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Environmental Assessment

Transportation System and Related Recreation Management Actions for the Upper Tellico Off-Highway Vehicle System

Nantahala National Forest: Cherokee County, North Carolina

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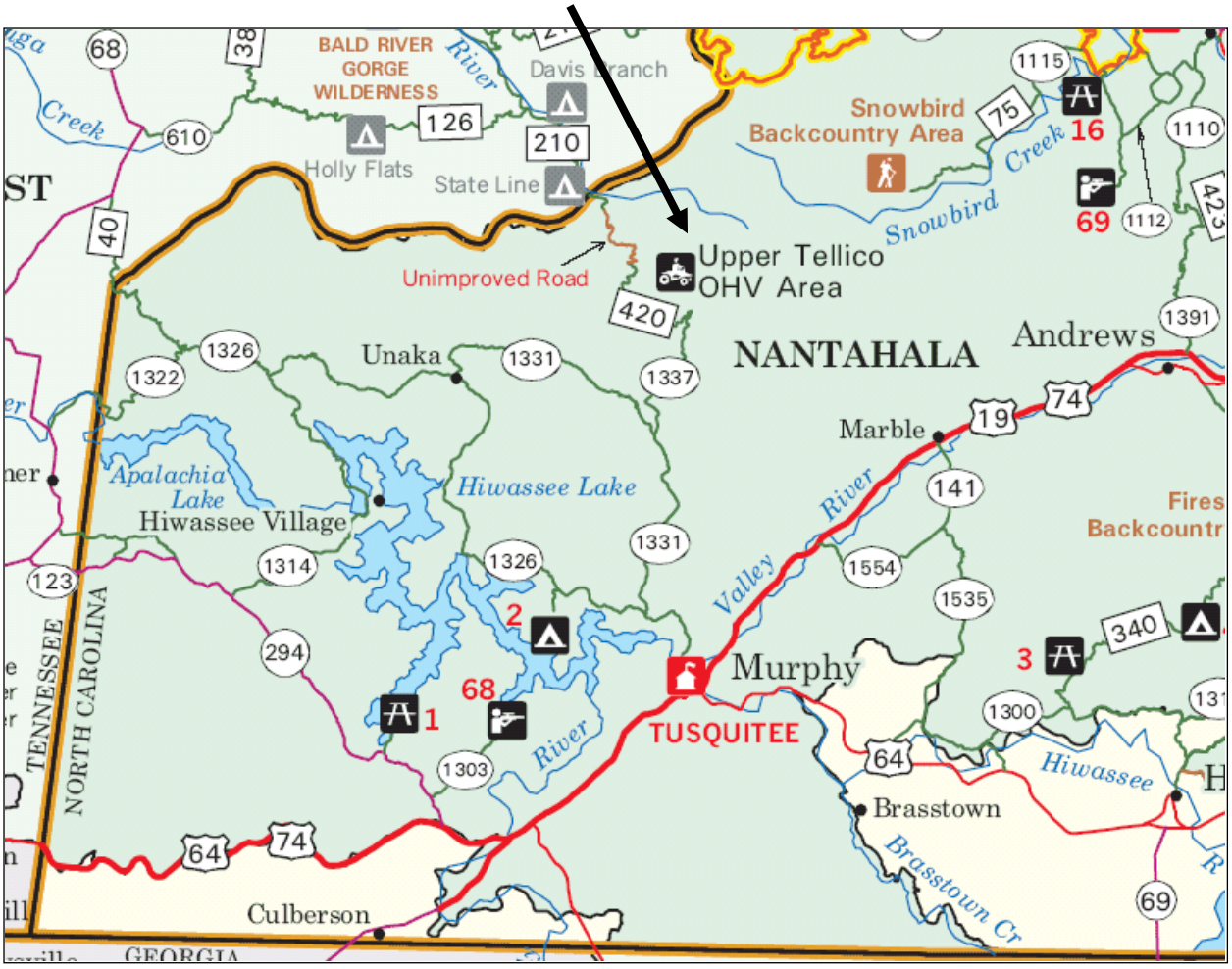
The Upper Tellico OHV System is located in Cherokee County, North Carolina near the Tennessee state line.



CHAPTER 1. PURPOSE AND NEED FOR ACTION

1.1 Purpose and Need

The Tusquitee Ranger District is proposing to implement a series of road and trail modifications and other management actions for the Upper Tellico Off-Highway Vehicle Road and Trail System (hereafter, the OHV system, or Tellico OHV System). The purpose would be to greatly reduce the amount of soil and other material leaving the road and trail system and entering the upper Tellico River and its tributaries and thereby improve the habitat for native brook trout. This outcome depends on three categories of activities: defining a system that can be maintained in the future without extraordinary maintenance costs; fixing existing problems with an initial intense period of heavy maintenance, reconstruction, and closures; and managing the conditions of future motorized use so as to reduce the potential for future soil loss.

Background

The Tellico OHV System is located in Cherokee County North Carolina, about 13 miles north of Murphy. The approximately 39.3 miles of existing roads and trails that comprise the OHV System are concentrated within an area approximately 8,000 acres in size. The area borders Monroe County, Tennessee, and the OHV System is accessible from both states. Most of the OHV System occurs within the upper Tellico River watershed. The Tellico River flows from its headwaters in Cherokee County, North Carolina through the area that encompasses the OHV System and on into Tennessee. The North Carolina Wildlife Resources Commission in 1991 classified the North Carolina segment of the Tellico River as "Wild Trout Waters." This section of the river contains self-sustaining wild trout populations, native brook trout in particular. The State classification was a factor that helped make the 5.8 miles of the Tellico River in North Carolina eligible and suitable for possible future inclusion in the National Wild and Scenic Rivers System as a Recreational River.

The OHV System was established May 1, 1986 with an amendment of the Off-Road Vehicle (ORV) Management Plan for the National Forests in North Carolina. At the time, analysis of the 58 miles of roads lying within the upper watershed found "user conflict, user safety conditions, and damage to natural and cultural resources are at an unacceptable level. In order to improve these conditions and to meet the minimum criteria established for ORV management by Forest Service policy:

1. The upper Tellico River area will be closed to ORV use unless signed open.
2. ORV use will be restricted to designated routes only."

The 1986 analysis called for using a range of 18-25 miles of the existing 58 miles of roads for ORV's

The analysis concluded that "It is within the Forest Supervisor's authority to close areas where motorized vehicle use is causing or is likely to cause considerable adverse effects. However, these changes should be sufficient to meet Forest Service policy and still allow user enjoyment of the area."

In resource surveys conducted in 2007 and 2008, it became clear that damage to natural and cultural resources was continuing. The Forest conducted an areawide Travel Analysis, concurrent with this OHV Trail System Analysis. In accordance with the Travel Management Rule (36 CFR 212, Subpart B), the travel analysis addresses the general and specific criteria for designating roads and trails in the upper Tellico watershed, including a wide range of resource and use considerations.

There is a need to stem the flow of sediment that is entering the upper Tellico River and its tributaries from the OHV System, and thereby improve habitat for native brook trout.

1) **Forest Plan standards for soil and water are being violated.**

- The Nantahala and Pisgah Land and Resource Management Plan (the Forest Plan or LRMP) standard for soil and water management states: "Prevent visible sediment from reaching perennial and intermittent stream channels…" (LRMP pg. III-40)
- Comprehensive field surveys conducted in 2007 and 2008 revealed 2003 sources of visible sediment along the 39-mile trail system. This is over 50 points of visible sediment for each mile of trail.
- One third of the 2003 sources of visible sediment are reaching the upper Tellico River and its tributaries. For each of these locations a path of soil particles could be seen and followed on the ground from an OHV trail to a waterbody in the stream system.
- Approximately 87% of the sources of visible sediment reaching the streams came from trail locations within 100 feet of a stream.
- Six miles of the system are within 100 feet of streams and one mile is within 25 feet of streams.

2) **Best management practices are currently failing.**

- Best management practices (BMPs) include 2000 trail drainage features- waterbars, broad-based dips, grade sags, ditches, cross drain culverts, outsloping, and sediment traps.
- Less than half of the trail drainage features are functioning properly.
- Poorly designed, located, and maintained drainage features coupled with excessive use has resulted in significantly deteriorated travel-ways to the point that regular road or trail BMPs are no longer adequate to protect trails from erosion and stream channels from sedimentation.

3) **BMPs are not sustainable due to heavy use, inadequate levels of maintenance, severely erosive soils and heavy rainfall.**

- The area receives greater than 80 inches of rainfall per year with the wettest period occurring during the winter months.
- All trails on the system are on soils classified as severe hazard by the Natural Resources Conservation Service (NRCS). A rating of severe indicates that

erosion of the trail is expected, the trail requires frequent maintenance, and costly erosion control measures are needed.

- The soil types in the watershed rate as *poorly suited* for using the natural soil surface for roads. Poorly suited ratings indicate that overcoming the risk of erosion would require special road designs, extra maintenance, and costly alteration.
- About 75,000 tons of soil has eroded from the existing trail system since the old logging transportation system was put in place, beginning many years before the Forest Service acquired the land.
- The effectiveness of the BMPs is continuously compromised due to the sheer number of sediment control features (2000) that must receive very frequent maintenance due to the highly erosive soils and heavy rainfall.
- It is virtually impossible to remove the water from deeply entrenched trail sections using standard road and trail engineering or drainage structures. Sections of the trail system are worn down to bedrock in spots, exposing springs that add to water flow and thus potential erosion. Several trail sections on the OHV System exhibit this deeply entrenched condition, making it difficult to manage the runoff without closure and rehabilitation.
- The trails are highly susceptible to damage from traffic during the winter months when the soils are moist and experience frequent freezing and thawing.

4) North Carolina standards for turbidity are being violated.

- In 1991, the North Carolina Wildlife Resources Commission classified the Tellico River as 'Wild Trout Waters'.
- The state of North Carolina's standard for turbidity states, "the turbidity in the receiving water shall not exceed…10 NTU in streams, lakes, or reservoirs designated as trout waters…Compliance with this turbidity standard can be met when land management activities employ BMPs…BMPs must be in full compliance with all specifications governing the proper design, installation, operation and maintenance of such BMPs."
- Turbidity measurements from the Tellico River have been recorded up to 370 NTU at the state line during storm events.
- During a run-off event occurring on March 4, 2008, the 10 NTU state standard was exceeded in virtually all surveyed streams.

5) Brook trout reproduction is being negatively affected.

- Improving "habitat of wild trout streams as a first priority" is a Forest Plan standard (LRMP III-185). All streams within the upper Tellico River watershed are suitable for brook trout.
- There are elevated fine sediment deposits in the Tellico River and its tributaries compared to nearby reference streams that are not impacted by the trail system . Brook trout spawning is reduced by increases in fine sediment deposits.
- Toxicity tests near three high challenge areas show elevated levels of petroleum products. Research has shown that these toxic substances, if in the streams, can inhibit reproduction and recruitment of fish populations.
- The Forest Service has no control over the effects of droughts, floods, geology, or acid deposition within the upper Tellico River watershed that may affect brook

trout. As land managers however, we can reduce the human induced sedimentation from the trail system and thus eliminate an environmental stressor and provide the highest likelihood of long-term persistence of brook trout within the watershed.

There is a need to have trail management be consistent with the Forest Plan.

1) Level of challenge is being exceeded.

- The Forest Plan direction for all OHV trails on the National Forests in North Carolina calls for providing "easy to moderate levels of challenge."
- Several trails on the Tellico OHV System provide a high degree of challenge and do not meet the Forest Plan direction.

2) Trail density is being exceeded.

- The Forest Plan direction calls for providing approximately two miles per square mile of OHV trails.
- The current system is over four miles per square mile.
- Either some trails should be closed to meet the existing trail density standard, or the Forest Plan would need to be amended to allow higher density for the Tellico OHV System.

There is a need to comply with the Travel Management Rule and corresponding Directives.

In 2005 a Travel Management Rule was promulgated that addresses the administration of motorized vehicle use and travel on National Forest System lands. On January 8, 2009, directives which provide specific direction on implementation of the Rule went into effect. While directing that the agency provide "a variety of trail opportunities, settings, and modes of travel consistent with the applicable land management plan", the directives also charge the agency with emphasizing long-term cost-effectiveness and need when developing or rehabilitating trails, and providing a trail system that is environmentally, socially and financially sustainable (FSM 2353.03).

The current trail system is not in compliance with the Forest Plan, and is not financially or environmentally sustainable in its current configuration. A Travel Analysis has been completed and is available on the Forest web site. The Travel Analysis addresses broad scale concerns in the upper Tellico watershed, and informs the travel management decision to be made on this project.

1.2 Proposed Action

The proposed action was developed to address the ongoing natural resource impacts of the Upper Tellico OHV System. The proposed action would:

- Reduce the trail system from its current 39.3 miles (all mileage figures throughout this document are approximate) to 24 miles;
- Implement seasonal and storm-event closures to reduce damage to the trail surfaces;

- Pave approximately one additional mile of Trail 1 (FSR 420-1) and reconstruct the remainder south to Allen Gap. It would remain an open through road but not be a part of the OHV System;
- Remove Trail 2 from the system and redesignate a portion as a system road for high clearance vehicles;
- Close Trails 9 and 12 completely;
- Leave Trails 3, 4, 5, 6, 7, 8, and 10 open at least in part;
- Leave Trails 10A and 11 on the system conditionally, to be re-evaluated in two years.
- Eliminate drive-in camping adjacent to the trail system to facilitate storm-event closures;
- Require 4-wheel OHVs to lock in 4-wheel drive (does not apply to Trail 1).

This proposed action would require amending standards in the Forest Plan that specify approximate trail densities and difficulty levels for this OHV System. See Chapter 2 for details.

Trail-by-trail details of findings from the condition surveys along with specific proposed actions for each trail based on these findings are in Appendix A. Photos related to the proposed action are located in the Graphics Supplement.

1.3 Public Involvement

A scoping letter describing the proposed action and soliciting comments was mailed and/or e-mailed in June of 2008 to individuals, organizations, and agencies that had previously expressed interest in Upper Tellico OHV System management, or who were on the Tusquitee District or Nantahala/Pisgah mailing lists. In addition, a news release was faxed to numerous media outlets. Notices appeared in the Asheville Citizen-Times on June 9, 2008 and the Cherokee Scout on June 11, 2008. On June 28, 2008 an open house was held in Murphy, North Carolina to provide additional information on the proposed action and the condition surveys, as well as resource information. This was also an opportunity for attendees to provide written comments, have their questions answered, and to contribute information to an economic impact survey being conducted by the University of Tennessee to assess the impacts of the OHV System on the local communities.

During the scoping period the Forest Service received almost 1500 comment letters, form letters, and/or e-mails. The comments were entered into a spreadsheet and organized by key phrases. The vast majority of responses to scoping were “form e-mails” that came through efforts of various special-interest organizations. Many of the individually generated responses contained helpful ideas and suggestions for ways to improve the OHV System and reduce sedimentation. The Interdisciplinary Team drew heavily on public comments received during scoping to identify issues and develop alternatives to the proposed action to address these issues. The effects of these alternatives are analyzed in Chapter 3 of this EA.

In February of 2009 a predecisional EA was distributed to interested parties for the 30-day Notice and Comment period as required by the Appeals Reform Act. A cover letter identified Alternative C (see Chapter 2 for details) as the preferred alternative. Over

2,000 individuals, organizations, or agencies submitted comments during this 30-day period. In response to these comments, two alternatives were modified and some additions, clarifications, and modifications were made to the EA.

1.4 Significant Issues Related to the Proposed Action

Issues serve to highlight effects or unintended consequences that may occur from a proposed action. Significant issues serve to drive the development of alternatives to the proposed action so that trade-offs become apparent to the public and the decision-maker. Eight significant issues were identified:

1. Concern that state water quality standards be met in managing the OHV System. The North Carolina Forest Practices Guidelines for Water Quality establish performance standards for the protection of water quality. These include:
    a. Streamside Management Zones sufficient to restrain accelerated erosion and prevent visible sediment from entering intermittent or perennial streams or perennial waterbodies;
    b. Minimizing stream crossings and constructing needed crossings and associated water control devices so as to: minimize the amount of sediment that enters the stream from the construction; not obstruct stream flow; restrain accelerated erosion and prevent visible sediment from entering intermittent or perennial streams or perennial waterbodies.

    While each action alternative is intended to meet state water quality standards, there are still questions as to their long term effectiveness.

    In response, each alternative will be evaluated in Chapter 3 based on the likelihood of restraining accelerated erosion and the amount of trail in close proximity to streams.

2. Concern that the proposed action still has OHV trails near streams and on sensitive soils and that these should be removed from the system to better protect the Tellico River and its tributaries from sediment. Reducing sediment inputs would improve habitat for native brook trout.

    In response, each alternative will be evaluated in Chapter 3 based on the amount of trail miles near streams and the amount on "severe hazard" soils. Impacts to trout habitat will also be discussed in the analysis of effects.

3. Concern that the OHV System should be closed until all the needed repairs are finished, in order to prevent additional accelerated erosion of the trails into the Tellico River and its tributaries and protect trout populations.

    In response, each alternative description will include whether or not the system remains open or closed during the repair period.

4. Concern that the proposed OHV System may not meet Forest Plan standards in regard to OHV trail density and challenge level.

All actions must comply with the Forest Plan or the Forest Plan must be amended. Each alternative either meets Forest Plan direction and standards, or a description of how the Forest Plan would be amended is included in the alternative description.

5. Concern that the proposed action reduces the amount of OHV opportunity and access to public lands for a variety of recreational uses, thereby reducing the ability of the public, especially families and people with less mobility, to enjoy the national forests.

   In response, each alternative will be evaluated in Chapter 3 based on the types of forest access available, and on the impacts to the recreational opportunity.

6. Concern that the proposed OHV System eliminates most of the very high challenge recreation opportunity that draws people to Upper Tellico.

   In response, each alternative will be evaluated in Chapter 3 based on how well it meets the desired experience of the OHV community.

7. Concern that the proposed upgrading of Trail 1 would eliminate access for non-highway-legal vehicles from the southern end of the system.

   Alternatives vary as to whether or not non-highway-legal OHVs (including ATVs) could access the trail system from the southern end. This information is included in the descriptions of the alternatives in Chapter 2.

8. Concern that the proposed storm-event closures and new camping restrictions would be burdensome on OHV trip planning, family experiences, and special event planning. Also, there are concerns as to how these might be implemented.

   Alternatives vary as to whether or not storm-event closures and/or additional camping restrictions are included. This information is included in the descriptions of the alternatives in Chapter 2.

1.5 Other Issues

Other issues are those that do not drive the development of alternatives to the proposed action but that may be addressed in the environmental effects analysis or may be outside the scope of the project.

1. Concern that the Forest Service should be building more trails, not closing trails.

   Response: The purpose and need for action is to reduce sediment coming from the existing system, not to provide more OHV opportunities.

2. Concern that the proposed action should be to study what the real sources of sedimentation are and what the real threats to the trout are.

   Response: Extensive studies have already identified that numerous sources of sediment ARE from the OHV System (See Condition Survey data available in

the project record). Also, threats to trout populations are well described in the scientific literature and sediment is recognized as a known threat.

3. Concern that the "no visible sediment" standard is unrealistic and should be changed.

   Response: This standard comes directly from State of North Carolina water quality guidelines, and Section 313 of the Clean Water Act directs Federal agencies to comply with State requirements.

4. Concern that the Forest Service should examine the cumulative effects on the OHV opportunity of the many closures across the region and the country.

   Response: The cumulative effects of the proposed action and alternatives are analyzed in the environmental assessment Chapter 3. This includes an analysis of cumulative effects to the OHV opportunity.

5. Concern that the proposed action will impact the local economy.

   Response: The environmental assessment contains an analysis of the economic impacts of the proposed action and alternatives.

6. Concern about the cost of the proposed action.

   Response: Costs associated with the proposed action and alternatives are displayed in an appendix to the environmental assessment.

7. Concern that a ban on fishing and/or fish stocking would more clearly address a threat to native trout populations than implementing the proposed action.

   Response: Such a ban would not address the purpose and need for the proposed action to reduce sediment entering the Tellico River and its tributaries.

CHAPTER 2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter presents a detailed description of the alternatives. These alternatives were developed by the interdisciplinary team in response to the purpose and need and the significant issues identified for this project.

2.1 Alternatives Considered in Detail

Maps depicting the alternatives are located in the Graphics Supplement.

