 miles. Direct impacts to turkey and deer would include fatalities from collisions, and disturbance to and/or destruction of reproductive efforts such as nest destruction. Indirect and cumulative impacts would include loss of habitat connectivity, noise and dust pollution, and traffic disturbing wildlife.

There are no expected direct impacts to Scarlet Tanagers and Pileated Woodpeckers; however, indirect and cumulative impacts include noise and dust pollution, as well as disturbance from traffic that could interfere with reproduction efforts as well as feeding activities. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

Alternative G

This alternative would provide the sixth highest total WPG routes of 39.2 miles. Direct impacts to turkey and deer would include fatalities from collisions, and disturbance to and/or destruction of reproductive efforts such as nest destruction. Indirect and cumulative impacts would include loss of habitat connectivity, noise and dust pollution, and traffic disturbing wildlife.

There are no expected direct impacts to Scarlet Tanagers and Pileated Woodpeckers; however, indirect and cumulative impacts include noise and dust pollution, as well as disturbance from traffic that could interfere with reproduction efforts as well as feeding activities. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

Alternative I

This alternative would provide the fifth highest total WPG routes of 39.6 miles. Direct impacts to turkey and deer would include fatalities from collisions, and disturbance to and/or destruction of reproductive efforts such as nest destruction. Indirect and cumulative impacts would include loss of habitat connectivity, noise and dust pollution, and traffic disturbing wildlife.

There are no expected direct impacts to Scarlet Tanagers and Pileated Woodpeckers; however, indirect and cumulative impacts include noise and dust pollution, as well as disturbance from traffic that could interfere with reproduction efforts as well as feeding activities. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

Alternative J

This alternative would provide the second highest total WPG routes of 59.6 miles. Direct impacts to turkey and deer would include fatalities from collisions, and disturbance to and/or destruction of reproductive efforts such as nest destruction. Indirect and cumulative impacts would include loss of habitat connectivity, noise and dust pollution, and traffic disturbing wildlife.

There are no expected direct impacts to Scarlet Tanagers and Pileated Woodpeckers; however, indirect and cumulative impacts include noise and dust pollution, as well as disturbance from traffic that could interfere with reproduction efforts as well as feeding activities. Current population trends for turkey and deer and Scarlet Tanagers and Pileated Woodpeckers are expected to remain steady.

MIS Stream Fishes

Data sources include the Basin Area Streams Surveys and Long-term Streams Survey Records which include long-term stream monitoring efforts, and fish collection records from Dr. Henry W. Robison in Arkansas. The Water Erosion Prediction Project (WEPP) model, which is a process-based, distributed parameter, continuous simulation, erosion prediction model, was used in analyzing the amount of sediment by alternative from road and trail systems, as well as ground disturbing activities such as new road/trail construction, road/trail obliteration installation of stream crossing structures, as well as the implementation of Best Management Practices (BMPs) within the WPG project analysis area.

Effects

The potential risks of direct, indirect and cumulative effects of activities by alternative on the aquatic habitat and population trends of the aquatic MIS species known to occur within the influence of the effects from the project area are summarized here. Scientific literature evaluating the effects of sedimentation on fish and freshwater mussels provides substantive support for adverse biological effects to individuals and adverse physical effects to their habitats associated with sedimentation.

The accelerated accumulation of sediments in aquatic ecosystems leads to a decline in surface water quality and biodiversity (Newcombe and Macdonald 1991). Sediments fill the interstices of gravel and cobble stream bottoms, greatly decreasing the spawning areas for many fish species and the habitat for macroinvertebrates, which serve as food for many fish species. Many Southeastern aquatic species including freshwater mussels are particularly sensitive to habitat degradation from increases in siltation and/or sedimentation (Castro and Reckendorf 1995).

The sediment yields for roads and trails disclosed in the Water Quality section were used in the effects analysis for aquatic MIS species.

Alternative A

The 'No Action' A alternative allows for the second highest total WPG routes of 41.7 miles, including the third highest number of miles available within WPG for road highway and OHV traffic year round (20.2 miles), the second highest number of miles for road highway only traffic year round (3.2 miles), as well as fourth highest for trail OHV traffic year round (18.3 miles). This alternative results in the second third highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

There are no ground disturbing activities including miles of new road/trail construction, miles of trail and road obliteration or stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' this alternative results in the highest overall risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative B

The 'Proposed Action' B alternative allows for the third highest total WPG routes of 41.3 miles, including the third lowest number of miles available within WPG for road highway and OHV traffic year round (6.1 miles), the lowest number of miles for road highway only traffic year round (2.9 miles), the highest number of miles for road highway year round and seasonal OHV traffic (14.3 miles), the highest number of miles for seasonal road highway and OHV traffic (1.1 miles), and the third highest number of miles of seasonal OHV traffic (16.9 miles). This alternative results in the third highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

Ground disturbing activities include 3.8 miles of new road construction, 8.8 miles of new trail construction, 6.5 miles of road obliteration and 9.8 miles of trail obliteration with a total of 272 stream crossing bridges and culverts planned for this alternative. Seasonal Use only is allowed on 32.3 miles (78%) of roads and trails in WPG from February 1 through October 31 (39 weeks) which allows closure of certain roads and trails to OHV/vehicle traffic for 13 weeks (25%) of the year from November 1 through January 31. Some beneficial effects would occur from the seasonal closure. According to the 'annual sediment yield in tons by alternative,' this alternative results in the third highest overall risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation compared to Alternative E, which is the no OHV alternative.

Alternative C

The 'Additional Resource Protection' C alternative allows for the second to the lowest total WPG routes of 38.6 miles next to Alt. E-No OHV's with next to the lowest number of miles available within WPG for road highway and OHV traffic year round (5.6 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), and the second highest number of miles for road highway year round and seasonal OHV traffic (7.2 miles), with seasonal only OHV traffic (22.6 miles). Alternative C results in next to the lowest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

Ground disturbing activities include 0.4 miles of new road construction, 10.7 miles of new trail construction, 5.6 miles of road obliteration 10.4 miles of trail obliteration and 4.0 miles of road converted to trail, with a total of 252 stream crossing bridges and culverts planned for this alternative. Thirty miles (76%) of the WPG routes would be only open seasonally for OHV access for 24-26 weeks of the year. The three options for open seasons for trail use are:

1. March 15 – August 31 (All of Spring and Summer season)
2. March 15 – March 31; June 1 – November 30 (Two weeks of Spring; Summer and Fall)
3. March 15 – April 15; May 1 – July 31; September 1 – October 15 (Most of Spring and Summer with some Fall season)

This alternative closes 30 miles of the trail system for 24-26 weeks of the year (~50%) allowing for beneficial effects including six months of suspended traffic. According to the 'annual sediment yield in tons by alternative,' this alternative results in next to the lowest risk to aquatic population trends from continued indirect and cumulative effects from sedimentation and degradation to aquatic habitat.