2.1.1 Alternative A – No Action

Alternative A is the "No Action" alternative. The OHV System would remain as is, with 39.3 miles of trails, existing high challenge opportunities, current use restrictions, current fees, current levels of maintenance and monitoring.

ALTERNATIVE A: NO ACTION			
Trail #	**Trail Name**	**Existing Trail Miles**	**Challenge Area(s) on Trail?**
1	Tipton Creek	5.3	No
2	Tipton Knob	3.2	Yes
3	Bearpen	4.1	No
4	Fain Ford – Fain Ford Bridge construction would move forward (previous decision)	4.8	No
5	Tellico River	1.6	No
6	State Line Loop	2.2	No
7	Peckerwood Connector	0.5	Yes
8	Bob Creek (condemned bridges would be replaced)	5.8	No
9	Mistletoe Connector	0.7	Yes
10	Round Mountain (ATV only)	4.5	Yes
10A	Round Mountain Spur (ATV only)	2.7	No
11	Chestnut Mountain	2.7	Yes
12	Hawk Knob	1.2	Yes

2.1.2 Trail 1 Actions Common to Alternatives B through F-modified

All action alternatives propose improvements to Trail 1, including; paving approximately 4,860 feet from the Tipton Creek Bridge south to the lower Tipton Creek Crossing (refer to map *Proposed Improvements to Trail 1 for all action alternatives*). Additional improvements to Trail 1 include reconstruction of the existing travel way and road prism to accommodate culverts, turnouts and a crowned road cross section; removal and resetting of existing culverts; installation of additional culverts; reconstruction and realignment of the existing switchbacks; and ditch excavation.

All action alternatives also propose a change in the use of Trail 1. The entire 5.3 miles of Trail 1 would be closed to ATV traffic. In Alternatives B, C, D-modified, and E, Trail 1 would be open year-round to only highway-legal vehicles. In Alternative F-modified OHVs

would be allowed on Trail 1 as well (just no ATVs). Trail 1 (FSR 420-1) would no longer be considered part of the OHV System except in Alternative F-modified.

2.1.3 Alternative B – Proposed Action

Alternative B reduces the trail system from 39.3 miles to 24 miles. It:

- Reduces the number of challenge areas;
- Has a winter closure and storm-event closure;
- Restricts camping adjacent to the trail system;
- Requires 4WD vehicles to lock in 4WD.
- Requires Forest Plan amendment to modify the OHV density standard and the OHV trail difficulty level standard.
- Recommends an increase in user fees (amount unspecified).

A trail-by-trail description of Alternative B is shown in the table below. A more detailed trail by trail description is presented in Appendix A.

ALTERNATIVE B: PROPOSED ACTION			
Trail #	**Trail Name and Action**	**OHV Miles**	**Challenge Area(s) on Trail?**
1	Tipton Creek – Pave additional 4,860 ft. (approx.) from the intersection with FS 420 (see point "B" on map in Graphics Supplement), south to point "C" on map in Graphics Supplement; reconstruct remainder of road south to Allen Gap. Remove from the trail system; leave as open system road for through traffic of highway-legal vehicles.	0 (5.3 ROAD miles)	No
2	Tipton Knob – Remove from OHV System. Close and rehabilitate the Rock Garden segment. Remainder would be system road: closed in part and open in part.	0 (2.2 ROAD miles	No
3	Bearpen – Retain as part of OHV System.	4.1	No
4	Fain Ford – Most remains part of the OHV System. Fain Ford Bridge construction would move forward (previous decision)	3.9	No
5	Tellico River – Retain as part of the OHV System within a partial reroute.	1.7	No
6	State Line Loop – Retain as part of the OHV System.	2.2	No
6 To 5	New connector – to allow ATV access.	0.2	No
7	Peckerwood Connector – Retain with a reroute to eliminate the challenge area.	0.5	No
8	Bob Creek – Retain in part and close in part. Condemned bridges would be replaced.	5.0	No
9	Mistletoe Connector – Remove from the OHV System. Close and rehabilitate.	0	No
10	Round Mountain (ATV only) Retain southernmost segment. Close and rehabilitate remainder.	1	No
10A	Round Mountain Spur (ATV only) – Retain as open to ATV's. Reevaluate in two years.	2.7	No
11	Chestnut Mountain – Retain as part of OHV System, to be reevaluated after two years.	2.7	Yes
12	Hawk Knob – Remove from the OHV System. Close and rehabilitate.	0	No

The table below describes the plan amendment associated with Alternative B:

Current Forest Plan Language	New Forest Plan Language
Pg. III-11: a. Designate routes that will: - provide easy to moderate levels of challenge;…"	Pg. III-11: a. Designate routes that will: - provide **"various levels of challenge:"**
Pg. III-59: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit.	Pg. III-59: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit **except for the Upper Tellico OHV System, where densities may be higher.**
Pg. III-67: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit.	Pg. III-67: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit **except for the Upper Tellico OHV System, where densities may be higher.**

2.1.4 Alternative C – Preferred Alternative

Alternative C eliminates the OHV System but retains a residual road system of approximately 13.4 miles. This alternative was developed to achieve a very low level of risk of sedimentation from the trail system and low long-term maintenance costs. Trails would be either converted for other use or closed and rehabilitated. The area remains completely open for foot travel. In this alternative:

- Approximately 4,860' of Trail 1 would be paved and the entire length kept open as a through route for highway legal vehicles;
- Most of Trail 2, all of Trail 6, and parts of Trails 4, 5, and 7 become forest roads for various uses;
- Remaining portions of Trails 4 and 5, and Trail 6 would be open part of the year for public access;
- Requires a Forest Plan amendment to de-list Tellico as one of the OHV trail systems.

A trail by trail summary of this alternative is shown in the table below:

ALTERNATIVE C:			
Trail #	**Trail Name and Action**	**ROAD Miles**	**Challenge Areas on Trail as Proposed?**
1	Tipton Creek – Same as Alternative B.	5.3	NA
2	Tipton Knob – Same as Alternative B	2.2	Closed
3	Bearpen – Close and Rehabilitate (decommission). Remove culverts and bridges. Restore hydrology. Remove pressure treated material; leave native material. Seeding and mulching of bare soil. Minor recontouring to put fill slope back in road. Replant.	0	NA
4	Fain Ford – From intersection with Trail 1 to intersection with Trail 3 (2.63 miles), this portion would remain on the Forest Road System as a seasonally-open road available for	2.6	NA

	resource management and public access. The road would be open to public access for up to four months each year, September-December. Improve and maintain for high-clearance 4WD highway-legal vehicles. Cancel Fain Ford Bridge. Close and rehabilitate (decommission) remainder of road similar to Trail 3.		
5	Tellico River - Leave and fix portion through Rough Crossing Bridge (1.01 mile). Construct turn-around across bridge and leave this section available for motorized access, fishing access, and resource management access. Implement a winter seasonal closure. Eliminate fish passage barriers for this section. Close and rehabilitate (decommission) remainder of road similar to Trail 3.	1.0	NA
6 to 5 connector	New Connector would not be built	0	NA
6	State Line Loop - Right-of-way prevents closeout. Gate. Retain on the Forest Road System as a seasonally-open road (2.25 miles) available for resource management, private and public access. The road would be open to public access for up to four months each year, September-December. Improve and maintain for high-clearance 4WD highway-legal vehicles. Improve existing turnaround at intersection with Trail 7. Decommission (close and rehabilitate) parking area.	2.2	NA
7	Peckerwood Connector – A short section of 7 that connects Trail 6 to a closed road that provides access to private property would remain available to the private landowner. Gate. Minimally maintain and monitor. Close and rehabilitate (decommission) remainder of road similar to Trail 3.	0.1	Closed
8	Bob Creek – Close and rehabilitate (decommission). Remove culverts and bridges. Restore hydrology. Remove pressure treated material; leave native material. Seeding and mulch bare soil. Minor recontouring to put fill slope back in road. Replant.	0	NA
9	Mistletoe Connector - Same as Trail 8	0	Closed
10	Round Mountain – Same as Trail 8	0	Closed
10A	Round Mountain Spur – Same as Trail 8	0	NA
11	Chestnut Mountain – Same as Trail 8	0	Closed
12	Hawk Knob – Close and rehabilitate (decommission). Intensive recontouring and intensive planting.	0	Closed

The table below describes the plan amendment associated with Alternative C:

Current Forest Plan Language	**New Forest Plan Language**
Pg. III-11: General Direction #5. Provide recreational riding opportunities for use by vehicles commonly classified as off-road vehicles (ORV's) on designated routes within established ORV areas. This includes Upper Tellico, Brown Mountain, and Wayehutta. Permit no cross-country travel in Management Areas 1 through 18.	Pg. III-11: General Direction #5. Provide recreational riding opportunities for use by vehicles commonly classified as off-road vehicles (ORV's) on designated routes within established ORV areas. **This includes Brown Mountain and Wayehutta.** Permit no cross-country travel in Management Areas 1 through 18.

2.1.5 Alternative D-modified

Alternative D-modified eliminates the trail system, retains Trail 1 as a partly-paved open year-round through road (5.3 miles) and retains 21.8 miles of high clearance, highway-

legal native surfaced or graveled roads, seasonally closed in the winter. This alternative was developed to provide access for traditional uses of the area, April-December (9 months open). It incorporates proposals received from the public during the EA notice and comment period. Changes from Alternative B (the proposed actions) include:

- Closing Trails 10A and 11;
- Closing Trail 3 (Trail 3 was open in the original D)
- No Trail 6-5 Connector for ATV's (This connector was included in the original D)
- Eliminating all the challenge areas;
- Requiring the roads (except Trail 1) be closed until repairs are completed;

A trail by trail summary of this alternative is shown in the table below:

ALTERNATIVE D-modified:			
Trail #	**Trail Name and Action**	**Road Miles**	**Challenge Areas on Trail as Proposed?**
1	Tipton Creek – Same as Alternative B	5.3	No
2	Tipton Knob – Same as B	3.2	Closed
3	Bearpen –ELIMINATED	0	No
4	Fain Ford – Same as B	3.9	No
5	Tellico River –Same as B	1.7	No
6 to 5	New Connector - ELIMINATED	0	No
6	State Line Loop - Same as Alternative B	2.2	No
7	Peckerwood Connector - Same as Alternative B	0.5	Closed
8	Bob Creek - Same as Alternative B.	5.0	No
9	Mistletoe Connector - Same as Alternative B. Close and Rehabilitate (decommission).	0	Closed
10	Round Mountain - Close and Rehabilitate (decommission).	0	Closed
10A	Round Mountain Spur - Close and Rehabilitate (decommission).	0	No
11	Chestnut Mountain - Close and Rehabilitate (decommission).	0	Closed
12	Hawk Knob – Same as Alternative B. Close and Rehabilitate (decommission).	0	Closed

The table below describes the plan amendment associated with Alternative D-modified:

Current Forest Plan Language	**New Forest Plan Language**
Pg. III-11: General Direction #5. Provide recreational riding opportunities for use by vehicles commonly classified as off-road vehicles (ORV's) on designated routes within established ORV areas. This includes Upper Tellico, Brown Mountain, and Wayehutta. Permit no cross-country travel in Management Areas 1 through 18.	Pg. III-11: General Direction #5. Provide recreational riding opportunities for use by vehicles commonly classified as off-road vehicles (ORV's) on designated routes within established ORV areas. **This includes Brown Mountain and Wayehutta.** Permit no cross-country travel in Management Areas 1 through 18.

2.1.6 Alternative E

Alternative E reduces the trail system from 39.3 miles to 30.2 miles. It was developed to better meet the demand for OHV opportunities than does the Proposed Action, while still reducing sediment from the trail system. Change from Alternative B (the proposed action) include:

- Rerouting Trail 9 while retaining access to the challenge area (Slickrock);
- Constructing an additional challenge area on Trail 11;
- Reconstructing Trail 10 (including a partial reroute) for full-sized OHV use;
- Adding a new parking lot at the intersection of Trails 4 and 11 and reconstructing a piece of Trail 4 from its intersection with Trail 1 to this new parking lot (to provide OHV and ATV-UTV access from the southern end of the trail system);
- Eliminating the storm-event closure;
- Eliminating new camping restrictions;
- Eliminating 4WD lock-in.

A trail by trail summary of this alternative is shown in the table below:

ALTERNATIVE E:			
Trail #	**Trail Name and Action**	**OHV Miles**	**Challenge Areas on Trail as Proposed?**
1	Tipton Creek – Same as Alternative B	0	No
2	Tipton Knob – Same as Alternative B	0	Closed
3	Bearpen - Same as Alternative B	4.1	No
4	Fain Ford – All of Trail 4 is retained as part of the OHV System with heavy maintenance, minor realignments, and some reconstruction.	4.8	No
5	Tellico River - Same as Alternative B	1.7	No
6 to 5	New Connector - Same as Alternative B	.2	No
6	State Line Loop - Same as Alternative B	2.2	No
7	Peckerwood Connector - Same as Alternative B	0.5	Closed
8	Bob Creek - Same as Alternative B.	5.0	No
9	Mistletoe Connector – Reroute trail to retain access to Slickrock while allowing closeout and rehabilitation of existing deeply entrenched trail sections.	2.0	Yes
10	Round Mountain – Reroute north end of trail to avoid existing problem area. Design reroute to accommodate full-size OHVs. Reconstruct remainder of trail to accommodate full-size OHVs. Close and rehabilitate (decommission) that portion of the current trail that would be rerouted.	4.3	Closed
10A	Round Mountain Spur – Remains open with heavy, frequent maintenance.	2.7	No
11	Chestnut Mountain – Reconstruct to include an additional challenge area along the western part of the trail. [NOTE: This new challenge area is not shown on the map.]	2.7	Yes
12	Hawk Knob – Same as Alternative B. Close and Rehabilitate (decommission).	0	Closed

The table below describes the plan amendment associated with Alternative E:

Current Forest Plan Language	**New Forest Plan Language**
Pg. III-11: a. Designate routes that will: - provide easy to moderate levels of challenge;…"	Pg. III-11: a. Designate routes that will: - provide **"various levels of challenge:"**
Pg. III-59: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square	Pg. III-59: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per

mile in any management area unit.	square mile in any management area unit **except for the Upper Tellico OHV System, where densities may be higher.**
Pg. III-67: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit.	Pg. III-67: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit **except for the Upper Tellico OHV System, where densities may be higher.**

2.1.7 Alternative F-modified

In Alternative F-modified the miles of trail change from 39.5 to 44.5 and the alternative provides new trail opportunities for all types of OHVs. It was developed to provide a trail system with opportunities similar to what they are today, but with repairs, relocations, and with new or replacement construction to alleviate sedimentation concerns. It incorporates proposals received from the public during the EA notice and comment period. Changes from Alternative B (the proposed action) include:

- Allowing mixed-use on Trail 1;
- Retaining Trail 2 and building bypasses around Rock Garden and Tipton Knob. This was not in the original Alternative F;
- Retaining Trail 9;
- Reconstructing 1.0 mile of Trail 10 (including a partial reroute) for full-sized OHV use and decommissioning the remainder. The original Alternative F reconstructed ALL of Trail 10 for full-sized OHVs;
- Retaining most of Trail 12, closing the challenge area (Schoolbus Hill) and constructing a reroute down to Trail 4. This was not in the original Alternative F;
- Constructing 7.3 miles of new trail for full-sized OHVs(all of Trail 13). The original Alternative F allowed only ATVs on Trail 13.
- Eliminating the storm-event closure;
- Eliminating additional camping restrictions;
- Eliminating 4WD lock-in.

A trail by trail summary of this alternative is shown in the table below:

ALTERNATIVE F-modified:			
Trail #	**Trail Name and Action**	**OHV Miles**	**Challenge Areas on Trail as Proposed?**
1	Tipton Creek – Same as B but allow mixed use (not ATVs)	5.3	No
2	Tipton Knob – Maintain with large drainage control features and water rechannelization- construct bypasses	3.2 + 0.25	Yes
3	Bearpen - Same as Alternative B	4.1	No
4	Fain Ford – Same as Alternative B	4.8	No
5	Tellico River – Same as Alternative B	1.7	No
6 to 5	New Connector - eliminated	0	No
6	State Line Loop - Same as Alternative B	2.2	No
7	Peckerwood Connector - Same as Alternative B	0.5	Closed
8	Bob Creek - Same as in Alternative B	5.0	No
9	Mistletoe Connector – reroute trail to include access to Slick Rock	2.0	Yes

10	Round Mountain – Leave open that portion that connects Trail 3 to Trail 10A, close the remainder	1.2	No
10A	Round Mountain Spur – Same as Alternative E	2.7	No
11	Chestnut Mountain – Maintain	2.7	Yes
12	Hawk Knob – Leave open that portion above the challenge area and construct a new reroute to connect with Trail 4.	1.5	Closed
13	New OHV Trail	7.3	No

The table below describes the plan amendment associated with Alternative F:

Current Forest Plan Language	**New Forest Plan Language**
Pg. III-11: a. Designate routes that will: - provide easy to moderate levels of challenge;…"	Pg. III-11: a. Designate routes that will: - provide **"various levels of challenge:"**
Pg. III-59: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit.	Pg. III-59: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit **except for the Upper Tellico OHV System, where densities may be higher.**
Pg. III-67: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit.	Pg. III-67: 2. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit **except for the Upper Tellico OHV System, where densities may be higher.**

2.1.8 Additional Actions:

The following actions would be included as appropriate as part of whatever alternative is selected:

1. All standards and guides for the protection of the Indiana bat, as listed in Amendment 10 of the LRMP, would be followed. No suitable snags would be cut between April 15 and October 15.

2. Impacts to all sites eligible for listing in the National Register of Historic Places will be mitigated through data recovery (excavation).

3. There would be no in-stream construction during the trout-spawning season (October 15 – April 15) to protect trout eggs and larvae while they are within the gravel.

2.2 Alternatives Considered but not Analyzed in Detail

1. **The "Add Trails/Rotate Trails" Alternative.** This general concept was proposed by several individuals who submitted comments during the 30-day Notice and Comment period. Such an alternative would either re-open some of the old historic logging roads and trails that were closed after Forest Service acquisition or build new trails within the

area. These would either replace the high-sediment producing trails on the current system, and/or be used to establish a trail rotation where some trails would be closed and some open. The idea would be to allow some trails to rest for one or several years, thereby reducing wear and tear overall. The ID Team has seen no indication that the historic roads and trails that were closed were in better locations or on less hazardous soils than the current trails. Since actual rehabilitation and revegetation of closed trails would be impractical given the intent to reopen, the resting trails would continue to be sediment producers. This could increase the number of sediment sources, which would not support the purpose and need for the project. Therefore this alternative was not analyzed in detail.

2. **The Caliber Alternative.** This alternative would:

   - Retain Trails 2,3, 4, 5, 6, 7, 8, 9, 10A, 11, and 12 with some reroutes and bypasses, and 1 mile of Trail 10;
   - Add Trail 13 as proposed in Alternative F in the EA but construct it for full-sized OHVs;
   - Retain all existing challenge areas and construct bypasses around them;
   - Include a seasonal winter closure;
   - Require a Forest Plan amendment.

   Many pieces of this alternative were already included in alternatives considered in the Predecisional EA, and some additional pieces were added to Alternative F-modified in the final EA; in particular, retaining Trail 2 including the Rock Garden, a reroute of Trail 12, and constructing Trail 13 for full-sized OHVs. The School Bus challenge area on Trail 12 is not included due the many issues associated with the deeply entrenched section leading to the challenge area. The Peckerwood Ledge challenge area on Trail 7 is also not included in Alternative F-modified due to it being in such a state that few OHVs even attempt to traverse it. Additional details regarding this alternative are in the project record.

3. **The BDX Alternative.** This alternative was presented by an interested party as combining some elements of Alternative B and D in the predecisional EA with some additional ideas. This proposal also included a number of specific construction details. It would:
   - Reduce the "active" miles of trail to 21.4 miles for the first five years;
   - Rest Trails 2, 7, 10, 10A and 12 for five years; and reduce the number of high challenge areas;
   - Require 4x4 lock-in, licensed vehicles only (first five years), camping restrictions, and winter closures;
   - Over time, reevaluate and rotate 5 mile closed trail into service, and five miles open trail out of service;
   - Require amendment to the Forest Plan.

   Many elements of this alternative are within the range of alternatives already considered in detail. Some specifics not included in existing alternatives:
   - Reconstruction of a portion of Trail 8 proposed for closing in Alternatives B through F;
   - Non-traditional stream crossing methodologies on Trails 4 and 8;

- The concept of "resting" certain trails for five years.

As previously stated, resting a trail without being able to actually close and rehabilitate would not have the same effectiveness in reducing accelerated erosion, although we anticipate some reduction would occur. Also, the stream crossing methodologies suggested would likely not comply with Forest policy regarding crossings on open roads and Forest Service fish passage requirements. Given that many other elements are already within the range of alternatives analyzed in detail and could be combined in a decision, we did not analyze Alternative BDX in detail as a separate alternative.

Additional details of this alternative are in the project record.

4. **The Response #2247 Alternative.** This alternative was presented by an interested party as focusing on a less challenging trail system for ATVs, UTVs, and high-clearance highway-legal vehicles. It would:

   - Close Trails 7, 9, 11, and 12, upper and lower Trail 2 (this essentially closes all the high challenge areas);
   - Construct an ATV lane on Trail 1;
   - Construct some connectors for more ATV loops;
   - Construct the Fain Ford Bridge.

   Additional details regarding this alternative are in the project record.

   Some elements of this alternative are incorporated in Alternative D-modified in the final EA. However the ATV lane as proposed would not be appropriate for ATV use due to safety considerations, which throws ATV access to the system into question. In Alternative D-modified motorized use is limited to highway-legal vehicles, thus circumventing the ATV access issue. Rather than analyzing this alternative in detail as presented, we have incorporated elements into Alternative D-modified.

5. **The Trails Unlimited Alternative.** Three members of an internal USDA Forest Service enterprise team reviewed the Upper Tellico OHV System over the course of two days in January, 2007. Trails 7 and 12 were not reviewed. Many public comments asked why we did not use the recommendations from this report. In response, the following recommendations were considered for an alternative:
   - Relocate 1.2 miles of trail;
   - Heavy reconstruction on 5.7 miles of trail;
   - Establish "bailout" routes adjacent to extreme rock crawl sections;
   - Applying revised maintenance techniques on 24.8 miles;
   - Construction of a "monolithic concrete and boulder structure" to hydrologically isolate the Rock Garden;
   - "Barriers" placed to restrict widening of routes (large boulders and logs, for example);
   - Five unspecified "large projects" to provide stability and increase sustainability for the extreme rock crawling routes.

   This alternative represents recommendations made after a short field inspection and with little data collection as opposed to the month-long condition survey conducted by

multiple teams of local Forest Service personnel. Trails Unlimited reviewers did not look at Trails 12 and 7, and did not have the benefit of the more extensive information available to the ID Team when the range of alternatives was developed. The suggestions presented by Trails Unlimited for restricting the widening of routes do not appear practical given the logistical difficulties that would be involved in building and/or placing massive barriers to prevent trail widening over extensive lengths of trails, much less be safe and effective over a long period of time. The suggestion to establish bailout routes would not be practical in many cases due to terrain features. Bypasses for some extreme rock crawling areas (high challenge areas) are included in Alternative F-modified. Due to the lack of detail in the recommendations and impracticality of some suggestions this alternative was not analyzed in detail.

2.3 Comparison of the Alternatives Analyzed in Detail

Table 2.3.1 on the following two pages provides a comparison of actions by alternative.

Table 2.3.1. Actions by Alternative

Trail #	Alternative A	Alternative B	Alternative C	Alternative D-modified	Alternative E	Alternative F-modified
Road. Miles	**39.3**	**24.6**	**13.3**	**21.8**	**34.8**	**44.5**
OHV Trail Miles	**39.3**	**24.0**	**0**	**0**	**30.2**	**44.5**
1	5.3 mi road/trail no change	5.3 mi. open road highway-legals only	5.3 mi. open road highway-legals only	5.3 mi. open road	5.3 mi. open road highway-legals only	5.3 mi. mixed use road - OHVs (no ATVs)
2	3.2 mi. road/trail no change	0.8 mi open road, 1.4 mi. closed road for pvt access	0.8 mi open road, 1.4 mi. closed road for pvt access	0.8 mi open road, 1.4 mi. closed road for pvt access	0.8 mi open road, 1.4 mi. closed road for private access	3.2 mi. road/trail + 0.25 bypass – Maintain trail, add new bypass at Upper 2 ledge
3	4.1 mi. road/trail no change	4.1 mi. road/trail no change	0 mi. trail decommission	4.1 mi. open road/ winter closure	4.1 mi. road/trail no change	4.1 mi. road/trail no change
4	4.8 mi. road/trail no change	3.9 mi road/trail-partial closure	0 mi. trail, 2.6 mi.road open seasonally (decommission remainder)	3.9 mi open road/partial closure/ winter closure	4.8 mi. road/trail improve southern end from Trail 1 to a new parking lot at intersection with 11	4.8 mi. road/trail
5	1.6 mi. road/trail no change	1.7 mi. road/trail partial reroute	0 mi. trail, 1.0 miles road open	1.7 mi. open road/partial reroute/ winter closure	1.7 mi. road/trail partial reroute	1.7 mi. road/trail partial reroute
6-5 connector	n.a.	0.2 ATV trail construct	n.a.	n.a.	0.2 ATV trail construct	n.a.
6	2.2 mi road/trail no change	2.2 mi. road/trail heavy maintenance	0 mi. trail, 2.2 mi. road open seasonally-heavy maintenance	2.2 mi. open road/ winter closure	2.2 mi. road/trail heavy maintenance	2.2 mi. road/trail heavy maintenance
7	0.5 mi. road/trail no change	0.5 mi. road/trail partial closure & reroute	0 mi. trail/ 0.1 mi closed road for pvt access (decommission remainder)	0.5 mi. open road/ partial closure/ reroute/winter closure	0.5 mi. road/trail partial closure & reroute	0.5 mi. road/trail partial closure & reroute
8	5.8 mi road/trail no change	5.0 mi. road/trail reconstruction/ partial closure	0 mi. decommission	5.0 mi. open road/ partial closure/winter closure	5.0 mi. road/trail reconstruction/ partial closure	5.0 mi. road/trail reconstruction

Trail #	Alternative A	Alternative B	Alternative C	Alternative D-modified	Alternative E	Alternative F-modified
Road. Miles	**39.3**	**24.6**	**13.3**	**21.8**	**34.8**	**44.5**
OHV Trail Miles	**39.3**	**24.0**	**0**	**0**	**30.2**	**44.5**
9	0.7 mi. road/trail no change	0 mi. decommission	0 mi. decommission	0 mi. decommission	2.0 mi. road/trail reroute	2.0 mi. road/trail reroute
10	4.5 mi ATV trail no change	1.0 mi. ATV trail partial closure	0 mi. decommission	0 mi. decommission	4.3 mi. road/trail reroute/reconstruct	1.2 mi. road/trail/reconstruct/partial closure
10A	2.7 mi. ATV trail no change	2.7 mi. ATV trail no change	0 mi. decommission	0 mi. decommission	2.7 mi. ATV trail no change	2.7 mi. ATV trail no change
11	2.7 mi. road/trail no change	2.7 mi. road/trail construct bypasses	0 mi. decommission	0 mi. decommission	2.7 mi. road/trail reconstruct/add challenge area	2.7 mi. road/trail
12	1.2 mi. road/trail no change	0 mi. decommission	0 mi. decommission	0 mi. decommission	0 mi. decommission	1.5 mi. road/trail/reroute to eliminate challenge area
13	n.a.	n.a.	n.a.	n.a.	n.a.	7.3 mi road/trail new construction
Seasonal closure	No	Yes (except Trail 1)	Yes (except Trail 1)	Yes (except Trail 1)	Yes (except Trail 1)	Yes (except Trail 1)
Storm-event closure	No	Yes	n.a.	Yes	No	No
New camping restrictions	No	Yes	No	Yes	No	No
4WD lock-in	No	Yes	n.a.	n.a.	No	No
Plan Amendment	n.a.	Yes	Yes	Yes	Yes	Yes

In the table below, those alternatives that best address each significant issue are displayed to the right, while those that address the issue less or not at all are on the left.

Table 2.3.2. Relative Ranking of How Well the Alternatives Address the Significant Issues

1. Concern about meeting State water quality standards – Likelihood of effectiveness in meeting the standards.					
Alt. A →	→ Alt. F-m	→ Alt. E →	→ Alt. B →	→ Alt. D-m	→→ Alt. C
Less likely →→→→

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Chapter 3 describes the environmental components of the area that would be affected by the alternatives under consideration. It provides the analytical basis for comparison of the alternatives, and describes direct, indirect, and cumulative impacts of the alternatives. Chapter 3 is organized around each potentially affected resource.

3.1 Soil and Water

3.1.1 AFFECTED ENVIRONMENT

Almost all of the Upper Tellico OHV System is within the 6,848 acre upper Tellico River drainage, a sixth level sub-watershed (Hydrologic Unit Code: 06010204030010). It is located approximately 22 miles east of Tellico Plains, Tennessee and 13 miles northwest of Murphy, North Carolina in the Blue Ridge Mountains, Southern Metasedimentary Mountain Eco-region. The analysis area lies in the North Carolina portion of the Tellico River watershed which flows west into Tennessee in the Little Tennessee River Basin. Elevation in the area ranges from 4,979 feet on Grassy Top Mountain to 2,500 feet on the Tellico River at the North Carolina-Tennessee state line.

According to the NOAA (National Oceanic and Atmospheric Administration) weather station at Andrews, NC, the area has an average annual temperature of 55.7 degrees Fahrenheit. January is usually the coldest month with an average temperature of 37.0 degrees Fahrenheit, while July is usually the hottest month with an average temperature of 73.8 degrees Fahrenheit. The Andrews area averages about 66 inches of precipitation annually, while the Upper Tellico area receives on average greater than 80 inches per year (USDA-NRCS 1997), with the wettest period occurring in the months of December to March (Figure 3.1.1.1). Prevailing winds and rainfall in western North Carolina are predominantly from the southwest.

Streams in the area include the Tellico River, and its tributaries of Round Mountain Branch, Bob Creek, Mistletoe Creek, Peckerwood Creek, Bearpen Branch, Jenks Branch, Tipton Creek, and numerous, smaller unnamed streams. Small first order streams, springs, and seeps are common because of shallow depths to bedrock.

While most of the OHV trails are in the upper Tellico River drainage, sections of Trail 1 (from Allen Gap to Harshaw Gap) and Trail 2 are located in the headwaters of the Davis Creek drainage. This drainage flows into Hanging Dog Creek within the Hiwassee River Basin. Trail 1 crosses several streams in this drainage while Trail 2 is at a high elevation in the drainage with no stream crossings.

A high percentage (> 70 %) of the watershed is currently in public ownership (Nantahala National Forest), however the area has had many historical landowners, including private timber companies.

Between 1950 and 1969, before Forest Service acquisition, extensive ground-based logging with skidders took place in the area, requiring construction of numerous roads and skid trails.

Many of the roads and skid trails were located near streams, had steep grades and little drainage control, and were poorly located on the contour. Compared to current North Carolina industry practices these routes would have never been constructed. As these roads were abandoned, some restored naturally to a stable condition, while others were never completely closed or decommissioned, and continued to be used by four-wheel drive vehicles. Due to the location, grade, soil type, concentrated flow and erosion over extended periods of time, many roads became deeply rutted and eroded leaving a permanent scar on the landscape. After the bulk of the land became part of the National Forest System in the early 1980's, numerous trails were closed while those remaining open became an official OHV trail system. Private inholdings remained in the headwaters of Peckerwood Creek and Tellico River, and on Tipton Creek. Since then funds for maintenance and improvements have been limited and the popularity of the area has grown. This resulted in a steady decline in trail conditions. With the increased public interest in off road vehicle use of high-powered vehicles, designed to negotiate steep and rugged terrain, use continued on otherwise impassable trails and surface erosion continued to increase.

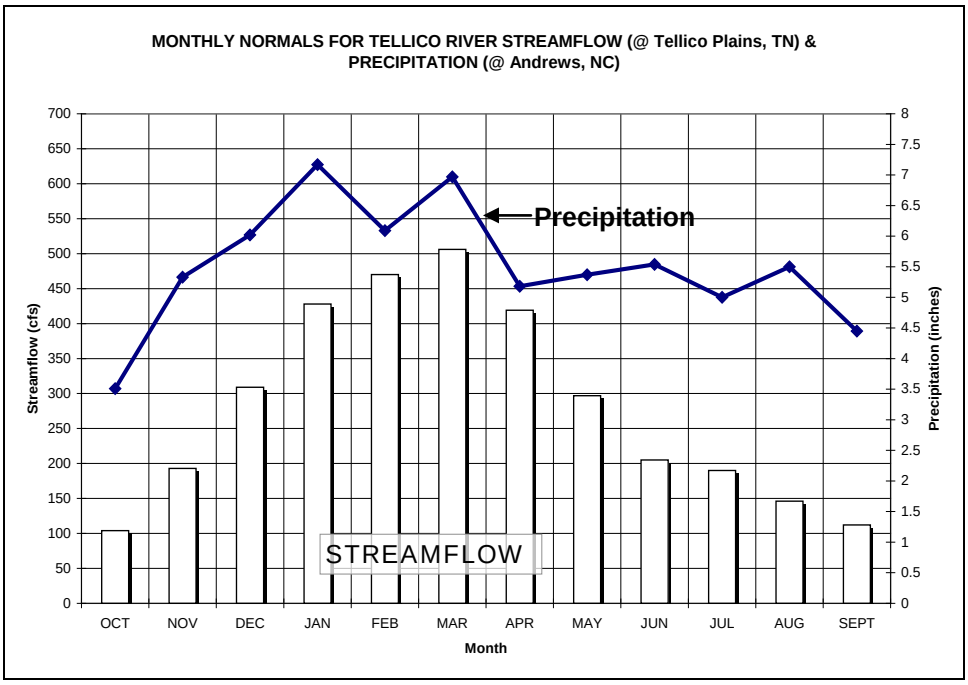
For parts of the analysis of environmental effects it was necessary to put Upper Tellico condition data in context with similar sites away from the trail system. Reference sites were established in Citico Creek and Sycamore Creek. Citico and Sycamore Creeks drain 11,519 and 3,678 acres, respectively, and are located in nearby areas with similar geology and maintain similar forested landcover. Both streams are located in Tennessee. Citico Creek drains north into the Little Tennessee River, at the upper end of Tellico Lake. Sycamore Creek is a tributary to the Tellico River, approximately 3 miles from the state line. Old roads exist in these drainages from the early logging days, but these have become largely vegetated and stable. A hiking trail network is present within each drainage, which may be a source of sediment to streams. In addition to Citico Creek and Sycamore Creek, a third site, Tipton Creek-3 (613 acre drainage area), also serves as a reference site for comparison since it is in the Upper Tellico but not subjected to sediment input from the current trail system.

Stream Flow, Stream Channels, and Water Quality

Stream Flow:

Streams within the analysis area have an estimated average annual discharge of about 2.42 cfs (cubic feet per second) per square mile of watershed; a value similar to other watersheds in the region. Figure 3.1.1.1 displays the mean monthly streamflow for the Tellico River (drainage area = 118 sq miles) downstream from the analysis area near Tellico Plains, Tennessee for the 1925 to 2007 period of record, and mean monthly precipitation at Andrews, NC. Stream flow varies seasonally with rainfall and the effects of evapo-transpiration. January is usually the wettest month with an average of 7.2 inches of precipitation, while October is usually the driest with an average of 3.5 inches of precipitation. In an average year, stream discharge will be highest during the winter months when precipitation is high and most vegetation is dormant.

Figure 3.1.1.1. Mean monthly streamflow of the Tellico River at Tellico Plains, TN (data from 1925 – 2007) and mean monthly precipitation, Andrews, NC (data from 1971 – 2000).



During the winter months soils are moist and experience frequent freezing and thawing where freezing temperatures penetrate into the soil. Roads and trails subjected to freezing and subsequent thawing are highly susceptible to damage from traffic during those periods (Kestler, et. al. 2000).

Stream Channels:

Stream gradients are generally steep in the watershed with channel materials dominated by boulder size rock, but with a mixture of bedrock, cobble, gravel, and sand sizes as well. Stream types are predominantly A2 and B2/3 stream types as defined by Rosgen stream classification (Rosgen 1996). These stream types are defined as having a low sensitivity to increases in flow and sediment, and low bank erosion potential. These stream reaches are considered to be high energy reaches that can transport a large load of stream materials (both bedload and suspended load) and sediment from outside the channel. Therefore, under natural conditions channel habitat features, such as pools, are expected to maintain themselves without filling with fine sediments such as silt and sand size particles.

Water Quality:

The water quality of the Tellico River can generally be characterized as low in conductivity, low in alkalinity, and slightly acidic. Water in the assessment area is currently characterized by the State of North Carolina as being of adequate quality to support all protected uses (NC DWQ 2006). Protected uses for the upper Tellico River include: secondary recreation, fishing, aquatic life including propagation and survival, and wildlife. Additionally, the Tellico River is classified as trout waters. This classification adds further protection for natural trout propagation and survival of stocked trout (no trout are stocked in upper Tellico

on the NC side). Water quality in the Tellico River downstream from the assessment area fully supports protected uses as of the 2006 State of Tennessee water quality assessment of the Little Tennessee River Watershed (Tennessee Department of Environment and Conservation 2006).

Understanding Erosion

The process of erosion is natural and occurs on all landscapes. The current landscape is a result of numerous processes, the most recent being erosion. In the southeastern U.S., erosion occurs predominantly as a result of the interaction of water with soil. Water erosion is a common geologic process that is responsible for the leveling of mountains and the other land features. Natural rates of erosion are often very slow and occur frequently whenever soils interact with moving water. This type of chronic erosion occurs across the landscape. Occurring less frequently is a catastrophic type of erosion associated with large storm events and mass failure of soils. These two types of erosion are natural and it is only when the rate and extent of erosion exceeds a natural rate it is called accelerated erosion. Accelerated erosion is often caused by human disturbance of a stable soil. It is this type of erosion that should be controlled (NC Division of Forest Resources (DFR) 2006).

Erosion is the process of soil particle detachment and movement. When the soil particles are detached from the soil aggregate particles can be carried away by the action of falling raindrops, flowing water, or freezing and thawing. On bare soil, such as a native surfaced road, the force of a raindrop hitting the ground (raindrop splash) can transport soil particles several feet under a heavy rainfall. The action of flowing water can transport soil particles for great distances where the flow is concentrated in gullies and rills (small gullies), depending on the gradient and length of the slope (NC DFR 2006). Steep slopes allow water to flow at higher velocity thus it can transport more soil, and detach more particles along the way. The erosion process of freezing and thawing is largely a detachment mechanism caused by the influence of moisture is the soil and soil temperatures that fluctuate between freezing and thawing. As water freezes in the soil, often within the upper few inches, it expands, carrying soil particles with it. When thawing occurs, soil particles are deposited in a new location. These detached particles, now separated from the soil aggregate, are susceptible to further erosion.

Existing Condition

Soils and the Erosion Hazard

Soils in the watershed consist primarily of Soco and Stecoah soils on the warmer side slopes and most ridges. Of somewhat lesser extent are Cheoah and Jeffrey soils that occur on the cooler side slopes and some higher ridges. All these types are typically deep, well-drained, acidic, loamy soils derived from weathered metasedimentary rock. Although Ditney-Unicoi-Rock outcrop complexes are of relatively limited extent overall, significant acreages occur on southerly aspects within the Mistletoe Creek and Bob Creek drainages and on the very steep side slopes and narrow ridges along the Tellico River. Riparian areas are predominantly Spivey soils that commonly occur in complex with fine-loamy Whiteoak soils or, in the steeper coves with slopes of greater than 30 percent, coarse-loamy Santeetlah. All map units of these “riparian” soils are described as bouldery or very bouldery.

The geology and climate of the area has formed a landscape characterized by steep, dissected mountains and narrow V-shaped valleys. The watershed geology is in part covered with deposits of loose, poorly sorted rock in a medium known as colluvium. Colluvium is the deposited material that has moved from steeper upper slopes and accumulates on lower gradient slopes and in valley bottoms. This gravity transported material is the main geologic hazard in the mountains of North Carolina (NC Geological Survey (unpublished)) and the analysis area. On steep terrain, these deposits are potential landslides if set in motion by abundant rainfall and/or man-made activities, such as roads.