Alternative D

The 'Additional OHV Miles' D alternative allows for the highest total WPG routes of 61.1 miles, including the second highest number of miles available for highway and OHV traffic year round (21.2 miles), the lowest number of miles for road highway only traffic year round (2.9 miles), as well as the highest for trail OHV traffic year round (37 miles). This alternative results in the highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by vehicular traffic crossing streams.

Ground disturbing activities include 1.1 miles of new road construction, 28.2 miles of new trail construction, 2.7 miles of road obliteration 9.8 miles of trail obliteration and 0.3 miles of road converted to trail, with a total of 364 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative', this alternative also results in the second highest risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative E

The 'No OHV Use' E alternative allows for the lowest total WPG routes of 24 miles with no OHV traffic allowed, including the lowest number of miles available for highway and OHV traffic year round (0 miles) as well as the lowest for trail OHV traffic year round (0 miles). This alternative results in the lowest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by vehicular traffic crossing streams.

Ground disturbing activities include 18.3 miles of trail obliteration with a total of 133 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' this alternative results in the lowest risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative F

The 'Minimal Change' F alternative allows for the fourth highest total WPG routes of 40.8 miles, including the highest number of miles available for highway and OHV traffic year round (21.5 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), as well as the lowest number of miles in alternatives that allow for trail OHV traffic year round (16.1 miles). This alternative results in the fourth highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by vehicular traffic crossing streams.

Ground disturbing activities include 2.8 miles of new trail construction, and 5.0 miles of trail obliteration with a total of 236 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' this alternative also results in the fourth highest risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative G

The 'Modified Resource Protection' G alternative allows for the sixth highest total WPG routes of 39.2 miles including the fourth highest number of miles available for highway and OHV traffic year round (13.2 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), as well as the second highest for trail OHV traffic year round (22.8 miles). This alternative results in the sixth highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by vehicular traffic crossing streams.

Ground disturbing activities include 10.9 miles of new trail construction, 1.2 miles of road obliteration and 10.5 miles of trail obliteration, with a total of 269 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' these alternatives also result in the sixth highest risk to the aquatic species population trends from continued indirect and cumulative effects from sedimentation and aquatic habitat degradation.

Alternative I

The 'Modified Season' I alternative allows for the fifth highest total WPG routes of 39.6 miles, with next to the lowest number of miles available within WPG for road highway and OHV traffic year round (5.6 miles), the next to the lowest number of miles for road highway only traffic year round (3.2 miles), and the second highest number of miles for road highway year round and seasonal OHV traffic (7.6 miles), with seasonal only OHV traffic (22.8 miles). Alternative I results in the fifth highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration 10.1 miles of trail obliteration and 3.3 miles of road converted to trail with a total of 270 stream crossing bridges and culverts planned for this alternative. Almost 31 miles (~78%) of the WPG routes would be only open seasonally for OHV access for approximately 32 weeks of the year. For routes designated as "WPG Seasonal OHV," OHV use would be limited to the following time periods:

1. 2nd Friday of March – October 31
2. Three days before Thanksgiving through two days after Thanksgiving
3. December 25 through January 2

According to the 'annual sediment yield in tons by alternative,' this alternative results in fifth highest risk to aquatic population trends from continued indirect and cumulative effects from sedimentation and degradation to aquatic habitat.

Alternative J

The 'Rotation' J alternative employs a rotation schedule where year-round OHV use would be alternated on an annual basis between roughly the east and west halves of the road and trail system. Portions of Trails 6 and 8 would remain open each year to provide access to the system. Since the effects would be comparable for each area, this analysis combines some aspects of the numbers of miles.

The 'Rotation' J alternative allows for the second highest total WPG routes of 59.6 miles with 25.8-J1 and 33.8-J2. Alternative J allows 11.3 and 7.5 (J1 & J2, respectively) miles available within WPG for road highway and OHV traffic year round, the next to the highest number of miles for road highway only traffic year round (5.1-J1 & 8.9-J2 miles). Alternative J results in the second highest risk among all alternatives of direct effects to individuals in low-water stream crossings. Individual eggs, larva and/or adults could be directly harmed by OHV and vehicular traffic crossing streams.

Ground disturbing activities include 0.4 miles of new road construction, 10.9 miles of new trail construction, 1.2 miles of road obliteration 10.1 miles of trail obliteration and 3.3 miles of road converted to trail, with a total of 270 stream crossing bridges and culverts planned for this alternative. According to the 'annual sediment yield in tons by alternative,' this alternative results in the second highest risk to aquatic population trends from continued indirect and cumulative effects from sedimentation and degradation to aquatic habitat.

Chapter 4
Persons and Agencies Consulted

Coordination

Interdisciplinary Team

Mark	Adams	GIS Program Manager	SO
Bubba	Brewster	Engineering Program Manager	SO
Lisa	Cline	NEPA Coordinator	SO
Jade	Ryles	NEPA Coordinator	District
Alan	Clingenpeel	Hydrologist	SO
Annetta	Cox	GIS Editor	District
Betty	Crump	Stream Ecologist	SO
Meeks	Etchieson	Archeologist	SO
Chris	Ham	Recreation Program Manager	SO
Susan	Hooks	Botanist	SO
Tom	Ledbetter	Trails Program Manager	SO
Alett	Little	Forest Planner	SO
Lea	Moore	Transportation Engineer	SO
Jeff	Olson	Soil Scientist	SO
Maria	Schleidt	Archeologist	District
Russell	Standingwater	Recreation Program Manager	District

Steering Team

John	Baswell	Deputy Forest Supervisor	SO
Steve	Cole	Staff Officer	SO
Mary	Lane	Wildlife Biologist	SO
Alett	Little	Forest Planner	SO
Tim	Oosterhous	District Ranger	District
Bill	Pell	Staff Officer	SO
Norm	Wagoner	Forest Supervisor	SO
Mike	White	Staff Officer	SO

Consultation

Arkansas Archeological Survey
Arkansas Department of Environmental Quality
Caddo Tribe
Chickasaw Nation
Choctaw Nation
Osage Nation
Ouachita ATV Club
Quapaw Tribe
Southern Research Station
State Historic Preservation Officer
The Nature Conservancy
Trails Unlimited
US Fish and Wildlife Service

Chapter 5
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Appendices

A – Public and Partner Meetings
B – Wet Weather Management Protocol
C – TNC Monitoring Protocol
D – Water Quality Monitoring by US Geological Survey
E – Maps