Currently, landslides and other forms of mass wasting events are not apparent on the landscape. Undisturbed forested areas in the watershed appear to generate little sediment because infiltration rates are high and overland flow is rare. The primary source of erosion in the area is from soil disturbance, particularly the existing road and trail network. Sections of trail considered "high challenge", such as the "Rock Garden" on Trail 2 and "Slick Rock" on Trail 9, have lost all soil and are eroded to bedrock and boulders, while sidewalls of the entrenched areas continue to erode. It is estimated that 74,550 tons of soil has been eroded from the current trail system since the establishment of the old logging transportation system more than 50 years ago (based on the depth and length of entrenchments). Much of the displaced soil was deposited on the uplands, while some was transported to the stream network. The current trail system occupies many of the old logging routes, and erosion of the trail system persists.

Erosion of soils from stream banks occurs infrequently in the watershed. Several sites have been observed where the stream channel scours the toe of the adjacent side slope. Although infrequent, these sites add to sources of sediment in the watershed. On private lands in the Tipton Creek and Peckerwood Creek drainages, development and roads are likely to be other sources that add to the sediment load in the Tellico River.

An analysis of the Natural Resource Conservation Service soil data and mapping identifies a *severe* hazard of erosion on most trails in the Upper Tellico OHV System. Exceptions occur on short segments of Trails 1, 5, and 6, where the hazard is identified as *slight* or *moderate*. Hazard of erosion is defined as the hazard or risk of soil loss from unsurfaced roads or trails and is based on inherent erodibility of the parent material, steepness of slope, and content of rock in the soil. A rating of *severe* indicates that erosion of the trail is expected, the trail requires frequent maintenance, and costly erosion control measures are needed (NRCS 1998).

Additionally, the soil types in the watershed rate as *poorly suited* for using the natural soil surface for roads. Poorly suited ratings indicate that overcoming the risk of erosion would require special road designs, extra maintenance, and costly alteration (NRCS 1998).

Soil Contamination Hazard

In addition to the concern of trail erosion in "high challenge" areas is the concern of vehicle derived pollutants. Table 3.1.1.1 displays results of testing for soil contamination from petroleum products at the challenge areas on Trails 2, 7, and 9 (Mahan 2008). Other sections of trail have not yet been tested. Even with the limited extent of testing completed to date, ten sites were found to have exceeded acceptable NCDENR levels.

Table 3.1.1.1. Results from Soil Contamination Testing

Description	NCDENR Action Level	Location				
Trail 2 - Rock Garden		**T2-1 (3-4')**	**T2-2 (3-4')**	**T2-3 (3-4')**	**T2-4 (3-4')**	**T2-5 (surface)**
petroleum hydrocarbons as diesel	40	61.8	21.8	ND	23.3	152
petroleum hydrocarbons as gasoline	10	ND	ND	ND	ND	ND
oil & grease	250	ND	ND	ND	ND	439
Trail 7 - The Cliff		**T7-1 (3-4')**	**T7-2 (surface)**	**T7-3 (surface)**		
petroleum hydrocarbons as diesel	40	77.6	121	6,270		
petroleum hydrocarbons as gasoline	10	ND	ND	ND		
oil & grease	250	248	1,230	9,870		
Trail 9 - Slickrock		**T9-1 (3-4')**	**T9-2 (surface)**			
petroleum hydrocarbons as diesel	40	24.3	61			
petroleum hydrocarbons as gasoline	10	ND	ND			
oil & grease	250	ND	708			

Notes:
NCDENR Action Level = The level that triggers treatment or other requirements by the North Carolina Department of Environment and Natural Resources

ND = None Detected

The North Carolina Division of Forest Resources recognizes that: "solid waste, oils, and other fluids can be potential pollution risks to water quality if not managed and controlled. This includes surface water and groundwater" (NC DFR 2006). The Forest Service has responsibility to control vehicle fluids to prevent them from entering the ground and water. For forestry activities, this includes maintaining equipment, preparing for spills, and properly disposing of used materials. On the Upper Tellico OHV System, the Forest Service has limited control over recreational OHV equipment maintenance, but still must prepare for spills and act quickly to cleanup spills of any amount (NC DFR 2006).

Trail Condition Surveys

Trail condition surveys and turbidity data clearly indicate that State and Forest Plan standards for water quality are not being met in the area impacted by the Tellico OHV System. Visible sediment from the OHV trails is reaching area streams; turbidity is higher than reference streams, and pools within streams are filled with fine sediments. Details regarding these findings are discussed below.

Trail surveys conducted during 2007 and 2008 assessed trail conditions and sediment delivery to analysis area waters from the OHV System. The system is predominantly native surfaced. Exceptions include Trail 1 and sections of Trails 4 and 5 which have surfaces of gravel or larger stone. Most trail segments were originally outsloped, but have become rutted and entrenched (downcut) over many years. Currently, water drainage from the trail system is by means of waterbars, broad-based dips, rolling dips, grade sags or reverse grades, ditches, cross drain culverts, outsloping, sediment traps, or a combination of these. The effectiveness of these drainage control features is compromised in places where trail use is high and trail conditions are not maintainable or maintenance has not been adequate (Figure 3.1.1.2). The survey determined that 53 percent of the drainage dips and waterbars on the

trail system were not properly functioning (Table 3.1.1.2). As a result, erosion control measures put in place have not been adequate to prevent erosion and sediment movement from the road prism.

Figure 3.1.1.2. Example of entrenchment depth and failed waterbar/dip on Trail 11.

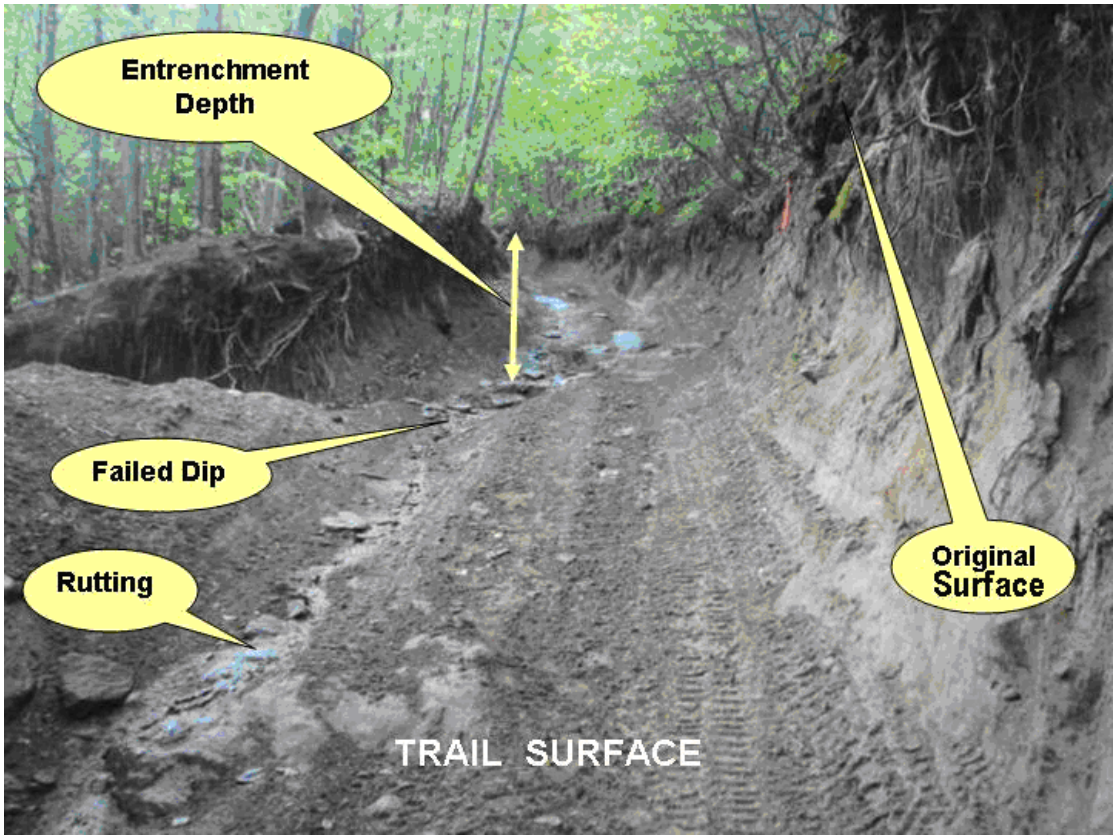


Table 3.1.1.2. Summary of Trail Survey Data.

Trail Number	Miles Surveyed	Road Template	Road Surface Type	Drainage Dips & Waterbars	% Non Functioning Dips & Waterbars
1	3.61	Outsloped	Aggregate Surface	88	14
2	3.17	Outsloped/Entrenched	Native Surface	107	71
3	4.15	Outsloped/Entrenched	Native Surface	152	75
4	4.97	Outsloped/Entrenched	Native Surface	297	34
5	1.51	Outsloped/Entrenched	Agg. & Riprap Surface	70	36
6	2.25	Outsloped/Entrenched	Native Surface	125	61
7	0.59	Entrenched	Native Surface	24	22
8	5.97	Outsloped/Entrenched	Native Surface	125	49
9	0.73	Entrenched	Native Surface	36	33
10	4.79	Outsloped/Entrenched	Native Surface	145	100
10a	2.74	Outsloped/Entrenched	Native Surface	120	38
11	2.74	Outsloped/Entrenched	Native Surface	64	77
12	1.27	Outsloped/Entrenched	Native Surface	38	85
Total:	38.5			1,391	53

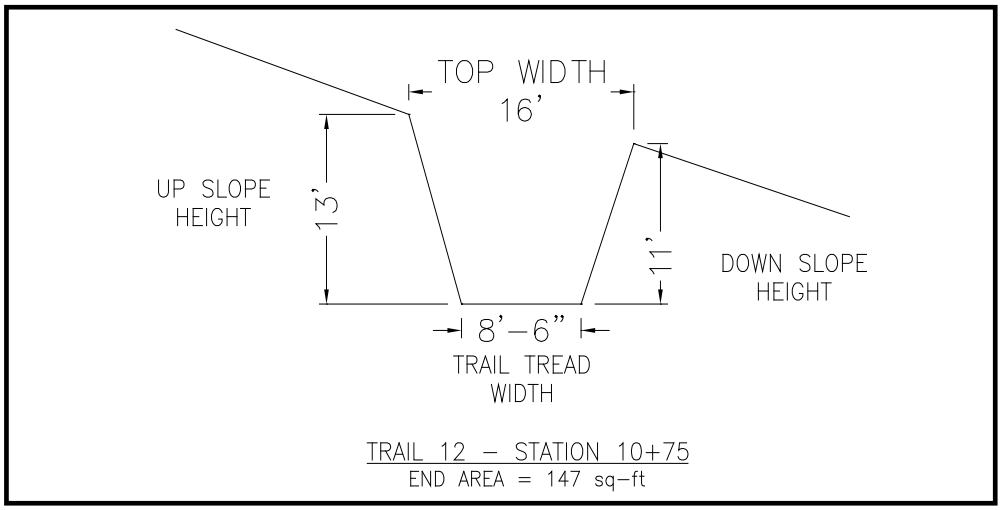
On many miles of trail, poor location in combination with excessive use have resulted in deteriorated travelways to the point that regular road or trail Best Management Practices (BMPs) are damaged to the extent that even if they were rebuilt, they may be no longer adequate to protect trails from erosion and stream channels from sedimentation. Intensive reconstruction, drainage, armoring, and/or relocation methods would be needed to bring most of these trails back to a functional standard where they could be maintained and water quality could be protected. Some trails have entrenched several feet and have lost their cushioning material (gravel and native surfacing), exposing large rock and bedrock (see Figure 3.1.1.3). In these areas, diverting water off the trail is no longer possible with standard practices and the road has become the conduit for water flow for long distances, often directly to stream channels. Without frequent and routine maintenance, even minor rutting within the travelway provides, on a smaller scale, a conduit for runoff. All of the surveyed OHV trails were heavily used and had at least 85% bare soil on the open and active trail system. Trails 7

Figure 3.1.1.3. Example of trail entrenchment in the Upper Tellico OHV Area, where approximately 10 feet of soil has been lost, exposing large rock and bedrock.

and 9 are two examples of this.

Due to the large amounts of soil that have been displaced by erosion and the relatively high rates of erosion, large modifications have been made on the Forest landscape. During condition surveys engineers conducted field measurements to determine the amount of soil that has been displaced within each entrenchment. Field measurements included the width and length of the entrenched trail section to determine the soil loss volume. An example of the field measurements can be seen below in Figure 3.1.1.4.

Figure 3.1.1.4. Example of field measurements of trail entrenchment (downcut).



An estimated 74,550 tons of soil has eroded from the current trail system since the establishment of the old logging transportation system, approximately 50 years ago. To put this into perspective, this volume of sediment would fill 5,000 – 15 ton dump truck loads or 26 football fields one foot deep. Trails 6 and 10 have the longest lengths of entrenched trail; these sections occur over 96.4 and 50.1 percent of the total trail length, respectively (Table 3.1.1.3). Trails 9 and 12 also have a relatively high percent of trail length that has eroded to an entrenched condition, 56.2 and 55.1 percent respectively. Some of the greatest volumes of soil erosion occurred on Trails 6, 12, 11, 2, and 9. Trail 1 did not have sections of entrenchment and the other trails had relatively short sections of entrenchment. However, regardless of length, where entrenched trail conditions lead directly to stream channels, for example on Trail 7, sediment delivery to streams has been high.

Table 3.1.1.3. Soil erosion quantities from entrenched sections of the Upper Tellico OHV System.

Trail #	Trail Length (miles)	Entrenched Trail Length (miles)	Percent Trail Length Entrenched	Soil Loss Entrenched Sections (tons/mile)	Soil Loss Entrenched Sections (tons)
1	3.61	0	0	0	0
2	3.17	0.33	10.4	2,030	**6,431**
3	4.15	0.36	8.7	596	2,473
4	4.97	0.02	0.4	622	3,090
5	1.51	0.39	25.8	1,539	2,317
6	2.25	2.17	**96.4**	**9,051**	**20,386**
7	0.59	0.09	15.2	**4,113**	2,426

Trail #	Trail Length (miles)	Entrenched Trail Length (miles)	Percent Trail Length Entrenched	Soil Loss Entrenched Sections (tons/mile)	Soil Loss Entrenched Sections (tons)
8	5.97	0.61	10.2	1,185	7,081
9	0.73	0.41	**56.2**	**8,487**	**6,173**
10	4.79	2.44	**50.9**	1,186	5,676
10a	2.74	0.35	12.8	692	1,894
11	2.74	0.56	20.4	2,531	**6,925**
12	1.27	0.70	**55.1**	**7,615**	**9,677**
Total:	**38.5**	**8.43**	**21.9**	**1,937**	**74,550**

Effectiveness of Best Management Practices

Best Management Practices or "BMPs" are those principles and practices that will protect water quality as well as the function of the road/trail when properly applied and maintained. Meeting State BMPs is an important element in complying with the Clean Water Act. BMPs are defined by the North Carolina Forest Practices Guidelines Related to Water Quality as follows "A practice or combination of practices, that is determined to be an effective and practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals" (NC DFR 2007).

The road and trail system was already in place when the Forest Service acquired ownership of the upper Tellico River watershed, and current BMPs were not used in the system's location and construction. Trail locations and construction was not in conformance with current State and Forest Service standards. Applying BMPs that are designed for constructing and maintaining trails to today's standards are not sufficient to correct for the deteriorated conditions identified by conditions surveys of the Upper Tellico OHV System.

Figure 3.1.1.5 Photograph of a Constructed Sediment Trap Full of Sediment

Figure 3.1.1.6. Photograph of a sediment plume in the Tellico River during a small rain event.

Factors limiting the effectiveness of BMPs in the Upper Tellico OHV Area include: soils sensitive to erosion, high precipitation amounts and intensity, a dense stream network, shallow groundwater, trails not within a design standard, native surfaced trails, a high level of use, year round use, modified vehicle types, inadequate maintenance and long-term severe erosion that transcends our ability to employ standard BMPs. The first four of these factors - sensitive soils, high precipitation amounts and intensity, a dense stream network, and shallow groundwater - set up any land disturbing activity for failure unless erosion control measures are forefront in the design and even then, regular and frequent maintenance is needed along with perhaps some wet weather closures. In many cases, retrofitting the trails with functional BMPs would require reconstruction or relocation – not just minor reshaping. Therefore, normal BMPs are limited in their effectiveness and meeting State Water Quality standards under these conditions would not occur as long as the trail system remains in its current state.

Monitoring trail BMPs shows that gravel surfacing on the trail system is partially effective at reducing sediment production, but not eliminating it. Runoff from segments of Trails 1, 4, 5 and 6 was measured from six rainfall events occurring between July and October 2008 to assess the amount of suspended solids (sediment) present. All of these trail segments had received maintenance in the spring of 2008, including reconstruction of waterbars and sediment traps. Trails 1 and 5 were graveled as well. The improved gravel segments of Trails 1 and 5 had an average Total Suspended Solids (TSS) concentration of 3,262 mg/L per centimeter of rainfall. The improved native surface segments on Trails 4 and 6 had an average concentration of 5,467 mg/L/cm. These values indicate that the gravel surfaced trail segments produced 40 percent less sediment than the native surfaced segments.

Sediment production from OHV trails is higher than from typical forest roads (Welsh 2008). Runoff from trails with gravel surfacing in the Upper Tellico OHV System produced much higher concentrations of sediment than average values from forest roads with gravel surfacing found in a study by the Coweeta Hydrologic Laboratory on the Chattooga River

Watershed in Georgia and South Carolina. Runoff from gravel surfaced roads in the Coweeta study had average sediment concentrations of 789.7 and 2,761.1 mg/L/cm depending on the level of road maintenance and improvements (Personal communication with Barry Clinton Nov. 7, 2008 and Clinton and Vose 2003).

Runoff was also measured below sediment traps and below waterbars – two of the most frequently used drainage control devices. The data collected shows that sediment traps improved the efficiency of waterbars; by reducing sediment runoff 74 percent from gravel surfaces and 60 percent from native surfaces. Still, sediment traps are not 100 percent effective at retaining sediment.

Two major factors essential for full sediment trap efficiency are proper design and adequate maintenance. The state of North Carolina Forestry Sediment BMP Manual to Protect Water Quality (NC Division of Forest Resources 2006) states that sediment traps should be designed to contain the expected sediment runoff while minimizing soil disturbance. Sizing of the trap is based on the volume of water drained from the contributing area of trail (length x width of trail surface) and a given storm event, e.g., 1 inch storm. The smaller the storm used for design the smaller the trap and ultimately the more frequent the maintenance. Along many trails in the analysis area sediment traps have not been designed to standard, and often are not even capable of retaining the flow and sediment from a 1 inch storm. Often where trails are close to streams or on relatively steep slopes, site conditions limit the size of sediment traps. As a result, a high frequency of maintenance would be required for the traps to remain effective. The North Carolina Forestry Sediment BMP Manual to Protect Water Quality (NC Division of Forest Resources 2006) recommends that sediment traps be cleaned out whenever the trap is half full.

Sediment runoff data from July through October 2008 shows that after 2 months following sediment trap cleaning, 14 percent of sediment traps surveyed were half full or more for both gravel and native surface trails. After almost four months 21 percent of gravel surfaced trails and 41 percent of native surfaced trails needed cleaning. After approximately five months, 57 percent of sediment traps on gravel surfaced trails and 91 percent on native surfaced trails needed cleaning. Since this data was taken during a period experiencing only 60 percent of normal precipitation (based on Andrews, NC weather data), runoff from the trail would be higher in a normal year, resulting in a higher rate of sediment trap filling. **Precipitation data from the Andrews, NC weather station (from 1971 to 2000) shows that approximately 20 days experience one inch or more of rainfall in a 24-hour period in an average year.**

Therefore, sediment traps on trails in the Tellico OHV area need to be cleaned every three months, and all sites within 100 feet of a stream channel should be surveyed following a 1 inch storm and cleaned if more than half full. Where traps are found to be one half or more full maintenance would be required. **Compared to the current level of trail maintenance this would increase maintenance frequency considerably, at a minimum four times per year for the entire trail system.**

<u>BMP Effectiveness Summary</u>

- Sensitive soils, high precipitation amounts and intensity, a dense stream network, and shallow groundwater set up any land disturbing activity for failure unless erosion control measures are forefront in the design of the activity. This concern is even

greater for an ongoing activity that continues to damage erosion control and surface drainage features on a regular basis.

- The gravel surfaced trail segments produced 40 percent less sediment than the native surfaced segments. Perhaps with employing improved engineering techniques such as layering and compacting materials, and adjusting the types of aggregate materials used, this could be improved.
- Sediment traps improved the efficiency of waterbars by reducing sediment runoff 74 percent from gravel surfaces and 60 percent from native surfaces. Still, sediment traps are not 100 percent effective at retaining sediment even under normal to dry conditions.
- Along many trails in the analysis area sediment traps have not been designed to standards, and often are not even capable of retaining the flow and sediment from a 1 inch storm.
- Sediment traps on trails in the Tellico OHV area need to be cleaned every three months, and all sites within 100 feet of a stream channel should be surveyed following a 1 inch storm and cleaned if more than half full.
- The frequency of rolling dips, water diversions and reverse grades may not be sufficient to limit the amount of concentrated flow and sediment delivery. Non-standard BMPs may need to be employed to either armor the trail surfaces or provide for ample drainage of concentrated flow.
- Where the trail is located within 100 feet of a stream channel, preventing sediment delivery to streams is unlikely.

Table 3.1.1.4 lists BMPs designed by the State of North Carolina to protect water quality during forestry activities (NC DFR 2006). Implementation of these BMPs is intended to help achieve compliance of such activities with requirements of the North Carolina Forest Practices Guidelines Related to Water Quality and ultimately the Clean Water Act. Although forestry BMPs are designed for skid trails and temporary roads and are not fully suitable benchmarks for the permanent use that occurs on OHV trails, they are used in the absence of specific trail BMPs as a starting point to measure success of the OHV trail system. In addition to forestry BMPs, existing road and trail design criteria are used. For example, where forestry BMPs recommend the use of waterbars to control runoff from temporary roads and trails, rolling dips are recommended on the OHV System.

Table 3.1.1.4. Summary of forestry Best Management Practices (BMPs) and discussion of effectiveness on the Upper Tellico OHV System.

Forestry BMPs (Where and how they work)	Existing Trail Conditions (Why BMPs fail in Tellico OHV)
Road prism should have an even contour to disperse runoff evenly (no ruts)	- The original road and skid trail prism is damaged and trails are scoured, exposing bedrock and boulders. This rock channelizes runoff and concentrates erosive force of runoff. -Trails have scoured so deeply that they now form ephemeral channels and the surface and subsurface hydrology if these areas are affected.
Roads should be constructed at least 1 year prior to usage to allow the road bed to stabilize prior to use. (Emphasizes potential for sedimentation from newly disturbed soils)	-Trails are continuously changing (existing in a state of constant soil disturbance) due to high trail usage and aggressive vehicle types. -Trails that receive heavy maintenance are immediately re-opened for traffic and compaction and other methods to stabilize materials are typically not used.

Forestry BMPs (Where and how they work)	**Existing Trail Conditions (Why BMPs fail in Tellico OHV)**
Forest roads should be "daylighted" to encourage drying of the road surface.	-Daylighting of trails has not been done. -Maintaining trails to allow sunlight to reach the trails would be virtually impossible because mowers cannot access most of the trails to mow cut banks and fill slopes.
-Forest roads (and associated BMPs) are designed for logging trucks, skidders, and standard 4-wheel drive pick-ups. -Forest roads are designed to allow efficient means of transporting timber from forest. -Forest roads are hardened to minimize erosion.	-Trails carry highly modified 4-wheel drive vehicles and ATV's designed for enhanced traction. -Trails are intended to provide a challenge to recreational users. -Poorly designed and maintained roads provide greater recreational opportunity in the form of challenge. -Few trails have been hardened. Those that have been hardened require frequent replenishment of stone because the OHV/ATV use dislodges the stone.
-Intensive soil disturbance should be minimized. -Close roads when suitable to minimize unnecessary use.	-Trails are open to vehicle traffic most of the year regardless of rainfall or trail conditions. Trails receive high degree of soil disturbance. (It is the Forest Service's responsibility to close these type uses if facilities and resources are being damaged.)
Skid trails are used for temporary access. These skid trails disturb soil yet seldom result in sedimentation in National Forest streams because the soil disturbance only occurs during the logging operation since BMPs stabilize soils and prevent the site from developing into a chronic sediment source. BMPs for forestry operations have been designed to minimize the short-term effects of soil disturbance.	-Trails are permanent routes in which vehicles continuously disturb new soil, resulting in sedimentation of streams. - BMPs on trails converted from other uses may temporarily minimize sedimentation but eventually fail due to a lack of maintenance and often poor design because they were never reconstructed to handle this use.
-Waterbars, dips, and silt traps are only functional if maintained -Roads are carefully planned and designed with water control structures. -Silt traps are cleaned when they are approximately half-full of sediment. -Silt traps are sized according to the road length, width, and the expected storm rainfall amount.	-Runoff control structures receive inadequate maintenance because the trails are difficult to access for maintenance equipment and District personnel. -Silt traps on trails have been installed as an afterthought; therefore, they are often in locations where there is inadequate space to properly size and locate the traps. -Silt traps have been cleaned usually when the trap fails (breached by runoff). This delay occurs because of the excessive number of silt traps necessary to capture storm water from the channelized trails and the inaccessibility of the traps. -Silt traps are sized according to the physical constraints of the terrain. Expanding the silt traps is often not possible because no additional space is available. -Storm events in the Tellico River watershed exceed the capacity of the silt traps.
Culverts are sized in proportion to the watershed area and the duration of use – temporary uses often use smaller culverts recognizing that the road surfaces will be revegetated and culverts removed within a few years.	-Trails contain inadequate number and sizes of culverts since they often were not designed for this permanent use. Lack of maintenance of drainage features puts added stress on other structures that can add to failure rate.

Forestry BMPs (Where and how they work)	Existing Trail Conditions (Why BMPs fail in Tellico OHV)
Silt fence, hay bales, and brush barriers are used to control runoff from areas of active soil disturbance (These are typically used to reduce erosion/sedimentation at construction sites – temporary mitigation measures)	-Silt fence has been sparsely used (and not maintained) and no hay bales or brush barriers are used. Brush barriers are impractical for these trails because there is no continuous supply of brush to construct the barriers. Brush barriers are impractical for long-term erosion control. -Silt fence requires maintenance and hay bales must be replaced periodically.
Open road densities are minimized in most watersheds on National Forests to reduce sedimentation potential	-Approximately 39 miles of open roads/trails exist within the Upper Tellico River watershed with inadequately maintained BMPs
Road design, BMP implementation and maintenance, and road operations (road closures) are all coordinated to minimize erosion and sedimentation.	-Trails have not been properly designed, BMPs have not been properly designed, implemented and/or maintained, and the OHV System operations are not coordinated to enhance the effectiveness of the BMPs and trail maintenance.

Reducing erosion and sediment yield from the trail system is important; however effectiveness is tested by whether or not the applied BMPs meet the State and Federal standard of preventing sediment delivery to streams. For example, the trail condition surveys of 2007 and 2008 showed that existing improvements on Trail 1 (conditions survey stations 24+30 to 65+40), including gravel surfacing, rolling dips, and sediment traps, were only 49 percent effective at preventing trail-derived sediment from entering the stream.

This information is crucial to understanding the effectiveness of BMPs that have been applied on the trail system to date. Typical forestry BMPs are useful in most situations, however, in the deteriorated circumstances found in the OHV System, normal forestry and road BMPs are not going to be effective in preventing visible sediment from reaching the stream channel (the State and Forest Plan standard). Trail 1 is an example of where intense maintenance efforts have taken place (short of paving) and visible sediment is still reaching the stream (Note: 1 mile of Trail 1 is within 100 feet of a stream). Sediment production from the trail can be reduced by implementing BMPs, but where the trail is located within 100 feet of a stream channel, preventing sediment delivery to streams is unlikely considering all the work that is needed. Improvements applied to trail segments located away from streams are more likely to be effective at preventing sediment from reaching streams because the greater vegetative buffer widths would filter storm runoff.

Trail condition surveys indicate that trails within 100 feet of a stream require special attention to reduce sediment traveling to the stream, such as additional design and maintenance practices. Within the 100-foot zone, trail segments within 25 feet of water are at the very highest risk for contributing sediment, especially after storm events. Table 3.1.1.5 displays the amount of each trail within the 100-foot zone and 25-foot zone.

Table 3.1.1.5. Miles of trail within 100 feet and within 25 feet of mapped stream (streams located on a U.S. Geological Survey topographic map).

Trail #	Miles within 100 feet of streams	Miles within 25 feet of streams
Trail 1	1.00	0.05
Trail 2	0.60	0.24
Trail 3	0.48	0.06
Trail 4	0.69	0.06
Trail 5	0.80	0.13
Trail 6	0.00	0.00
Trail 7	0.07	0.02
Trail 8	0.97	0.21
Trail 9	0.09	0.02
Trail 10	0.26	0.05
Trail 10A	1.09	0.16
Trail 11	0.00	0.00
Trail 12	0.00	0.00
TOTAL	**6.05**	**1.0**

Approximately six miles of trail is located within 100 feet of mapped streams. Trails paralleling stream channels within 100 feet occur along Tellico River, Tipton Creek, Jenks Branch, and Peckerwood Creek. The surveys identified 673 locations (including 46 on Trail 1) where sediment was tracked from the OHV System to the stream network. In 558 of these locations the sediment was coming from a trail segment within 100 feet of the stream. Distances between trail and stream of 100 feet or greater allows more opportunity for vegetative filtering and trapping of sediment before it reaches water.

Hydrologic Connectivity

Table 3.1.1.6 shows the miles of each trail that are connected to the stream channel network. Hydrologic connectivity occurs when storm water runoff from the trail enters a stream channel having perennial, intermittent, or ephemeral flow. Wherever a hydrologic connection exists, rapid runoff, sediments, and road-associated chemicals (for example, spills, oil) generated on the road surface and cut-slopes are provided a direct route into the streams (Forest Service, USDA 1999).

The best situation is for roads and trails to NOT be hydrologically connected to streams. Therefore, higher values for hydrologic connectivity are generally worse than lower values. Overall, 31 percent of the trail system is hydrologically connected, and in many of these cases sediment could be tracked directly from the trail to a waterbody. Trails 5, 7, and 9 have the highest connectivity values per mile of trail, and potentially impact Tellico River and Peckerwood Creek. Trails 1, 2, 6, 8, and 12 have the lowest connectivity values per mile of trail over the entire trail length. Connectivity per mile doesn't tell the complete story, however. Trail 12, for example, is a unique case where there is a low incidence of hydrologic connection, but the connectivity that does occur is contributing an inordinate amount of sediment, due to the nature of the trail and its position on the landscape (see Graphics Supplement – Trail 12).

Table 3.1.1.6. Miles of Trail Hydrologically Connected to the Stream Network.

Trail #	Miles of HC	Trail miles	Percent of trail HC
Trail 1	1.40	5.3	26
Trail 2	0.42	3.2	13
Trail 3	1.60	4.1	39
Trail 4	1.85	4.8	39
Trail 5	1.00	1.6	63
Trail 6	0.32	2.2	14
Trail 7	0.41	0.5	82
Trail 8	1.51	5.8	26
Trail 9	0.34	0.7	49
Trail 10	1.58	4.5	35
Trail 10a	0.97	2.7	36
Trail 11	0.73	2.7	27
Trail 12	0.08	1.2	6
TOTAL	**12.21**	**39.3**	

Suspended Sediment

Sediment measured as total suspended solids (TSS) and turbidity represents the fine-grained materials that are caught up in suspension and carried by water during runoff events. This is the suspended sediment load and is differentiated from the load that moves along the stream bottom called bed load. The suspended load most often consists of very small-sized particles of sand, silt, and clay. These very small particles in suspension affect the clarity of the water (turbidity). Turbidity is a measure of the amount of light reflected from particles and reflected through the water, and is often measured in Nephlometric Turbidity Units (NTU). In comparison, TSS is the concentration of particles in a given volume of water, often measured as milligrams per liter (mg/L) of water. Measuring total suspended solids helps us understand the amount of material transported out of the stream reach while turbidity gives us an indication of how cloudy or hazy the suspended material makes the water. Increases in suspended sediment can affect the behavior and survivability of aquatic life (see section 3.2 – Aquatic Wildlife).

The clarity of stream flow of the Tellico River, and whether or not the river meets the State of North Carolina standard for turbidity have been brought up as a concern by the public. The North Carolina standard states:

> "the turbidity in the receiving water shall not exceed…10 NTU in streams, lakes or reservoirs designated as trout waters… if turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased. Compliance with this turbidity standard can be met when land management activities employ Best Management Practices (BMPs)… recommended by the Designated Nonpoint Source Agency… BMPs must be in full compliance with all specifications governing the proper design, installation, operation and maintenance of such BMPs" (NC DENR 2007).

The standard for turbidity, as well as other standards, is designed to ensure the support of protected uses, in particular aquatic life propagation and survival.

Surveys conducted during 2007 and 2008 assessed trail conditions and sediment delivery from the OHV System. These surveys have identified elevated levels of erosion and sediment delivery to stream channels in the watershed as a result of failed BMPs. Therefore, the turbidity standard is not being met in the upper Tellico River watershed. Monitoring of suspended sediment and sediment deposition (streambed composition and pool filling) identified adverse affects to the aquatic ecosystem (see section 3.2 – Aquatic Wildlife).

The Forest Service and TVA have monitored the suspended portion of the sediment load since 1999 using single stage samplers in the Tellico River and Citico Creek Sub-basins. Table 3.1.1.7 summarizes TSS and turbidity data for the period between 2002 and 2004 when a turbidity analysis was completed for that data set. Although the Tellico River Stateline site did not have the highest average (mean) or median TSS concentrations, it did have the highest turbidity levels compared to the other sites.

None of the streams listed in Table 3.1.1.7 are on the respective state's water quality impaired waters list. Bald River drains predominantly federal ownership and is managed for designated and recommended wilderness, and a scenic corridor and sensitive viewshed. The North River drains federal ownership, and is managed for restoration and maintenance of rare communities and plant associations to their ecological potential, scenic corridor and sensitive viewshed, and nonmotorized recreation. Turkey Creek drains both federal (approximately 88 percent) and private lands. Federal lands in the watershed are managed as a scenic byway corridor, scenic corridor and sensitive viewshed, and early successional habitat emphasis. Each of these drainages are in the Tellico River Sub-basin and have a road and trail system to facilitate management, but do not have OHV areas. Citico Creek, north of the Tellico River Sub-basin, drains the Citico Wilderness, an area occupied by a hiking trail system. All of these drainages have old logging roads and trails, a legacy of early logging activity.

Each watershed occurs in the same geologic landform of greywacke sandstone and conglomerate in thick graded beds with interbeds of slate. Soil types vary across the area, but soils classified as having a "severe hazard of erosion on roads and trails" from NRCS soil data occur over more than 98 percent of these individual watersheds. See Appendix E for a presentation of watershed characteristics. The Tellico River Stateline site is the only watershed affected by the OHV System. The upper Tellico River watershed has the highest road density of these drainages, with a value of approximately 4 miles of road per square mile of area.

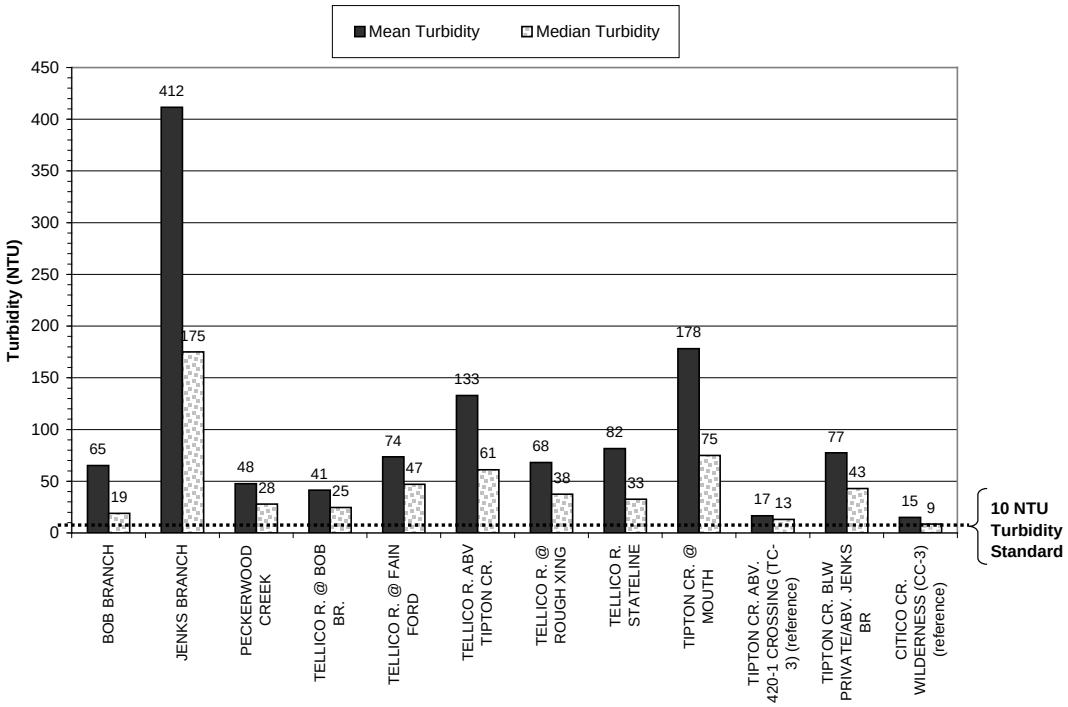
Table 3.1.1.7. Mean and Median values of Total Suspended Solids (TSS) and Turbidity data for five watersheds in the Tellico River sub-basin and Citico Creek for storm runoff events occurring between September 2002 and February 2004.

Stream	Total Suspended Solids (TSS) (mg/L)		Turbidity (NTU)	
	Mean	Median	Mean	Median
Bald River	662.6	295.0	36.4	23.0
Citico Creek (Wilderness)*	98.6	39.0	15.1	8.5
North River	89.7	58.0	24.9	10.0
Tellico River Stateline	309.9	140.0	81.5	32.5
Turkey Creek	517.1	53.0	70.5	17.0

* Citico Creek Wilderness is outside of Tellico River Sub-basin, and is a reference stream.

Streams in the upper Tellico River watershed during 1999-2008 show higher turbidity (mean and median) values where trails occupy the drainage (Figure 3.1.1.7). Some of the highest turbidity values came from Jenks Branch, Tipton Creek at the mouth, and Tellico River above Tipton Creek and at the state line. The reference stream reaches of Tipton Creek (TC-3) above the 420-1 trail crossing and Citico Creek (CC-3) at the wilderness boundary had the lowest turbidity values.

Figure 3.1.1.7. Statistical summary of Turbidity in the Upper Tellico River watershed and Citico Creek Wilderness (data from storms occurring during 2002 - 2004). Reference reaches, without an active OHV trail, include Tipton Creek above 420-1 crossing (TC-3) and Citico Creek Wilderness (CC-3).