Appendix A – Public and Partner Meetings

Public and Partner Meetings		
Date	**Participants**	**Description**
2010		
May 19	Forest Service (FS), The Nature Conservancy (TNC), US Fish & Wildlife Service (FWS)	Project meeting
May 20 - 22	FS, FWS, Public	Field trip
May 27	FS, Public	Field trip
June 29	FS, Public	Field trip
July 22	FS, Public	Public coordination meeting
July 29	FS, Ouachita ATV Club (OAC), Chamber of Commerce, Public	Public Meeting – Proposed Changes to WPG
September 11	FS, TNC	Project meeting
September 16	FS, TNC, FWS, Public	Public Meeting – Science Seminar
September 30	FS, Public	Public Meeting – Presentation of Interim Management Plan (IMP) and Project Announcement
October 7	FS, Public	Public Meeting – Community Issues
October 15	FS, Public	WEPP mapping
2011		
January 8	FS, Public	Field trip on interim management plan
February 17	FS, FWS, Public – field trip	Field trip
May 9-10	FS, Southern Research Station (SRS), University of Kentucky (UK)	Field trip
May 11	FS, Trails Unlimited (TU), Public	Field trip on Best Management Practices (BMPs) & equipment operation
May 31	FS, TNC	Field trip on BMPs & equipment operation
June 20	FS, TNC	WEPP and alternatives
July 19	FS, Public	Public Meeting – TU Work Results
August 26	FS, FWS, TNC, Delegation Representatives, Public	Field trip on BMPs
2012		
February 4	FS, TU	Project meeting
February 8	FS, TNC	Field trip on IMP and monitoring
April 5	FS, FWS	Briefing on preliminary alternatives
April 12	FS, Arkansas Department of Environmental Quality (ADEQ)	Field trip
May 15	FS, SRS, UK	Field trip on sediment budget study
May 17	FS, Congressional Delegation	Briefing on preliminary alternatives
June 13	FS, Chamber of Commerce, Public	Briefing on preliminary alternatives
August 7	FS, Senator Pryor's staff	Project meeting
August 24	FS, State Representative Nate Bell	Alternative listening session comment meeting
November 29	FS, Chamber of Commerce, Public	Briefing on Alternative listening session comment analysis
December 19	FS, FWS, TNC	Project meeting

Public and Partner Meetings		
Date	**Participants**	**Description**
2013		
January 22	FS, FWS, TNC	Project meeting
February 27	FS, TNC	Project meeting
March 26	FS, TNC, FWS	Project meeting
May 3	FS, ADEQ	Meeting on turbidity
June 12	FS,ADEQ,TNC,FWS	Field trip on turbidity/wet weather management
June 24	FS, FWS	Briefing on final alternatives and analysis
July 1	FS, FWS, USGS, TNC	Discussion on in-stream sediment sampling

Appendix B – Wet Weather Management Protocol

Wet Weather Management Plan for
The Wolf Pen Gap Trail Complex
February 2014

Purpose & Need: Off-Highway Vehicle (OHV) use in the Wolf Pen Gap Trail Complex has contributed to degraded soils, trails, and roads, and declining water quality resources, especially during periods of wet conditions when these impacts are exacerbated. This has created the need for increased maintenance, including re-design and/or re-location of roads or trails.

The purpose of a Wet Weather Management Plan (WWMP) is multi-fold: to protect native surfaced roads and trails during the wet periods when they are most susceptible to damage; to minimize soil erosion and its role as a source of sediment to streams; and to reduce hydrologic connectivity between trails and tributaries to minimize sediment delivery to streams. Such a plan will move the WPG trail system towards the goal of improved natural resource protection and trail sustainability, and contribute to the protection, preservation and enjoyment of our national forest for future generations.

The WWMP is designed as a supplemental document to the Wolf Pen Gap Environment Assessment (EA) and may also serve as a vehicle to help ensure that designated Best Management Practices (BMPs) designed for the trail system are effective. However, there is a separate monitoring protocol for BMPs.

Overview: The Wolf Pen Gap (WPG) OHV complex is a series of roads and trails that is open to mixed use of OHVs and highway-legal vehicles. The WWMP includes: measures to identify degraded road and trail surface tread and drainage structures and related detrimental impacts to water quality due to high volume and intensity of precipitation; and to limit OHV use during those periods where additional use would further contribute to resource damage. This plan employs a system in which the factors of precipitation, trail condition, and soil moisture are monitored and utilized to inform decisions on trail openings and closures.

Infrastructure: Two weather stations have been installed: one on High Point Peak (within the WPG OHV Complex – end of trail 300)) and the second at the Mena Ranger District Work Center. The weather station consists of a tipping bucket drainage, recorder and transmitter. The High Point unit provides a radio signal to the Mena Work Center (FS facility) where it is linked to a website. When activated by precipitation, either or both weather stations provide notification via email and phone text messaging to designated persons and can post information to the web.

Calibration: In order to determine when wet weather monitoring should begin, an initial threshold needed to be established. Beginning in October of 2011, portions of the trail system were observed within 24 hours of precipitation events and sediment and trail surface issues for various levels of precipitation were documented. For calibration purposes, two manual rain gauges were located on the east side of WPG (Road 243)

during the fall and winter months of 2011-2012. Comparing the manual gauges to the weather stations data would demonstrate if total precipitation values are consistent across the WPG area. It was found that precipitation values are reasonably consistent across the WPG area with an average difference of one-tenth to two-tenths of an inch over a four month period.

During the course of making field observations of the effects of rainfall volume and intensity on the trail system, several **Key Indicators** were noted:

- Failing cross-drains
- Presence of water on trail (puddling and flow/connectivity)
- Rutting on trail surface
- Degradation of rolling dip drainage structures
- Sediment basin mal-functions & at maximum capacity
- Potential turbidity downstream of trail crossings

Key Considerations

The preceding list of symptoms of wet weather and high soil/site moisture conditions require that monitoring on WPG be conducted in order to assess the effects of precipitation events on the trail system and to inform a management response which will ensure and enhance resource protection. From monitoring trail conditions following precipitation events in the fall/winter of 2011/2012, it was discovered that a rainfall amount of 0.4 inches within a 24-hour period resulted in some degraded condition in trail condition and water quality. While this is the point where damage first occurred in 2011-2012, it is understood that the effects of this amount and intensity of rainfall will not be the same for every season or even for every such event within the same season every year. However, during the late fall through winter months when soil moisture is higher this threshold can serve as an indicator to accelerate monitoring activities to assess trail conditions and its effects on water quality.

Some flexibility will be necessary for several reasons. First - some rainfall events could occur within a close proximity in time (back-to-back), so monitoring may be best implemented after all such events have ended. Second - over the past several years there have been numerous rainfall events of 0.4 inches in a 24-hour period per year in the WPG area, therefore it is important that monitoring activities capture as many of these events as possible. As more rainfall and soil moisture data is collected over time, this precipitation threshold will likely need to be adjusted to reflect the correlation between antecedent soil moisture and rainfall amounts and their impacts to trail condition and water quality. When this threshold is adjusted, the WWMP will be updated. It is initially recommended that monitoring be triggered by a rainfall event consisting of a minimum of 0.4 inches of rain in a 24-hour period. Since antecedent soil moisture is highest from early winter through late spring, it is most imperative that trail conditions be monitored as diligently as possible during this time. If monitoring is not completed in a timely manner, resource damage cannot be assessed promptly enough to initiate trail closings before damage is exacerbated and thus more costly and time-consuming to mitigate. Since soil moisture levels are typically lower during the mid- late summer months, the effects of high rainfall

intensity and volume during this period will be manifested through the detachment of accumulated dry/powdery soil from the trail surface and into the sediment basins. This "flush" of sediment into the basins will have a strong impact on their capacity and functionality afterwards. ***Note:*** *No monitoring should be done when weather conditions, trail surface and stream crossing conditions, or any other potential hazards on the trail system could compromise the safety of people. Decisions regarding safety and other contingencies which could prevent or delay monitoring will remain under the authority and at the discretion of the District Ranger.*

Using this information, the following procedure is recommended:

1. A precipitation event or series of events take place.
2. A text or email (and in the future web based notification) is initiated to all interested parties – this includes volunteers and/or Forest Service employees.
3. Forest Service employees and/or volunteers travel to monitoring sites***** on the trail (within 24 hours if possible) and assess site conditions. Monitoring procedures are followed as outlined on the following page. In addition to data collection, a date-stamped photo is taken. Per guidelines on page 6, if monitoring results are satisfactory, the trail remains open. If not, the trail or trail segment is closed.
4. Volunteers and/or Forest Service employees update the web page with openings and closings (using the OAC and Trail Blazer web sites if possible).
5. If trail conditions were inadequate, volunteers and/or Forest Service employees continue to document trail conditions until monitoring results show site conditions suitable for trail re-opening.
6. Volunteers and/or Forest Service employees update Web page as changes are needed.
7. Forest Service employees download precipitation data from weather station once a month.
8. Forest Service employees perform necessary non-technical maintenance to weather stations at Mena WC and at High Point Peak (WPG – Trail 300).

*** Note:** While in route to (and returning from) the monitoring sites, much can be learned about trail conditions. Therefore, making observations and taking note of any serious resource concerns along the way will likely prove very useful in the end.

Trail closures on maintained trails will likely be for a short duration of time when the precipitation is in the form of rainfall. However, when the precipitation event is snow or freezing rain, the trail running surface is very susceptible to damage, and the closure may persist until a prolonged thaw allows drying.

Other Mitigations: It is recognized that maintenance, reconstruction, and/or new trail construction may improve, remove, and/or replace many of the trail segments that exhibit poor surface conditions and/or water quality issues. With successful implementation (proper cross-drain construction and spacing, replacement of unimproved stream crossings, and hardening of crossing approaches), the monitoring locations can be adjusted to allow more flexibility. Thresholds may be adjusted as more rainfall and soil moisture data is collected and analyzed to reflect the correlation between the two. The

WWMP process and web page can also be used to identify trail segments closed for other reasons such as maintenance, safety, or other considerations.

For this project to be successful, key components must include:

- Clear communication of responsibilities and expectations
- Results documentation
- Proper training of volunteers
- Development of Web Page protocols
- Monitoring of trail conditions and effects on water quality
- Education of trail users
- Proper placement of signage on trails
- Designation of a person at the district level to coordinate all aspects of monitoring documentation, trail-related management, activities, education, and publicity.

Monitoring Procedures
(Trail Monitoring Locations are provided in Table 1)

Connectivity

- For Connectivity concerns at three designated points
    - Drive through the ponded water (4 to 6 MPH – normal trail speed)
    - In reverse, back through the puddle
    - Confirm whether or not the effects of the OHV tires push water through the puddle outlet and into the tributary
    - Record the results as well as other pertinent information on the form
    - Take a photo

Trail Drainage Structure Stability – For rolling dip condition and effect on sediment basin functionality.

After a precipitation event, if no recent OHV tracks are present:

1. Drive back & forth through the rolling dip (D1 thru D4) a minimum of seven (7) times
2. Observe positions D1 and D2 (*Figure 1*) on the rolling dip – and record conditions as follows:
    a. Good (G): D1 – no berm between dip and sediment basin or berm is in early stage of development, no puddling, trail out-slopes toward basin is very apparent; D1 & D2 – Little to no evidence of tread damage. If ruts are present, they are <2" deep.
    b. Marginal (M): D1 – berm present between dip and sediment basin, and impeding some water flow to basin (transitioning from "Good" to "Poor" - Figure 2), trail out-slope gradient toward basin is apparent but subtle; D2 - moderate evidence of tread damage. Most ruts are 2" to 4" deep with very slight berms and some evidence of puddling.*
    c. Poor (P) : D1 – berm present between dip and sediment basin , and impeding most or all water flow into basin (Figure 2), trail out-

slope toward basin is marginal or non-existent- or the trail is in-sloping away from basin; D2 - strong evidence of tread damage, ruts are greater than 4" deep with mostly large berms and strong evidence of puddling.*

3. Take soil moisture measurements at points D1 and D2. When rolling dips are in a compacted state, obtaining soil moisture readings from D2 may be difficult. Therefore, take the readings within the berms if any are present. If soil moisture conditions and soil compaction make use of the soil moisture meter difficult or impractical on all the points, then simply record the site as in good condition.
4. Record the results, and take a photo.

**See Figure 2*

Note: While sediment basins are not specified for assessment in these monitoring procedures, observing their condition at each location (and others while in route) would provide additional insight into the overall condition of these and other sites.

Figure 1.

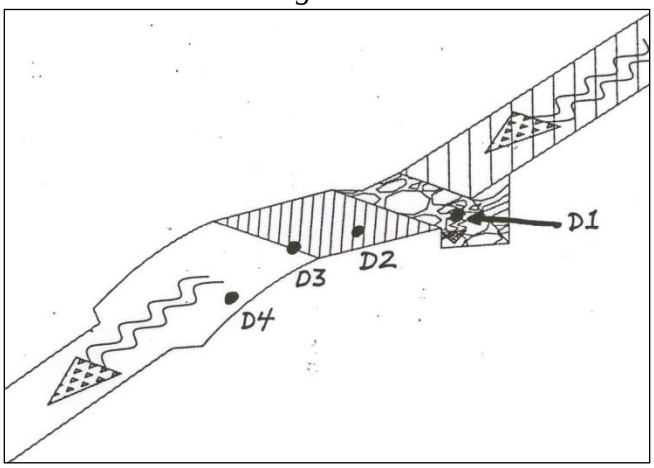
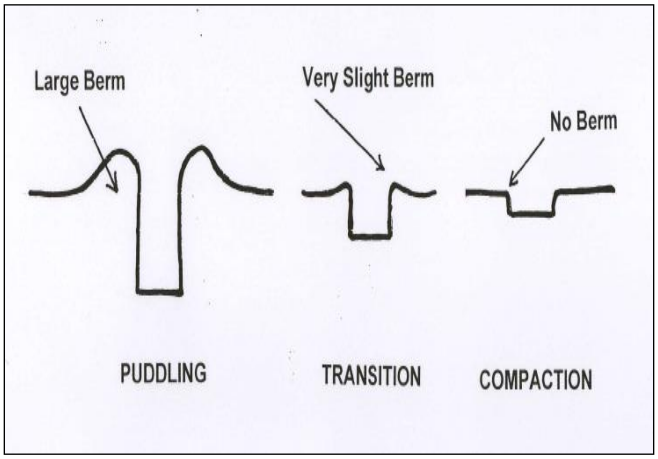


Figure 2.



Soil Moisture – For measuring soil moisture within drainage structures (where feasible), an electronic soil moisture meter will be used. This device measures the percentage of water per unit volume of soil (Volumetric Water Content).