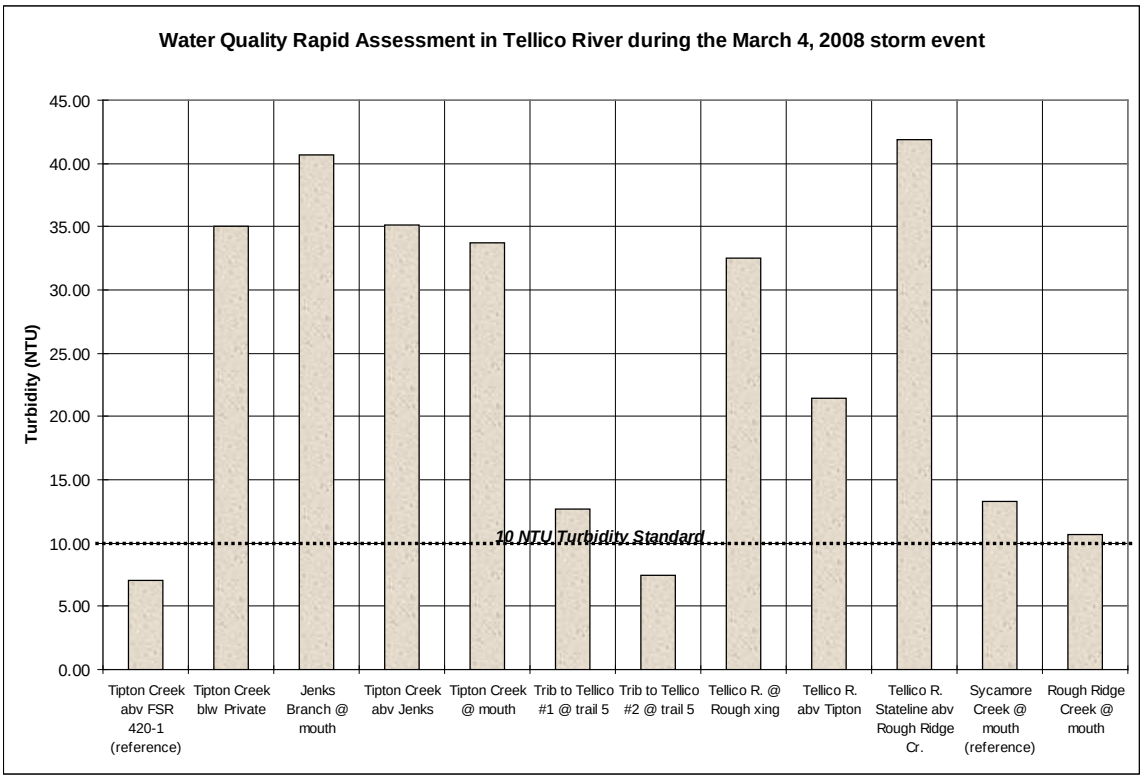


As discussed earlier, turbidity values greater than 10 Nephlometric Turbidity Units (NTUs) do not meet North Carolina water quality standards for trout waters. Turbidity measurements from the Tellico River have been recorded up to 370 NTUs at the state line site during storm events, while the reference sites on Citico Creek and Upper Tipton Creek had turbidity values of 50 and 29 NTUs, respectively for the same storm event occurring on September 22, 2002. During a runoff event occurring on March 4, 2008 (producing streamflow with a return period of about 2 years) the 10 NTU standard was exceeded in all streams surveyed except Tipton Creek above FSR 420-1 (Tipton Cr – 3 site, a reference site) and a small tributary to Tellico River at Trail 5 (Figure 3.1.1.8). Sycamore Creek (a reference site) had a turbidity value of 13.3 compared to Tipton Creek (at the mouth) and Tellico River (at Rough Crossing) values of 33.7 and 32.6, respectively. These three sites represent similar drainage areas. Citico Creek was not measured during this March event.

It is recognized that the state turbidity standard can be exceeded in all streams during major storm runoff events, regardless of watershed management. Although streams have natural background levels of turbidity that commonly exceed the standard, streams that exceed the

standard by a larger degree than a reference stream are a concern for watershed managers desiring to maintain protected uses.

Figure 3.1.1.8. Turbidity measurements from the March 4, 2008 storm runoff event. Reference streams represented by Tipton Creek above FSR 420-1 and Sycamore Creek @ mouth.



Additionally, both TSS and turbidity data indicates an increase in suspended sediment loading from the private inholding on Tipton Creek. Table 3.1.1.8 shows that median TSS values nearly double from the Tipton Creek-3 site above the private to the Tipton Creek-2 site just below the private. Turbidity measurements taken on March 4, 2008 at these same sites showed an almost 80 percent increase in turbidity below the private inholding (Figure 3.1.1.8).

Overall, streams having OHV trails nearby have notably higher median concentrations of suspended sediment in comparison to reference sites, particularly Jenks Branch, Tellico River above the Tipton Creek confluence, and Tellico River above Bob Branch (850 mg/L, 465 mg/L, and 425 mg/L, respectively). This data gives evidence to higher levels of erosion and sediment delivery to streams occurring within the upper Tellico River watershed where the trail system is present on the landscape. Table 3.1.1.8 represents a summary of TSS data. The locations of the monitoring sites are displayed on a map in the Graphics Supplement.

Table 3.1.1.8. Summary of Total Suspended Solids (TSS) data storm runoff events between 1999 to 2008. Sites with trails upstream have higher median TSS values than reference sites.

Site	Number of samples	Median TSS – mg/L
Reference Sites		
Citico Creek-3 (Wilderness)	40	39
Tipton Creek-3 (above FSR 420-1)	56	100
Trail System Sites		
Tellico River Stateline	103	170
Jenks Branch at mouth	27	850
Tipton Creek at mouth	46	315
Tipton Creek below private	49	180
Tellico above Tipton Creek	56	465
Tellico at Rough Crossing	46	350
Peckerwood Creek at mouth	42	275
Tellico at Fain Ford	51	320
Bob Branch at mouth	44	150
Tellico above Bob Branch	44	425

Sediment Deposition

In addition to the suspended portion of the sediment load, sediment deposition on the streambed is important to consider for meeting protected uses since aquatic organisms in mountain streams require open spaces between rocks for survival (see section 3.2 – Aquatic Wildlife). When minor amounts of sediment exist in temporary sources, temporary pool filling can be flushed during storms. When larger amounts of continuing sediment occur, pool filling and particle compaction can reduce the natural ability of the stream to recover. Increased and continuing streambed sedimentation fills these open spaces and eliminates this habitat. Two measures were used to help understand the effects of sediment deposition on streams in the area of the Upper Tellico OHV System - pebble count over the riffle habitat feature and pool filling.

Riffle Pebble Counts

The pebble count is a means of characterizing the sizes of the material on the streambed. The deposition of fine sediments on larger substrate reduces habitat for young fish and aquatic macroinvertebrates, and can adversely affect gravel permeability and the suitability of gravel for spawning (MacDonald, et.al. 1991). Streambed material is composed of sizes ranging from silt/clay to bedrock.

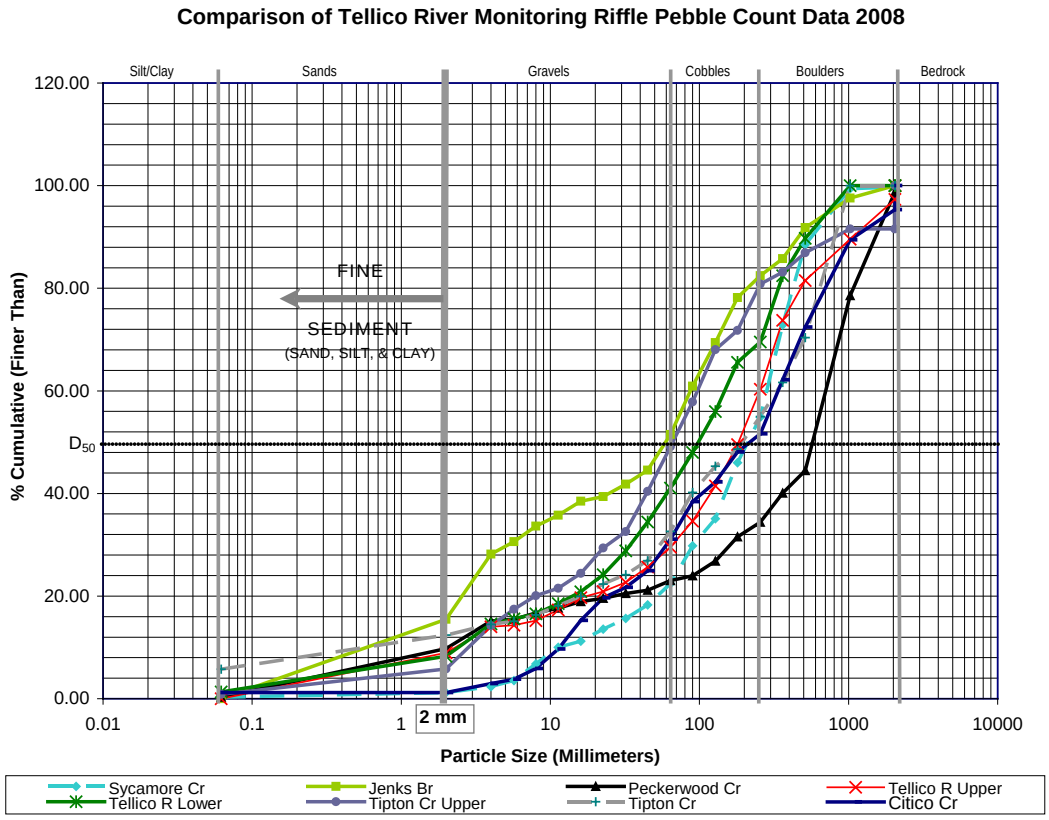
Pebble counts took place on riffle habitat units in the upper Tellico River and several of its tributaries and in Citico and Sycamore Creeks, both reference streams surveyed for comparison. Within the upper Tellico River watershed, the Tipton Creek Upper site (same site as Tipton Creek-3) is also considered a reference stream due to the absence of an active trail in the drainage.

The pebble counts indicate that the median particle sizes (D_{50}) range from large gravel to boulder sizes (Figure 3.1.1.9, Plot A). Focusing in on the fine sediment portion (<2 millimeters) of the stream bed, there is more fine sediment incorporated into the larger streambed material at sites affected by the trail system than in the three reference streams (Figure 3.1.1.9, Plot B). Jenks Branch and Tipton Creek (just above the Jenks Branch

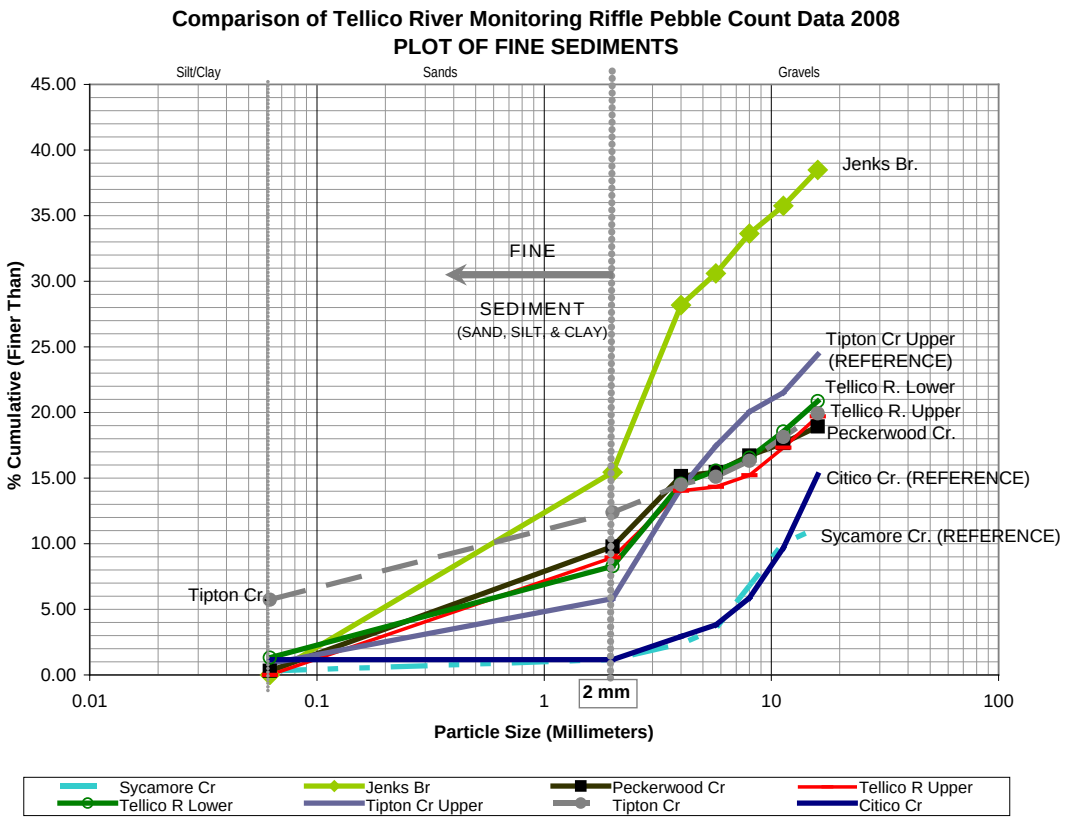
confluence) had the largest fine sediment composition with values of 15 and 12 percent, respectively. The reference streams, Citico, Sycamore, and Upper Tipton Creeks had fine sediment values of 1, 1, and 6 percent, respectively. Pebble counts also indicate an increase in fine sediment deposition below the private inholding on Tipton Creek from 6 percent at Tipton Creek Upper (same site as Tipton Creek-3) to 12.4 percent at Tipton Creek (just above the Jenks Branch confluence and below the private).

Figure 3.1.1.9. Comparison of pebble count data from streams in the upper Tellico River drainage, Citico Creek and Sycamore Creek, 2008. Plot A is the full data set and Plot B is a sub-set of Plot A data to focus in on the fine sediment (<2 millimeters) portion of the data. Fine sediments are higher in streams influenced by the OVH System.

<u>Plot A</u>



Plot B

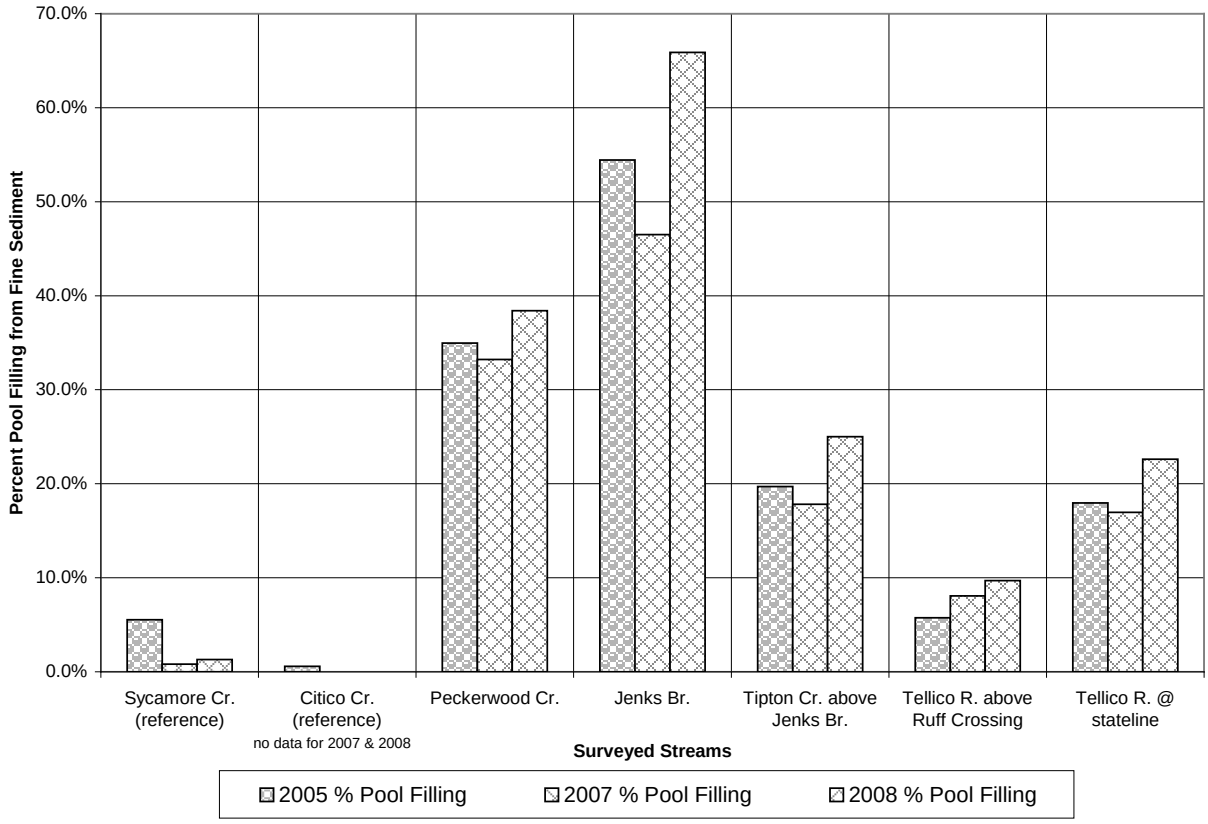


Pool Filling

The pool filling analysis is based on methodology developed by Hilton and Lisle (1993), and is a procedure to measure the fraction of pool volume filled with fine sediment. The fraction of pool volume filled with fine sediment can be a useful index of sediment supply.

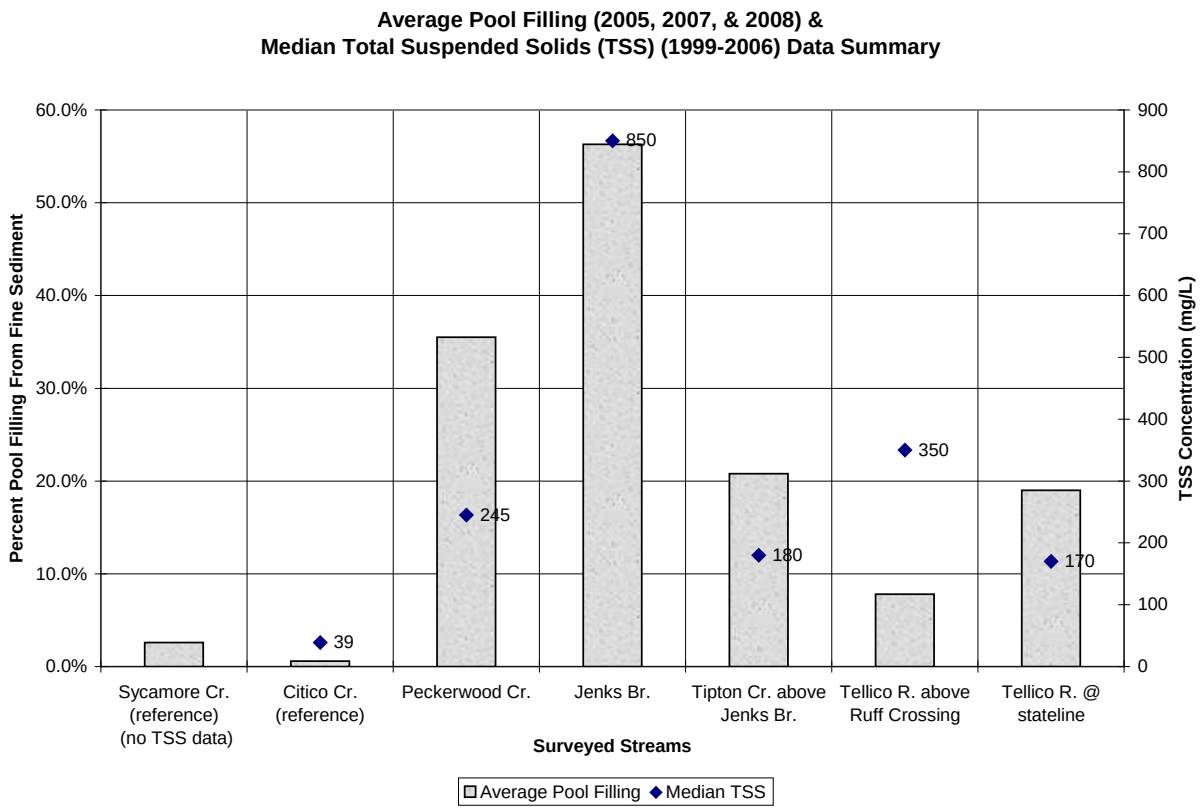
The pool filling analysis, conducted during 2005, 2007, and 2008, indicates that more fine sediment has accumulated in pools within the upper Tellico River drainage than in reference streams (Figure 3.1.1.10). Trends in pool filling from fine sediment since the 2005 baseline data seem to fluctuate generally with a decrease in 2007 and an increase in 2008. The Tellico River at Rough Crossing site is an exception, showing a small increase in pool filling from 2005 to 2008. Fine sediment in pools at the Sycamore Creek reference site remains relatively small with a reduction since 2005.

Figure 3.1.1.10. Summary of 2005, 2007, and 2008 pool filling analysis for streams in the Upper Tellico River watershed, Sycamore Creek, and Citico Creek.



With average pool filling values, suspended sediment data (presented as median TSS) are presented in Figure 3.1.1.11 for the same sites as the pool filling analysis, with the exception of Sycamore Creek. A comparison of these two data sets indicates that generally as TSS increases pool filling increases as well. In streams where the suspended load is high, e.g., Jenks Branch (850 mg/L), pool filling from fine sediment is also high. Where excessive pool filling is occurring, the amount of sediment in suspension in the water during storm runoff events is more than the stream can efficiently transport, and therefore it is deposited onto the streambed, in this case on pool habitat. An exception to this generalization is the Tellico River site above the Rough Crossing Bridge on Trail 5 where moderate to high concentrations of suspended sediments (350 mg/L) are transported more efficiently through the reach.

Figure 3.1.1.11. Average pool filling from 2005, 2007, and 2008 data compared to median Total Suspended Solids (TSS) data from 1999 to 2006 for streams in the Upper Tellico River watershed, Sycamore Creek, and Citico Creek. TSS data does not exist for Sycamore Creek.