Thresholds have been determined based on Field Capacity values for the two main general soil textures in WPG – loam (35%) and clay (50%) and allowing for higher compaction on drainage structures. Field capacity is essentially the water content of a soil at the point where gravity ceases to be a factor in soil water movement (i.e. excess water has drained away and the rate of downward movement has materially decreased). Above field capacity, an increase in soil water content will more readily advance to saturation level, at which point soil strength and (consequently) trail stability are at their lowest. Instructions and training on the operation of the soil moisture meter will be provided.

Closure determination

- Monitoring sites should be assessed within 24 hours of a precipitation event.
- Trail segments should be closed under the following conditions:
  (1) If more than one of the drainage structure assessments is "Poor."
  (2) If more than one of the sites has soil moisture percentages exceeding thirty-five percent (35 %) for loam soils or fifty percent (50%) for clayey soils.
  (3) If more than one of the connectivity points shows water flow into a tributary as a result of the splashing of water from the OHV crossing through.

If Closing is deemed necessary:

- Place a barrier (or close the gate) at one entrance and drive the trail to insure no one will become trapped. Place a barrier or close the gate on the other end of the trail.
- Trail segments closed will remain closed until noted rolling dips are repaired, all soil moisture values fall below the threshold levels, and trail/tributary connectivity recedes.

Adjustments

Monitoring sites are subject to changes in location and number based on future progress in trail maintenance, trail improvements, trail relocations, monitoring results, and data collection and analysis.

Records

- At the end of each of those months in which monitoring is conducted as a part of Wet Weather Management, a copy of the completed monitoring forms for each precipitation event(s) will need to be sent to the Forest Soil Scientist or Forest Hydrologist. This will help ensure consistency in information sharing and maintenance of records at all staff levels – and this should expedite and enhance the coordination of work and progress made by District and S.O. staff towards sufficient resource protection and trail improvement and sustainability.

Table 1 – Type and Locations of Monitoring

The following table lists ten monitoring sites on the Wolf Pen Gap trail system. These site numbers are labeled on maps which will be provided. Sites are subject to changes in location and number based on future progress in trail maintenance, trail improvements, trail re-locations, monitoring results, and data collection and analysis.

Monitoring Site	Trail/Road #	Resource Concern
1	3	Rolling Dip & Soil Moisture
2	313	Rolling Dip & Soil Moisture
3	313	Rolling Dip & Soil Moisture
4	6	Rolling Dip & Soil Moisture
5	6	Rolling Dip & Soil Moisture
6	8	Rolling Dip & Soil Moisture
7	8	Rolling Dip & Soil Moisture
8	243	Hydrologic Connectivity
9	243	Hydrologic Connectivity
10	243	Hydrologic Connectivity

Table 2 – Monitoring Log Template

Staff	Date	Trail Number	Point	Photo #	Site Type	Soil Moisture (%) (Woods or RD)	Rolling Dip (D1&D2) (Good, Marginal, Poor)	Hydro Connect (Yes or No)

Appendix C – TNC Monitoring Protocol

The Nature Conservancy
Arkansas Field Office
January, 2013

Background

Long-term monitoring conducted by the Ouachita National Forest shows impairment to Board Camp and Gap Creeks, two tributaries to the Ouachita River, related to sediment delivery from the Wolf Pen Gap trail system to adjacent streams. It is a priority for the Ouachita National Forest (ONF) and partners to immediately assess and efficiently address sedimentation within the Wolf Pen Gap (WPG) trail system and streams. The Ouachita National Forest is currently under informal consultation with the U.S. Fish and Wildlife Service regarding endangered species in the watershed and proposed a plan of action in 2011 to address these issues. The U.S. Forest Service (USFS) Trails Unlimited group also completed an in-depth diagnostic of the WPG - Off-Highway Vehicle (OHV) trails system in June 2011. They have since developed Best Management Practice (BMP) recommendations specific to the WPG trail system. Trails Unlimited (TU) completed heavy maintenance on approximately two miles of "Trail 6" with the aid of USFS district staff in February 2012 to serve as a demonstration of satisfactory trail restoration techniques. The Ouachita ATV Club (OAC) and Arkansas Trail Blazers have also donated significant time, money, and efforts toward a solution for the trails at WPG.

Due to limited available funding for assessment, maintenance and restoration of degraded trail systems such as these, it will take a series of collaborative efforts, grants and/or other private funding to accomplish these tasks. The project proposed below would pool resources and partnerships to implement monitoring and restoration objectives that align with the proposed action plan for Wolf Pen Gap. This collaborative effort to address the issues with WPG among stakeholders, including the ONF, TNC, TU, OAC, and landowners, will be a unique partnership that could be replicated in other forests with recreational ATV trails.

Proposed Work/Methodology

Sediment Trap Efficiency

The restoration work implemented by TU in 2012 involved installing a number of open-arch culverts, rolling dips, and sediment basins (referred to as "traps" in this document) for routing and containing sediment coming from the trail system. The ONF seeks to identify effective methods to monitor both the amount of sediment moving from the trail system into the sediment trap features as well as the timing and amount of sediment that over tops the traps in relation to specific rainfall events. The Nature Conservancy (TNC), upon request, has compiled information on relevant techniques for monitoring sediment trap retention. TNC proposes to collect the following metrics over a period of 18 months to analyze sediment trap efficiency, sediment amounts retained, and maintenance needs of the sediment traps: trap dimensions, total volume of sediment captured related to total rainfall and rate of rainfall during storm events, and site characteristics including those specified in the "Sediment Basin Site Risk Matrix" provided by the ONF.

Sediment Trap Selection Criteria

A total of approximately 20 sediment traps will be selected throughout the WPG complex to study. The selected sediment traps will have contributing trail segments that will span a range of slope classes; "low" (2-6%), "moderate" (6-15%), and "high" (>15%). Under the assumption that erosion rates start to increase significantly at higher gradients, TNC will select a slightly higher proportion of sediment traps in the 15%+ category. For example, if the target is 20 total traps, six traps will be selected within both the "low" and "moderate" categories and eight traps will be selected for study within the 15%+ category. To obtain an appropriate amount of traps within each slope category, approximately 40-50 traps will initially be randomly selected from the entire set. These traps will then be measured for contributing trail gradient and distance and categorized according to slope. If the targeted number of traps for each slope category are not obtained within the first sample, the above steps will be repeated to do so. A random selection within each slope category will then be selected until the desired number is reached for each slope class.

Sediment Accumulation Measurements /Trail Erosion Rate Estimations

To calculate existing dimensions for each sediment trap; length, width, and height of the basin will be measured in centimeters initially and at the end of the sampling period. The goal will be to establish a three-dimensional view of the existing basin dimensions with which to re-survey and compare following significant rainfall and runoff events. To calculate sediment depth following storm events, a minimum of 5 permanent survey pins will be installed in each trap flush to the ground, and additional pins if warranted by the shape of the trap (see Diagram below). These pins will establish a permanent elevation for each trap to insure both the accuracy of the sediment depths measured throughout the study period and to aid as a frame of reference for detecting erosion along the trap walls. Each pin will be installed at ground level and capped with a plastic cap. A benchmark, or reference point, will be established near each of the selected traps in a stable, undisturbed location to establish an arbitrary elevation. Elevation data of each of the pins will then be established through standard surveying techniques with elevations calculated to the hundredth of a foot. Sediment depth measurements will be taken either from the base of the pin, if found, or from the equivalent elevation established during site set-up. The total average volume of sediment accumulation will then be calculated and recorded along with the documented storm event information (precipitation and duration) from High Point Station within the Wolf Pen Gap trail system.

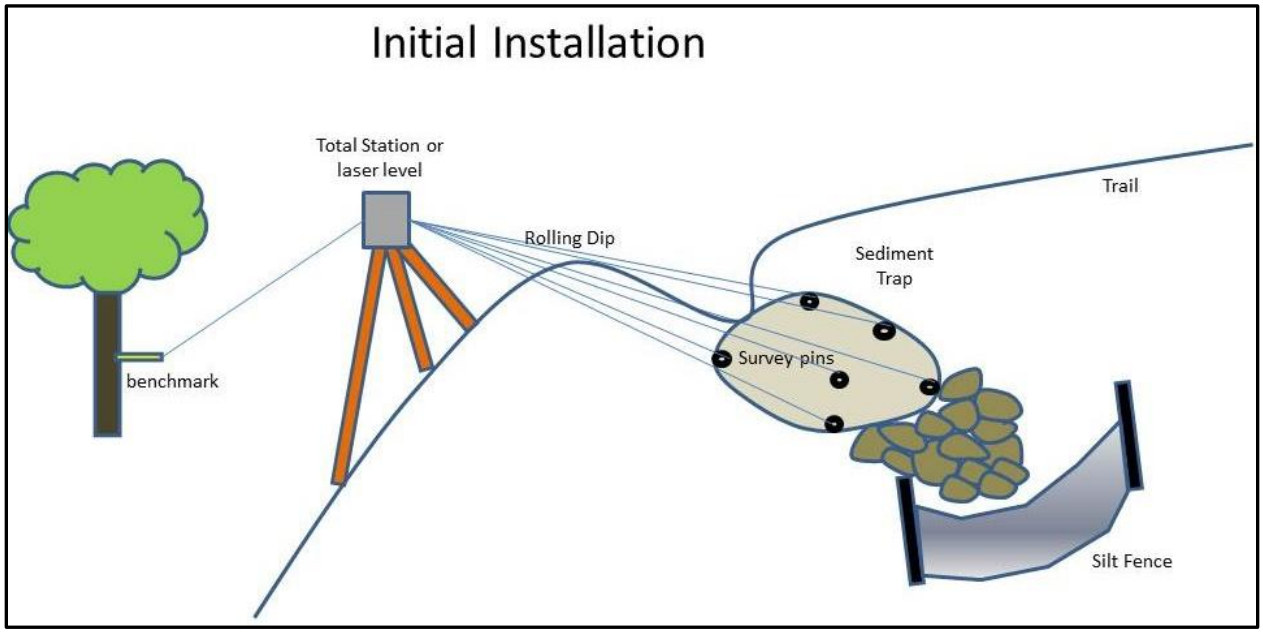


Figure 1. Diagram of Sediment Trap Monitoring Set up.

The selected sediment traps will preferably be cleaned out by the ONF Mena/Oden District prior to the start of the project and again if they fill such that trap efficiency has been compromised. This will be triggered when sediment accumulation in the silt fence indicates that overtopping sediment has occurred at three subsequent rain events and with increasing amounts measured. In the case where traps are cleaned out, sediment will be recycled and compacted back onto the trail to reinforce the water control features. Failure of any water control features, such as rolling dips, to divert all water into the sediment traps means in-accuracy in determining true erosion rates of the trail surface and will be documented. Documentation of any maintenance to the traps will also be made as measurements of the new trap dimensions and survey pins if necessary. Trail counters will be installed adjacent to the sediment traps selected for study to relate sediment generation to level of usage.

To monitor sediment trap efficiency and maintenance needs, a silt fence will be installed below the traps to document when and how much sediment escapes or overtops the trap following significant rain events (see sampling frequency below). TNC will also obtain at least one bulk density core sample from both the traps and the silt fences. These sample cores will be given to USFS research staff to analyze grain-size distribution and rock type distribution of surface grains in an effort to determine origins of the accumulated sediment (trail surface or adjacent banks to the trail).

Sampling Frequency

Initially, following individual site set-up, each trap will be measured following rain events of .40 inches or more over a 24 hour period OR .25 inches in 1 hour. Traps will be studied closely in the beginning of the study to determine if variables such as length of time between rain events and/or rate of rainfall indicate significant effects on erosion

rates. If this proves to be the case, triggers to measure the traps may be altered, but will always be documented. For example, if trap sediment depths are found to be low following the slower and smaller storm events (.40 - .75 inches/24 hours), focus may be emphasized on these events only if they occur at a faster rate (i.e. 1/4 inch or greater in 60 minutes), or if they occur following a long dry spell (2-3 months). A cursory look at the auto generated alerts from the WPG High Point Station in the last 15 months showed that more than 40 events occurred in the criteria described above (.40 inches or more in 24 hours or .25 inches in 1 hour) (pers. comm. Dan Marion, 1/10/2013). This was in a relatively dry year. Due to time and travel constraints, sampling frequency may be adjusted as described above to capture the most critical events.

Assessing In-stream Stability and Measuring Stream Bank Erosion Rates

TNC proposes to assess the geomorphic stability and measure stream bank erosion rates of key representative reaches of Board Camp and Gap Creeks. First, TNC will conduct a Bank Erosion Hazard Index (BEHI) analysis and estimate near bank shear stress (NBS) for Board Camp and Gap Creek stream banks from origin to confluence with the Ouachita River, utilizing the methodology described in Rosgen, 2001. Permanent erosion study sites will be selected that include a range of BEHI and NBS ratings and will reflect the channel conditions found throughout the drainage. A minimum of one, preferably two, reference reaches outside of the Board and Gap Creeks watersheds but within the Upper Ouachita watershed will also be surveyed for comparison purposes. The reference reach will act as the control or represent the least disturbed condition. Lateral erosion rates will be measured using bank profiles. Vertical stability will be assessed through monumented cross-sections in at least one riffle facet in each reach in addition to a longitudinal profile. Where gravel bed riffles are present throughout the reach, scour chains will be installed to determine the rate and magnitude of aggradation or degradation within the channel (see Figure 1, Appendix C). Bed material size distribution will be determined through reach and facet pebble counts. A stream channel stability analysis will be completed including characterization of the channel's current succession scenario. Following initial site set up and survey, predictions can be made for erosion rates based on erosion curves established for other watersheds, including curves from Colorado, Yellowstone, and North Carolina, and measured values from a variety of conditions within the West Fork of the White River in Arkansas, and Middle Fork Saline River in Arkansas. After 12-18 months of flows, TNC will re-survey each of the selected sites, including the selected reference reach, to determine if predicted values are validated or need to be adjusted based on measured values within each reach. All erosion data will be related to the nearest USGS gage site and categorized as a low, normal, or high flow year based on available gage data.