3.1.2 ENVIRONMENTAL CONSEQUENCES - SOILS & WATER RESOURCES

3.1.2.1 Best Management Practices by Alternative

During trail assessments Best Management Practices (BMPs) were noted including features such as rolling dips, water bars, drainage culverts, bridges, and sediment traps. These features along with typical out sloped road and gravel surfaced sections serve as the general techniques to address water runoff on the trail system. Table 3.1.2.1.1 summarizes the existing and planned sediment control BMPs for each alternative. For each of the alternatives, BMPs have been applied at the suggested spacing ranges given the site conditions at hand (Keller, G. and J. Sherar 2003 and NC DFR 2006). Over 2,400 BMP features are in place within the trail system at this time. Because of the reduction in trail miles proposed in each of the B – E alternatives, the number of BMPs needed would be less than the existing number. Alternative F-modified would create more trail miles than existing, but would require fewer BMP features since new trail would be constructed to a higher standard. The larger the number of drainage features, the lower the likelihood of them being effective because of the logistical and financial limitations of maintenance.

Table 3.1.2.1.1. Comparison by alternative of the number of sediment control BMPs for unpaved roads and trails in the analysis area.

Feature Description	Alt. A	Alt. B	Alt. C	Alt. D mod.	Alt. E	Alt. F mod.
Rolling Dip / Water Bar[1]	1,391	1,030	451	520	1,184	1,401
Drainage Culverts & Bridges	179	129	64	84	170	286
Sediment Traps	864	667	290	471	739	703
Total Number of Features:	**2,434**	**1,826**	**804**	**1,075**	**2,093**	**2,390**
Wet Weather Closures	No	Yes	No	No	No	No
Seasonal Closure	No	Yes	Yes	Yes	Yes	Yes
Paving of Trail 1 (0.92 miles)	No	Yes	Yes	Yes	Yes	Yes
Minimum Frequency of Maintenance[2]	< 1	4	1	4	4	4
Miles of unpaved road/trail within 100 feet of a stream[2]	6.05	4.4	2.07	3.04	4.62	4.69
Likelihood of BMP success[3]	None	Moderate	High	Moderate	Low	Low
Likelihood of Meeting State & Federal Standards	None	Moderate	High	Moderate	Low	Low

[1] Water bars are in Alternative A only since rolling dips would be constructed to replace waterbars in all of the action alternatives.
[2] Frequency of maintenance is the number of times per year to maintain BMPs on the entire trail system. It is estimated that 4 times per year would be a minimum when the system is used by Off-Highway Vehicles. The greater the miles of unpaved trail within 100 feet of a stream, the lower the likelihood of BMP success. Under Alternative C the remaining road network would be placed on the District's system road maintenance schedule.
[3] Likelihood of BMP success is based on the miles of trail within 100 feet of a stream and implementation of wet weather and seasonal closures.

Summarizing each alternative in comparison to Alternative A concluded that Alternative B would reduce the number of BMPs applied to 1,826, a reduction of 25% from existing. Alternative C would reduce BMPs by 67% to 804 BMP features; Alternative D-modified would reduce BMPs by 44% to 1,075 features; Alternative E by 14% to 2,093 BMP features; and finally Alternative F-modified would reduce the amount of BMPs needed by 1.8%, with 2,390 features. The frequency of maintenance of the entire system would increase for each action alternative.

Maintenance would include scheduled and reactionary maintenance; maintenance scheduled approximately every three months and maintenance responding to large storm events, respectively. Alternatives C and D-modified would convert the trail network into open Forest System road and therefore would be placed on the District's annual maintenance schedule. Alternative D-modified would require more maintenance than Alternative C since it would retain more miles of road open for high-clearance vehicles, and approximately three miles of road within 100 feet of a stream channel. Alternatives E and F-modified would require the greatest frequency of maintenance, beyond that which is scheduled, because they would have the greatest number of trail miles within 100 feet of a channel. Frequency of maintenance needed to maintain the trail systems under Alternatives E and F-modified could be as much as eight times a year assuming a wet season with frequent high intensity rain storms. Although Alternative B would retain almost as many miles of trail within 100 feet of a channel as Alternatives E and F-modified, this alternative would implement a wet weather closure that would reduce the need for "reactionary" maintenance. The frequency of maintenance under Alternative B would be about four times per year.

3.1.2.2. Effects on Soils by Alternative

To meet the purpose and need for this project, each alternative (except Alternative A: No Action) is designed to minimize soil damage by restraining accelerated erosion (Forest Plan, Forest-wide Direction, Soil and Water Management, Standard 7c), through some combination of trail decommissioning, relocation, reconstruction, closure, and/or additional drainage features, and assuming adequate post-implementation maintenance. Although implementation of this type of work would benefit the soil resource in the analysis area, each alternative offers different levels of benefit that will be evaluated. Also of concern is the ability to maintain the trail system left in place by each alternative. This will be measured by the likelihood of applied BMPs being successful at minimizing soil loss or erosion. Most trail locations in the analysis area are inherently susceptible to possible lapses in sediment control because soil stability ratings are *severe* for hazards of erosion and *poorly suited* for native surfaced roads. Trail locations near streams also present greater challenges in controlling sediment transport and deposition into nearby streams, and will be discussed in **Chapter 3.1.2.4 - Effects on Water Resources by Alternative**.

For this analysis of environmental consequences to the soil resource, the alternatives will be compared by assessing the likelihood that the alternative would minimize or reduce soil damage. The likelihood of successful implementation of BMPs (Table 3.1.2.2.1) and the change from current condition of miles of unpaved road or trail on soils with severe erosion hazard (Table 3.1.2.2.1) will be used to compare alternatives.

Table 3.1.2.2.1. Comparison of alternatives for the soil resource risk factor "Miles of System Unpaved Road & Trail" and "Miles of Unpaved Road or Trail on Severe Hazard of Erosion Soils." Values include all unpaved road and trail miles on federal lands in the analysis area.

Risk Factors	Alternatives					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Miles of System Unpaved Road & Trail*	38.7	30.9	12.9	20.2	37.1	42.9
Miles of All Unpaved System Road & Trail on "Severe Hazard of Erosion" Soils in the analysis area	38.5	30.5	12.6	20.0	36.7	42.6

* Includes 3.75 miles of unpaved road on Trail 1 for Alt. B – F and 4.67 miles for Alt. A, 0.63 miles of Trail 1 was paved following a separate decision memo.

Alternative A:

Direct and Indirect Effects

The effects of the no action alternative would be the same as the existing conditions described in the Affected Environment section. Specifically, these effects would be a continuation of accelerated erosion from the existing trail system and continuing sedimentation to streams. This alternative would retain approximately 38.5 miles of existing system roads and trails located on soils with inherently erosive characteristics, having a severe hazard of erosion for native surfaced trails (Table 3.1.2.2.1). The total 39.3 miles of OHV System trail (paved and unpaved) would be open year round, regardless of weather and trail conditions, and would not minimize soil damage. Many sections of trail cannot be properly maintained, even with the implementation of BMPs. In many locations, applied BMPs would remain largely ineffective.

This alternative would not meet forest plan direction since it would not minimize soil damage by restraining the current levels of accelerated erosion. Additionally, sections of trail considered "high challenge" would continue to be sources of soil contamination, and potentially water contamination from vehicle-derived fluids. The continued contamination of these sites would not meet North Carolina state guidelines to reduce nonpoint sources of pollution (NC DFR 2006). Refer to Section 3.1.2.4 for the effects to water resources.

Cumulative Effects

Cumulative effects on soil resources are assessed for the upper Tellico River and the Davis Creek watersheds. Past activities analyzed for cumulative effects do not go back more than 60 years when timber harvest occurred over most of the analysis area. Future activities include those projected out 10 years into the future.

Previous activities in the analysis area include timber harvest and road construction prior to Forest Service acquisition of the property and one Forest Service timber sale within the Jenks Branch watershed. Currently, the Farmer Branch Project will implement harvesting and regenerating five stands in the watershed for a total of 125 acres. Three stands along Trail 1 and two stands accessed from the Allen Gap parking lot will be harvested over the next few years. The effects of logging have been extensively studied. The Forest Service uses logging techniques designed to minimize erosion and sedimentation. Many of these techniques have been developed at the Coweeta Hydrologic Station in Otto, North Carolina. Monitoring of past and ongoing timber sales, including timber haul road construction, have shown that the BMPs employed during timber harvest are highly effective at minimizing soil erosion and sedimentation. Furthermore, the Tusquitee Ranger District has harvested 38 acres using the 2-age timber harvest method within the Jenks Branch watershed within the last 10 years. Post harvest monitoring has not located any sediment sources related to this timber sale, and none are anticipated from the Farmer Branch sale. Therefore there would be no cumulative impacts to sedimentation from these activities.

Private lands in the analysis area are primarily characterized by second home developments. Subdivisions are being developed within the Tipton Creek watershed. These activities include the construction of homes, graveled roads and driveways. Total suspended sediment and turbidity data indicates an increase in suspended sediment in Tipton Creek below the private inholdings. It is likely that erosion is occurring as a result of these ongoing private activities and that these activities are leading to adverse cumulative effects to soil loss and sedimentation in the Tellico River drainage. Other ongoing activities on private lands affecting the soil resource in the analysis area include the network of roads and trails in the Peckerwood Creek drainage. The extent of potential effects of this road network has not been determined.

The Tusquitee Ranger District has also implemented the paving of approximately 3,340 feet of Trail 1 adjacent to the Tellico River and lower Tipton Creek. These actions would likely result in a net reduction of sediments entering the Tipton Creek and Tellico River watersheds. There are no other actions proposed for the area on federal lands in the future. Therefore, there would be no additional effects from foreseeable future actions. There are no other known future actions planned for private lands that would affect the soil resources of the project area.

The cumulative effects of Alternative A would be continued erosion of the existing 39.3 miles of trails minus the reduction of erosion on the 3,340 feet of Trail 1 being paved. Alternative A would not meet forest plan direction and standards for minimizing soil damage, and would not meet NC water quality standard for turbidity.

Alternatives B, C, & D-modified:

Direct and Indirect Effects

The effects of Alternatives B, C, and D-modified would be similar in that they would each reduce the number of miles of total trail length on soils with inherently erosive characteristics. Seasonal closure of the road and/or trail system during periods of freeze and thaw of soils would greatly reduce soil damage and subsequent erosion from the trail system. The wet weather trail system closure proposed in Alternative B and D-modified would provide additional protection and soil loss. Closures would help protect BMP features, therefore requiring less maintenance over time and lower maintenance costs.

Alternative C would reduce the amount of unpaved road or trail on severe hazard soil types by the greatest amount, leaving 12.6 miles of system road on these soils (Trail 6 and sections of Trails 2, 4, 5, and 7) (Table 3.1.2.2.1). Alternative D-modified reduces the amount of unpaved road or trail on severe hazard soil types to 20.0 miles. Both alternatives C and D-modified would convert all remaining trails to system roads and implement a seasonal closure. Alternative B reduces road and trail on severe hazard soil types to 30.5 miles. Alternative B would leave a trail system on the landscape; however it would implement a seasonal and wet weather closure that would help to mitigate soil erosion. The reduction in trail miles from each alternative would reduce the erosion and loss of soil from the existing trail system. Additionally, sections of trail considered “high challenge” on Trails 2, 7, 9, and 12 would be decommissioned in each alternative, reducing the risk of vehicle fluid spills and subsequent soil (and potentially water) contamination from petroleum products. The elimination of these sites would meet North Carolina state guidelines to reduce nonpoint sources of pollution (NC DFR 2006).

These alternatives each reduce soil damage, although Alternative C would do the most to effectively minimize soil damage, followed by Alternative D-modified, then Alternative B. To promote meeting the Forest Plan direction and the State standard for turbidity, each alternative would have BMPs implemented on the remaining road and trail system that would be designed to effectively restrain accelerated erosion and prevent sediment delivery to streams. BMPs would include such measures as; gravel and larger size stone surfacing, trail relocation and reconstruction to frequently remove storm runoff from the trail surface (e.g., rolling dips, and outsloping), seasonal and storm-event closures, properly sized sediment traps, brush barriers, and scheduled and reactionary maintenance.

If BMPs are implemented and effective on the road and trail system, there would be an overall benefit from each alternative on the soil resource. However, it is assumed that the likelihood of BMP effectiveness or success differs by alternative. Table 3.1.2.1.1 presents the likelihood of success in general terms, ranging from a definite “no liklihood” of success (Alternative A) to a “high likelihood” of success. The measure of “likelihood of success” is based on miles of trail within 100 feet of stream and the implementation of trail closures.

Therefore, Alternative C is estimated to have the highest likelihood of implementing successful BMPs and meeting Forest Plan standards. Alternatives B and D-modified would each reduce adverse soil impacts through the decommissioning and improvements of trails in areas of concern; the remaining trail and road systems are estimated to have a Moderate likelihood of implementing successful BMPs and meeting standards.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The paved section of Trail 1 would eliminate many sediment sources along Tellico River and Tipton Creek. The cumulative effects of Alternatives B, C, and D-modified would reduce soil damage by restraining accelerated erosion (Forest Plan, Forest-wide Direction, Soil and Water Management, Standard 7c), through decommissioning, reconstruction, implementing storm-event and seasonal closures, implementing BMPs, and post-implementation maintenance. Because Alternative C reduces the greatest miles of trail on severe hazard soils and has the highest likelihood of BMP success, the greatest cumulative benefit to the soil resource would come from Alternative C, followed by Alternative D-modified, and Alternative B.

Alternative E:

Direct and Indirect Effects

The effects of Alternative E would be a net reduction in the number of miles of total trail length on soils with inherently erosive characteristics. Seasonal closure of the trail system during periods of freeze and thaw of soils would greatly reduce soil damage and subsequent erosion from the trail system. A wet weather closure would not be implemented in this alternative. By not implementing a wet weather closure, the risk of trail erosion and soil damage during these periods is higher than Alternatives B, C, and D-modified. Alternative E would reduce the amount of unpaved road or trail on severe hazard soil types, leaving 36.7 miles of system road and trail (Table 3.1.2.2.1). The reduction in trail miles would reduce the erosion and loss of soil from the existing trail system.

Additionally, sections of trail considered “high challenge” on Trails 2, 7, and 12 would be decommissioned, reducing the risk of soil (and potentially water) contamination from petroleum products. Alternative E would retain the high challenge area on Trail 9, a known source of contamination from vehicle-derived fluids. The continued contamination at this site would not meet North Carolina state guidelines to reduce nonpoint sources of pollution, unless the Forest Service prepares and implements a spill response plan that facilitates a rapid cleanup of any size spill (NC DFR 2006).

This alternative would implement BMPs on the remaining road and trail system that would be designed to effectively restrain accelerated erosion and prevent sediment delivery to streams. BMPs would include such measures as; gravel and larger size stone surfacing, trail relocation and reconstruction to frequently remove storm runoff from the trail surface (e.g., rolling dips, and outsloping), seasonal closures, properly sized sediment traps, brush barriers, and scheduled and reactionary maintenance.

If BMPs are implemented and effective on the road and trail system, there would be an overall benefit from Alternative E on the soil resource. However, because of a “low

likelihood" of successful implementation of BMPs, the benefit to the soil resource would be limited and less from this alternative than Alternatives B, C, and D-modified. Compared to Alternatives A and F however, the benefit would be greater. Additionally, the likelihood of this alternative meeting the Forest Plan standard, to minimize soil damage, would be met in some places with the decommissioning and improvements of trails in areas of concern, but would not likely meet the standard for long, because of the low likelihood of BMP success on the remaining trail system.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. Paving of Trail 1 would eliminate many sediment sources along Tellico River and Tipton Creek. The cumulative effects of Alternative E would reduce soil damage by restraining accelerated erosion (Forest Plan, Forest-wide Direction, Soil and Water Management, Standard 7c), through the decommissioning and improvements of trails in areas of concern. However the relatively high miles of trail remaining on sensitive soils and a low likelihood of BMP success on the remaining trail system, the cumulative benefit would be less from this alternative than Alternatives B, C, and D-modified, but greater than Alternatives A and F.

Alternative F-modified:

Direct and Indirect Effects

Alternative F-modified increases the number of miles of unpaved road and trail on soils with inherently erosive characteristics. Seasonal closure of the trail system during periods of freeze and thaw of soils would greatly reduce soil damage and subsequent erosion from the trail system. Similar to Alternative E, a wet weather closure would not be implemented in this alternative. By not implementing a wet weather closure, the risk of trail erosion and soil damage during these periods is higher than Alternatives B, C, and D-modified. Since Alternative F-modified would construct several miles of new trail, it would not reduce the amount of unpaved road or trail on severe hazard soil types, leaving 42.6 miles on the system. This alternative would only move the "severe" potential for erosion from the Tellico River headwaters (above Tipton Creek) to the headwaters of Tipton Creek. However, a reduction in erosion and loss of soil from the existing trail system is expected since trails experiencing excessive erosion would be decommissioned or rerouted, and the new trail construction (Trail 13) would be designed and constructed to minimize trail erosion.

Additionally, sections of trail considered "high challenge" on Trails 7 and 12 would be decommissioned, reducing the risk of soil (and potentially water) contamination from petroleum products. Similar to Alternative E, Alternative F-modified would retain the high challenge area on Trail 9, a known source of contamination from vehicle-derived fluids. The continued contamination at this site would not meet North Carolina state guidelines to reduce nonpoint sources of pollution, unless the Forest Service prepares and implements a spill response plan that facilitates a rapid cleanup of any size spill (NC DFR 2006). Additionally, high challenge areas on Trails 2 and 11 would remain, and therefore a risk of soil and water contamination in those locations would persist.

Alternative F-modified would implement BMPs on the remaining road and trail system that would be designed to restrain accelerated erosion and prevent sediment delivery to streams. BMPs would include such measures as; gravel and larger size stone surfacing, trail relocation

and reconstruction to frequently remove storm runoff from the trail surface (e.g., rolling dips, and outsloping), seasonal closures, properly sized sediment traps, brush barriers, and scheduled and reactionary maintenance.

However, because of a low likelihood of successful implementation of BMPs, the benefit to the soil resource would be limited and certainly less from this alternative than Alternatives B, C, D-modified, and E. Additionally, the likelihood of this alternative meeting the Forest Plan standard, to minimize soil damage, would be met initially with the decommissioning and improvements of trails in areas of concern, but would not likely meet the standard following such work, because of the low likelihood of BMP success on the remaining trail system.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. Paving of Trail 1 would eliminate many sediment sources along Tellico River and Tipton Creek. The cumulative effects of Alternative F-modified would reduce soil damage by restraining accelerated erosion (Forest Plan, Forest-wide Direction, Soil and Water Management, Standard 7c), through the decommissioning and improvements of trails in areas of concern. Because of the relatively high miles of trail remaining on sensitive soils and a low likelihood of BMP success on the remaining trail system, the cumulative benefit would be less from this alternative than Alternatives B, C, D-modified, and E, but greater than Alternative A.

3.1.2.3 Summary of Effects to Soil Resources

While Alternatives B through F-modified are designed to minimize soil damage by restraining accelerated erosion (based on Forest Plan direction, Soil and Water Management, Standard 7c), the likelihood of meeting the standard depends on the miles of trail system on *severe hazard* soils (Table 3.1.2.2.1) and the likelihood of meeting BMPs.

To ensure meeting the Forest Plan standard regarding visible sediment and the State water quality standard for turbidity, each alternative would need to implement and maintain BMPs on the remaining road and trail system, which effectively restrain accelerated erosion and prevent sediment delivery to streams. Because implementing effective BMPs has been found to be challenging in the analysis area, alternatives with a low likelihood of successful BMP implementation and more unpaved trail or road miles have a higher risk of not meeting standards.