While current erosion rates will be determined through the above mentioned method, USFS research hydrology staff will be investigating various ways, including dendrochronological techniques, to model and/or estimate past erosion rates. The data produced by TNC will establish a baseline of existing conditions in the Wolf Pen Gap streams and can be utilized as a tool in the future to measure change in erosion rates, and relate the changes to the BMP installation, maintenance, and relocation work completed within the trail system. The monitoring methods described above will support the development of in-stream channel erosion rates by providing measured lateral erosion

and vertical aggradation or degradation values. These values would support the development of sediment models for the WPG area, an effort currently underway by research hydrology staff within the USFS.

Measuring Other BMP Effectiveness

Trail segments within Wolf Pen Gap include OHV only, mixed OHV & vehicle, and gated USFS access only trails. The majority of sediment traps installed are on OHV only trail segments and thus the majority of study sites described above will occur on these segments. It has been suggested to look at sediment captured within other BMP's that exist throughout the complex. TNC also proposes to study two sections of trail of the same slope categorization, both with sediment traps at the outlet of the segment, and determine erosion rate reduction from the installation of ¾" rock placed throughout the trail prism. Rock will be installed on only one of the two selected segments and the same measurement methods will be utilized as described above for measuring sediment accumulation within the sediment traps. These study segments will include the same methodology described above to estimate sediment retention in the traps in an effort to provide comparisons between segments with and without rock installation as a BMP.

Another suggestion, with the potential to include significant involvement from the local stakeholder groups and/or the local college, was to conduct either biannually or once every three years a "Critical Sites Analysis." This would include a trail-wide assessment looking specifically at variables such as connectivity of sediment from trails to streams and other site conditions matrix to continually update prioritization of BMP needs throughout the system. Current cost estimations could be tied to each required BMP to understand the ongoing maintenance costs of the system. A specific outcome of this work could be detailed photo monitoring at randomly selected sites within the Wolf Pen Gap Complex. These photo points could be randomly selected to repeat in future assessments with a very detailed protocol in an effort to visually tell the story of the progression of restoration and maintenance efforts within the trail system. TNC conducted a trail assessment in 2010 that included the above mentioned data. If determined useful, TNC will provide the protocol describing the assessment methodology conducted in 2010 including GPS location and photos of more than 216 photo monitoring point locations that could be randomly selected from to repeat in future assessments.

References

Rosgen, David L. 2001. A Practical Method of Computing Streambank Erosion Rate. Proceedings of the Seventh Federal Interagency Sedimentation Conference, Vol.2, pp. II – 9-15, March 25-29, 2001, Reno, NV.

Appendix D – Water Quality Monitoring by US Geological Survey

Collaborative Efforts to Collect Hydrologic Information: Wolf Pen Gap, Ouachita National Forest

Project Description

Background

The USDA Forest Service (FS) oversees over 35 miles of looped trails and roads in in the Wolf Pen Gap area of the Ouachita National Forest located in western Arkansas (fig 1). Each year, thousands all- terrain vehicle (ATV) riders enjoy the scenery and sometimes challenging terrain of the trail system. Additionally, local communities enjoy economic benefits associated with the out of town guests that travel to visit and ride the trail/road system. There are also numerous water sources within Wolf Pen Gap, some of which flow year round, that are tributaries to the Ouachita River, home to various species of endangered, threatened or otherwise "sensitive" mussel populations.

Providing data and information necessary to define and manage the Nation's water resources remains among the highest of USGS priorities. Of vital interest to the USGS are water-resource activities that support Federal, State, and/or local efforts to avoid degradation and to improve water quality and/or quantity in stream ecosystems in watersheds across the country. A related focus is to improve the availability and dissemination of water-quantity and quality information to all potential users.

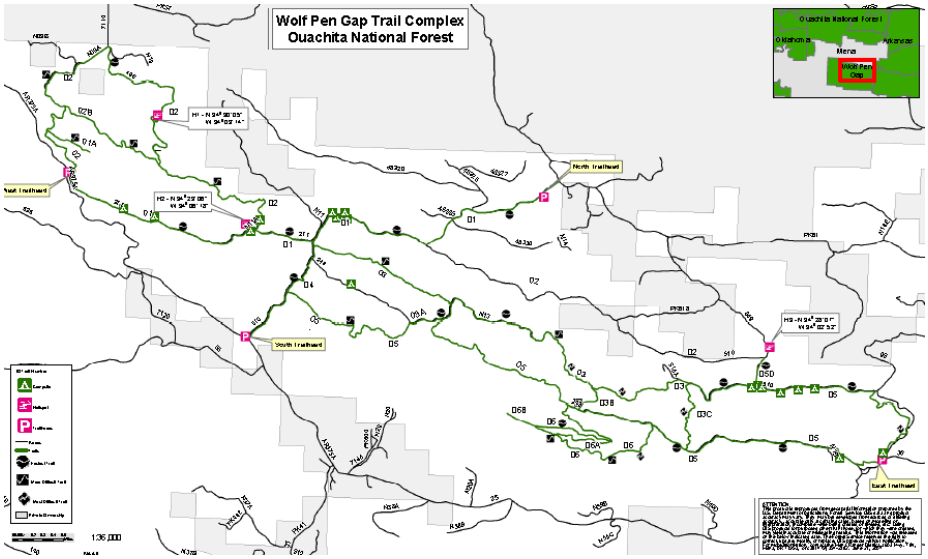


Figure 1. Map showing proposed monitoring area in the Wolf Pen Gap recreation area (provided by NFS).

Problem

The 35 mile system includes trails that are located upon highland areas as well as lowland areas near several miles of stream reaches along Gap Creek and Board Camp Creek. These streams are home to many species of fish and other aquatic species, and they are tributaries to the Ouachita River. The Ouachita River is home to several species of endangered, threatened or otherwise sensitive mussels. Because Ouachita National Forest managers desire to reduce the amount of sediment entering both of these streams, the FS is implementing an exhaustive set of Best Management Practices for motorized trails and a "wet weather management plan" designed to close road and trail segments when they are most vulnerable to damage. Currently, there is little information available to evaluate the effectiveness of these practices, and no baseline data concerning actual sedimentation. As a result, the FS is very interested in developing and implementing a monitoring plan which would allow them to evaluate the effectiveness of best management practices, trail relocations and other measures designed to reduce sedimentation.

Initializing a long-term monitoring plan for streamflow and sediment, which will provide data to determine sediment loads occurring in the streams, will provide the FS with the information necessary to better address road and trail maintenance, improve stream crossings, and restore stream banks, as well as help the FS develop a better understanding of how natural processes affect stream functions.

Objective and Scope

The FS is interested in monitoring water resources in the Wolf Pen Gap area of the Ouachita National Forest to provide data necessary to evaluate the effectiveness of best management practices to control sedimentation and streambank erosion on those water resources. The intent is to establish representative data collection sites and to collect appropriate data to understand current water resource conditions and to monitor any changes that may occur during and after the implementation of the best management practices. Data on water quantity and water quality will be collected at strategic stream locations within the Wolf Pen Gap area.

Approach

To monitor the effectiveness of best management practices on sedimentation and streambank erosion, three water-quality sampling, streamflow and precipitation sites are proposed within the Wolf Pen Gap area. One site will be located on Board Camp Creek below the confluence with Gap Creek, and two sites (one within the basin of each creek) will be located upstream of the confluence. Each site will consist of a shelter, data collection platform (DCP), pressure transducer or stilling well and float, an outside reference gage, precipitation gage, and an automatic sampler that is programmed to take samples at various streamflow intervals during high-flow events. All of the sites will measure and record streamflow stage (elevation), water temperature and precipitation at 15-minute intervals and transmit data via satellite once every hour (more frequent transmissions can occur when the streams are experiencing extreme high-flow conditions) to the USGS Arkansas Water Science Center in Little Rock where the data will be automatically downloaded into the USGS National Water Information System (NWIS) database. Discharge measurements (Rantz and others, 1982) will be made routinely and a stage-discharge relation (rating) will be developed and maintained for the downstream site. For the two upstream sites, cross sections will be surveyed and a flow model will be developed to establish a theoretical rating curve that will be used to calculate stream discharge. The rating curves for all sites will be

used by NWIS to compute instantaneous (for the downstream site) and daily discharge values. The stage, discharge, and temperature values will be displayed in near real-time fashion on the USGS Arkansas Water Science Center web page (http://ar.water.usgs.gov).

Each of these three sites will also collect unattended suspended-sediment samples through the use of single-point, automatic samplers (Edwards and Glysson, 1999; Wilde and others, 1999). The automatic samplers will be used to collect water during the rise, peak, and fall of the hydrograph during high-flow events. Each automatic sampler will be programmed and set to collect a water sample when prescribed conditions are met. Frequency of sampling during high-flow events will be flow-weighted, and will be based on volume passing the sampler. The suspended sediment, turbidity, and streamflow data can then be used to estimate suspended-sediment concentrations and annual loads in the streams.

To characterize the annual loads, high-flow samples, combined with quarterly base-flow samples, will be collected at each of the streamgaging stations. During high-flow sampling, the USGS will sample the rise, peak and fall of flow at each of the gaging stations. The samples collected at the downstream station will be collected isokinetically at equal-width increments of the stream (USGS, variously dated) to estimate concentrations representative of the entire cross section. All water samples collected during the storm event will be analyzed for turbidity and suspended sediment concentration. A total of four high-flow events and four quarterly samples (approximately one every three months) will be collected annually. Results from these samples, combined with the streamflow information, can later be used to evaluate potential water-quality changes as a result of best management practices in the NFS. Samples will be sent to the USGS Missouri Water Science Center sediment laboratory for analysis of sediment concentration.

The FS is interested in working collaboratively with the USGS to maintain the three stations. The FS intends to enter into an interagency agreement with the US Geological Survey (USGS-Little Rock) to deploy, maintain and collect and analyze water samples from three sediment samplers within or immediately downstream from the Wolf Pen Gap area. This sampling effort will be jointly sponsored by the Forest Service and USGS and is intended to be a long-term cooperative effort. All maintenance, sampling and sample analysis will be handled by USGS for at least the first 18 months to 2 years, after which time the agencies may modify the agreement (perhaps to co-locate an employee in Mena who has had the appropriate USGS training programs to maintain and operate these systems). Table 1 lists the costs associated with each task for one station. Specific details associated with each task also are listed in the table.

Table 1. Cost analysis by monitoring location and task for 2014 and 2015 FY.

	Details	Cost
1. Installation of three real-time transmitting streamflow gaging station (this is a one-time task). FY14.	All stations will be equipped with stage (water-level) sensing instruments that are accurate to within 0.01 foot, and for stations with an adequate location, rainfall tipping buckets that can measure as little as 0.01 inch of rainfall over a range of rainfall intensities will also be installed. Additionally, at the downstream location, a water temperature probe will be installed as well. Each station will record these data in 15-minute increments and transmit the data to the USGS office in Little Rock via satellite telemetry once every hour. The data will be stored in the USGS database and posted to the Arkansas Water Science Center's website. All equipment at the station will be housed in a sufficiently sized metal box that can withstand vandalism activities such as bullets fired from a hunting rifle	$39,600
1b. Installation of three automatic samplers (this is a one-time task). FY14.	All stations will be equipped with automatic samplers that will sample the streams when prescribed flow conditions are met. A total of four high-flow samples will be collected annually, with at least three samples occurring during each event (rise, peak and fall).	$15,800
2. Operation and maintenance of three real-time transmitting streamflow gaging stations. FY14 and FY15.	Streamflow will be measured at the stations during routine visits (at least 6 – 8 times per year for two years) by USGS and, when possible, NFS personnel and during a range of streamflow conditions (the downstream station will have high-flow measurements made; the two upstream stations will have a theoretical rating curve established). Established USGS standards and methods will be followed for streamflow measurements. A stage-discharge relation will be developed, modified, and maintained based upon streamflow measurement data collected at the stations. Streamflow will be computed and stored in the USGS database for each unit-value (15-minute reading) that was transmitted to the USGS office from the station. Should equipment at the station cease to work for any reason (vandalism, theft, natural disaster, etc.,) the USGS will replace all equipment at no cost to NFS.	$60,640
3. Storm event sampling. FY14 and FY15	Annually, four high-flow events, combined with quarterly base-flow samples, will be collected at each of the streamgaging stations. During high-flow sampling, the USGS will sample the rise, peak and fall of flow at each of the gaging stations. The samples collected at the downstream station will be collected isokinetically at equal-width increments of the stream using established USGS methods.	$42,000

Budget

The total estimated cost for the continuous-record streamflow gaging network over a 2-year period is $158,040. The USGS will provide the resources to install all of the streamflow gaging station components. The NFS will provide the funding necessary for the annual operation and maintenance of this monitoring program.

Funding Source	FY 2014	FY 2015	TOTAL*
USGS	$55,400	$0	$55,400
NFS	$51,320	$51,320	$102,640
TOTAL	$106,720	$51,320	$158,040

***Actual expenditures or value of contributions may change as specific elements of this monitoring effort are worked out in the field over the first 2-3 years. All dollar figures are estimates.**

References

Edwards, T.K, Glysson, G.D., 1999, Field methods for measurement of fluvial sediment: U.S. Geological Survey Techniques of Water-Resource Investigation, Book 3 Chapter C2.

Rantz, S.E, and others, 1982, Measurement and computation of streamflow: Volume 1. Measurement of stage and discharge and Volume 2. Computation of discharge: U.S. Geological Survey Water-Supply Paper 2175, 631 p.

U.S. Geological Survey, variously dated, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A9, available online at URL http://water.usgs.gov/owq/FieldManual/index.html

Appendix E – Maps

Maps are available online and will be sent if requested.