For these reasons, Alternatives B through F-modified are all associated with a higher likelihood of success than Alternative A (current condition). Alternative F-modified increases the trail miles on severe hazard soils and has a low likelihood of BMP success. All other action alternatives reduce the amount of trail on severe hazard soils, while at the same time no alternative – even closing the OHV System – eliminates all of these roads or trails. However Alternative C (system closure) reduces the amount to a much greater degree than any other alternative and has a high likelihood of BMP success. Based on this information the alternatives can be ordered from least likely to most likely to succeed in meeting Forest Plan standards for no visible sediment:

None	Low	Moderate	High
Alt. A			
	Alt. F-mod.	Alt. B & Alt. D-mod.	Alt. C
	Alt. E		

3.1.2.4. Effects on Water Resources by Alternative

To meet the purpose and need for this project, each alternative (except Alternative A: No Action) is designed to minimize soil loss and protect water quality by preventing visible sediment from entering intermittent or perennial streams or perennial waterbodies (Forest Plan and State of N.C. Performance Standard (NC DFR 2007)), through some combination of trail decommissioning, relocation, reconstruction, closure, and/or additional drainage features, and assuming adequate post-implementation maintenance. Although implementation of this type of work would benefit water quality of the project area, each alternative offers different levels of benefit that will be evaluated. Trail locations near streams also present greater challenges in controlling sediment transport and deposition into nearby streams, and therefore trails within 100 feet and 25 feet (Table 3.1.2.4.1 and Table 3.1.2.4.2) will be used as a measure of alternative comparison. Also of concern is the ability to maintain the transportation system left in place by each alternative. This will be measured by the likelihood of applied BMPs (Table 3.1.2.1.1) being successful at preventing visible sediment from entering streams and meeting the State turbidity standard.

Table 3.1.2.4.1. Miles of road and trail within 100 feet of a perennial stream. Data generated from GIS using a 100 foot horizontal measurement from perennial streams.

Trail	Alternative					
	A	B	C	D	E	F
1	1.00	1.00[1]	1.00[1]	1.00[1]	1.00[1]	1.00[1]
2	0.60	0.37	0.37	0.37	0.37	0.60
3	0.48	0.48	0.0	0.0	0.48	0.48
4	0.69	0.27	0.48	0.48	0.27	0.27
5	0.80	0.66	0.73	0.66	0.66	0.66
5-6 Connector	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.07	0.07[2]	0.0	0.07[2]	0.07[2]	0.07[2]
8	0.97	0.97	0.0	0.97	0.97	0.97
9	0.09	0.0	0.0	0.0	0.0	0.0
10	0.26	0.0	0.0	0.0	0.22[3]	0.0
10A	1.09	1.09	0.0	0.0	1.09	1.09
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.06
Total	6.05	4.91	2.58	3.55	5.13	5.20
Net reduction of miles of trail within 100 feet of streams	0	1.14	3.47[4]	2.50	0.92	0.85

1. Part of Trail 1 would be paved, reducing long-term sediment inputs.
2. Relocations would improve trail grade and erosion control.
3. Relocation would improve trail grade but still requires a stream crossing.
4. Additional sediment reductions would result from road reshaping (Trails 1, 2, 4, and 5), seeding, and closure (Trail 4), and paving (Trail 1).

Table 3.1.2.4.2. Miles of road and trail within 25 feet of a perennial stream. Data generated from GIS using a 25 foot horizontal measurement from perennial streams.

Trail	Alternative					
	A	B	C	D	E	F
1	0.05	0.05[1]	0.05[1]	0.05[1]	0.05[1]	0.05[1]
2	0.24	0.14	0.14	0.14	0.14	0.24
3	0.06	0.06	0.0	0.0	0.06	0.06
4	0.06	0.05	0.05	0.05	0.06	0.06
5	0.13	0.13	0.13	0.13	0.13	0.13
5-6 Connector	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.02	0.02[2]	0.0	0.02[2]	0.02[2]	0.02[2]
8	0.21	0.21	0.0	0.21	0.21	0.21
9	0.02	0.0	0.0	0.0	0.0	0.0
10	0.05	0.0	0.0	0.0	0.05[3]	0.0
10A	0.16	0.16	0.0	0.0	0.16	0.16
11	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.01
Total	1.0	0.82	0.37	0.60	0.88	0.89
Net reduction of miles of trail within 25 feet of streams	0	0.18	0.63[4]	0.40	0.12	0.11

1. Part of Trail 1 would be paved, reducing long-term sediment inputs .
2. Relocations would improve trail grade and erosion control.
3. Relocation would improve trail grade and erosion control but still requires a stream crossing.
4. Additional sediment reductions would result from road reshaping (Trails 1, 2, 4, and 5), seeding, and closure (Trail 4), and paving (Trail 1).

Alternative A:

Direct and Indirect Effects

The effects of the no action alternative would be the same as the existing conditions described in Section 3.1.1. Specifically, these effects would be a continuation of chronic sedimentation from the existing trails, continuing sedimentation of riffles and pools, and the potential for continued declines in fish populations. This alternative would retain approximately 6.05 miles of existing trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain the existing 1.0 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2). Applied BMPs would continue to be mostly ineffective at controlling soil erosion and runoff under current trail conditions and level of use. Approximately 63 springs would be allowed to flow within or across the trails. These springs would continue collecting sediments and transporting these sediments to larger streams.

This alternative would not reduce sedimentation derived from the trail system; a known violator of the Forest Plan and State water quality protection standard to prevent visible sediment from entering intermittent or perennial streams or perennial waterbodies. Additionally, elevated levels of turbidity would continue to exceed the State standard and

adversely affect the designated protected uses of the Tellico River, particularly aquatic life propagation and survival.

Cumulative Effects

Cumulative effects on water are assessed for the upper Tellico River and the Davis Creek watersheds. Past activities analyzed for cumulative effects do not go back more than 60 years when timber harvest occurred over most of the analysis area. Future activities include those projected out 10 years into the future.

Previous activities in the analysis area include timber harvest and road construction prior to Forest Service acquisition of the property and one timber sale within the Jenks Branch watershed. Currently, the Farmer Branch Project will implement harvesting and regenerating five stands in the watershed for a total of 125 acres. Three stands along Trail 1 and two stands accessed from the Allen Gap parking lot will be harvested over the next few years. The effects of logging have been extensively studied. The Forest Service uses logging techniques designed to minimize erosion and sedimentation. Many of these techniques have been developed at the Coweeta Hydrologic Station in Otto, North Carolina. Monitoring of past and ongoing timber sales, including timber haul road construction, have shown that the BMPs employed during timber harvest are highly effective at minimizing sedimentation. Furthermore, the Tusquitee Ranger District has harvested 38 acres using the 2-age timber harvest method within the Jenks Branch watershed within the last 10 years. Post harvest monitoring has not located any sediment sources related to this timber sale, and none are anticipated from the Farmer Branch sale.

Private lands in the analysis area are primarily characterized by second home developments. Subdivisions are being developed within the Tipton Creek watershed. These activities include the construction of graveled roads and driveways. These developments are subject to the North Carolina Sedimentation Pollution Control Act of 1973, which should provide protection to the aquatic resources. Effects to aquatic resources are likely occurring due to private activities because TSS and turbidity data indicate an increase in suspended sediment and pebble counts show a 53% increase in fine sediment deposition below the private in-holding. These activities are leading to adverse cumulative effects on water quality. There are no other ongoing activities on private lands known to be affecting the aquatic resources in the project area.

The Tusquitee Ranger District is also implementing the paving of approximately 3,340 feet of Trail 1 adjacent to the Tellico River and lower Tipton Creek. These actions would likely result in a net reduction of sediments entering the Tipton Creek and Tellico River watersheds. There are no other actions proposed for the analysis area on federal lands in the future; therefore, there would be no effects from future actions. There are no known future actions planned for private lands that would affect the water resources of the project area.

The cumulative effects of Alternative A would be continued sedimentation from the existing 6.05 miles of trails within 100 feet of perennial streams. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs. Additionally, effects from the private development within Tipton Creek are expected to continue. Accumulation of toxic

substances in the high challenge areas would also continue. Cumulatively, Alternative A would not meet forest plan standards for preventing visible sediment from entering streams or the State of North Carolina turbidity standard.

Alternative B:

Direct and Indirect Effects

The effects of Alternative B would be a net reduction of 1.14 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for improvement in stream turbidity. This alternative would retain approximately 4.91 miles of existing trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 0.82 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01 miles of road within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative B would reduce miles of trail within 100 feet on Trails 2, 4, and 5, and eliminate sections on Trails 9 and 10. Overall, the remaining 4.91 miles of unpaved trail within 100 feet of streams would have BMPs applied that would be designed to reduce sediment yield. BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the trail. BMPs in this alternative are estimated to have a moderate likelihood of successfully controlling sediment delivery from the open trail system to streams. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and several unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated.

This alternative would reduce sedimentation to streams within the analysis area by closure of many of the most eroding trail sections and repair the remainder of the trails. Fine sediment deposition found on riffle and pool habitat would slowly diminish as new sediment sources are reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion. Accumulation of toxic substances in the high challenge areas would be reduced.

Alternative B would require installation of approximately 52 new culverts to cross ephemeral stream channels. Approximately 30 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails and trail crossings are decommissioned or repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of construction Best Management Practices (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Sediment traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or sediment traps within 25 feet are the most vulnerable to sedimentation because these

locations have less surface area to filter sediments when sediment traps over-flow during storm events. This alternative would eliminate 0.18 miles of these most vulnerable locations in the Tellico River Watershed.

The proposed seasonal and storm-event closures would provide additional water quality protection by avoiding soil disturbing OHV/ATV use during the wettest season. This closure should reduce the amount of erosion and sedimentation, and hasten improvements to turbidity and aquatic habitats.

The proposed camping restrictions would have no effects on water resources because the dispersed camping areas along the upper Tellico River have already been closed. Additional closures would only affect remaining campsites, which are not located in riparian areas. The proposed four-wheel drive lock-in restriction on OHVs would help reduce erosion by reducing the amount of tire spinning and digging on the trail surface.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs. The paving in this alternative when combined with the paving implemented in the spring of 2009 will cover over half the locations where visible sediment was tracked from the trail to the stream during condition surveys in 2007 and 2008.

The cumulative effects of Alternative B would be the elimination of sedimentation from the approximately 1.14 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.18 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 4.91 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Alternative B would reduce visible sediment entering streams and therefore reduce turbidity. However, under Alternatives B the remaining trail system is estimated to have a moderate likelihood of implementing successful BMPs and meeting the State turbidity standards. Of the alternatives proposing continued OHV use, Alternative B would provide the lowest amount of risk to water resources.

Alternative C:

Direct and Indirect Effects

The effects of Alternative C would be a net reduction of 3.47 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for improvement in turbidity. This alternative would retain approximately 2.58 miles of existing trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 0.37 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01 miles of road within 100 and 25 feet , respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative C would reduce miles of trail within 100 feet on Trails 2, 4, and 5, and eliminate sections on Trails 3, 7, 9, 10, and 10A. Overall, the remaining 1.58 miles of unpaved trail within 100 feet of streams would be converted to system road. Since traffic on these roads is expected to decrease under this alternative, applied BMPs are likely to be more effective at reducing sediment yield from the roads. BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the trail. Because these road segments are near stream channels, the risk remains that sediment would be transported from the roads to nearby streams. However, BMPs in this alternative are estimated to have a high likelihood of successfully controlling sediment delivery to streams. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and many unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated.

This alternative would reduce sedimentation to streams within the analysis area by closure of many of the most eroding trail sections and repair the residual roads. Fine sediment deposition found on riffle and pool habitat would slowly diminish as new sediment sources are reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion. Accumulation of toxic substances in the high challenge areas would be stopped.

Alternative C would require installation of approximately 15 new culverts to cross ephemeral stream channels. Approximately 135 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails crossings are decommissioned and residual road crossings are repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of construction BMPs (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Sediment traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or sediment traps within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when sediment traps over-flow during storm events. This alternative would eliminate 0.63 miles of these most vulnerable locations in the Tellico River Watershed.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs. The paving in this alternative when combined with the paving implemented in the spring of 2009 will cover over half the locations where visible sediment was tracked from the trail to the stream during condition surveys in 2007 and 2008.

The cumulative effects of Alternative C would be the elimination of sedimentation from the approximately 3.47 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.63 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 2.58 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Of the six alternatives, Alternative C would provide the highest level of sediment reduction and provide the greatest likelihood of meeting forest plan standards for preventing visible sediment from entering streams and therefore reduce turbidity. Under Alternatives C the remaining road system is estimated to have a high likelihood of implementing successful BMPs and meeting the State turbidity standards.

Alternative D-modified:

Direct and Indirect Effects

The effects of Alternative D-modified would be a net reduction of 2.50 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for improvement in turbidity. This alternative would convert the trails to system road and retain approximately 3.55 miles of existing road within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 0.6 miles of road within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01 miles of road within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative D-modified would reduce miles of road within 100 feet on Trails 2, 4, and 5 and eliminate sections on Trails 3, 9, 10, and 10A. Overall, the remaining 3.55 miles of unpaved system road within 100 feet of streams would have BMPs applied that are designed to reduce sediment yield. BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the road. BMPs in this alternative are estimated to have a moderate likelihood of successfully controlling sediment delivery from roads to streams. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and several unnamed tributaries to Tellico River, where road segments within 100 feet of a stream would be reduced or eliminated.

This alternative would reduce sedimentation to streams within the analysis area by closure of many of the most eroding trail sections and repair the remainder of the trails to a high clearance, highway-legal road network. Fine sediment deposition found on riffle and pool habitat would slowly diminish as new sediment sources are reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion. Accumulation of toxic substances in the high challenge areas would be stopped.

Alternative D-modified would require installation of approximately 52 new culverts to cross ephemeral stream channels. Approximately 66 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails and trail crossings are decommissioned or repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of BMPs (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Sediment traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with roads and trails within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when sediment traps over-flow during storm events. This alternative would eliminate 0.40 miles of these most vulnerable locations in the Tellico River Watershed.

The effects of the proposed seasonal closure and new camping restrictions would be the same as described for Alternative B.

Alternative D-modified would reduce visible sediment entering streams more than Alternatives A, B, E, and F-modified, but less than C. Under Alternatives D-modified the remaining transportation system is estimated to have a moderate likelihood of implementing successful BMPs and meeting the State turbidity standards.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs. The paving in this alternative when combined with the paving implemented in the spring of 2009 will cover over half the locations where visible sediment was tracked from the trail to the stream during condition surveys in 2007 and 2008.

The cumulative effects of Alternative D-modified would be the elimination of sedimentation from the approximately 2.50 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.40 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 3.55 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue.

Alternative E:

Direct and Indirect Effects

The effects of Alternative E would be a net reduction of 0.92 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for

some improvement stream turbidity. This alternative would retain approximately 5.13 miles of trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 0.88 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01 miles of road within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative E would reduce miles of trail within 100 feet on Trails 2, 4, 5, and 10, and eliminate sections on Trail 9. Overall, the remaining 5.23 miles of unpaved trail within 100 feet of streams would have BMPs applied that would be designed to reduce sediment yield. BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the trail. BMPs in this alternative are estimated to have a low likelihood of successfully controlling sediment delivery to streams. Therefore, BMPs on road segments near stream channels are not expected to eliminate sediment delivery from trails to nearby streams under this alternative. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and several unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated. Accumulation of toxic substances in the high challenge areas would be stopped, except on Trail 9, and therefore a risk of water contamination persists.

This alternative would reduce sedimentation to streams within the analysis area by closure of some of the most eroding trail sections and repair the remainder of the trails. Fine sediment deposition found on riffle and pool habitat would slowly diminish as new sediment sources are slowly reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion. However, Alternative E would likely continue to produce sediment in the Peckerwood Creek watershed and the headwaters of the Tellico River (where Trails 10 and 10A are adjacent to the Tellico River and its tributaries).

Alternative E would require installation of approximately 62 new culverts to cross ephemeral stream channels. Approximately 9 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails and trail crossings are decommissioned or repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of construction BMPs (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Sediment traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or sediment traps within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when sediment traps over-flow during storm events. This alternative would eliminate 0.12 miles of these most vulnerable locations in the Tellico River Watershed.

Expanding the use of Trail 10 to accommodate full-size OHVs would likely increase use of this trail and possibly increase sedimentation of streams within 25 feet of the trail. Trail condition surveys found that 46 of 47 sites within 25 feet of streams surveyed along Trail 10 were contributing sediment to those streams. The sediment traps proposed for this alternative

would likely over-top during rain events exceeding 1 inch/day. As the trail condition survey results suggest, these sediments would likely enter the streams - depositing on larger substrates and increasing turbidity.

The proposed seasonal closure would provide additional water quality protection by avoiding soil disturbing OHV/ATV use during the wettest season. This closure should reduce the amount of erosion and sedimentation, and hasten improvements to turbidity and aquatic habitats. In the absence of storm-event closure, improvements to water quality would be less evident than in Alternatives B and D that proposed such closures.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs. The paving in this alternative when combined with the paving implemented in the spring of 2009 will cover over half the locations where visible sediment was tracked from the trail to the stream during condition surveys in 2007 and 2008.

The cumulative effects of Alternative E would be the elimination of sedimentation from the approximately 0.91 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.12 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 5.14 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Of the alternatives proposing continued OHV use, Alternative E would provide a lower level of sediment reduction and habitat improvements than Alternatives B, C, or D-modified.

While Alternative E would reduce visible sediment entering streams, sediment from Trail 10 in particular may continue to present a challenge to control. Also, under Alternatives E the remaining trail system is estimated to have a low likelihood of implementing successful BMPs and meeting the State turbidity standard.

Alternative F-modified:

Direct and Indirect Effects

The effects of Alternative F-modified would be a net reduction of 0.85 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for improvement stream turbidity. This alternative would retain approximately 5.20 miles of trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 0.89 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01 miles of road within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek.

Compared to Alternative A, Alternative F-modified would reduce miles of trail within 100 feet on Trails 2, 4, 5, and 10, and eliminate sections on Trail 9. With the construction of Trail 13, this alternative would add 0.06 miles of system trail within 100 feet of upper Tipton Creek. Overall, the remaining 4.20 miles of unpaved trail within 100 feet of streams would have BMPs applied that would be designed to reduce sediment yield. BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the trail. BMPs in this alternative are estimated to have a low likelihood of successfully controlling sediment delivery to streams. Therefore, BMPs on road segments near stream channels are not expected to eliminate sediment delivery from trails to nearby streams under this alternative. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and several unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated. An increase of sediment to streams could occur in the upper Tipton Creek drainage.

This alternative would reduce sedimentation to streams within the analysis area by closure of some of the most eroding trail sections and repair the remainder of the trails. Fine sediment deposition found on riffle and pool habitat would slowly diminish as new sediment sources are reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion. However, Alternative F-modified would likely continue to produce sediment in the Peckerwood Creek watershed and the headwaters of the Tellico River (where Trail 10A is adjacent to the Tellico River and its tributaries). Additionally, the proposed Trail 13 would cross the watershed of upper Tipton Creek and Bearpen Branch. Upper Tipton Creek and Bearpen Branch contains one of the few stream channels currently unaffected by OHV/ATV use. This trail would come within 25 feet of the head of Bearpen Branch. Trail condition surveys have shown that trails within 25 feet of a stream have had a nearly 100% chance of releasing sediments to streams. Sedimentation sources may develop in this new trail reach that could reduce water quality. Accumulation of toxic substances in the high challenge area on Trails 7 and 12 would be stopped, however areas on Trails 2, 9, and 11 would remain, and therefore a risk of water contamination would persists.

Alternative F-modified would require installation of approximately 62 new culverts to cross ephemeral stream channels plus an additional unknown number of culverts to cross springs exposed during construction. Approximately 9 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails and trail crossings are decommissioned or repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of BMPs (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Sediment traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or sediment traps within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when sediment traps over-flow during storm events. This alternative would eliminate 0.11 miles of these most vulnerable locations in the Tellico River Watershed.

The effects of retaining and expanding the use of Trails 10 and 10A would be the same as described for Alternative E. Sediments would likely enter the streams - depositing on larger substrates and increasing turbidity.

The effects of the proposed seasonal closure would be the same as described for Alternative E.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs. The paving in this alternative when combined with the paving implemented in the spring of 2009 will cover over half the locations where visible sediment was tracked from the trail to the stream during condition surveys in 2007 and 2008.

The cumulative effects of Alternative F-modified would be the elimination of sedimentation from the approximately 0.85 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.11 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 5.20 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Of the alternatives proposing continued OHV use, Alternative F-modified would provide a lower level of sediment reduction and habitat improvements than Alternatives B, C, D-modified, or E.

While Alternative F-modified would reduce visible sediment entering streams from the existing trail system, sediment from Trail 10A in particular may continue to present a challenge to control. New sediment sources could be created with Trail 13, and on the new trail sections proposed on Trails 7 and 9. The extent is largely unknown until construction occurs. This alternative would provide a better likelihood of improving water quality than Alternative A, but the remaining trail system is estimated to have a low likelihood of implementing successful BMPs and meeting the State turbidity standard.

See “Consistency with State and Forest Plan Standards” section in Section 3.2.3 for summary by alternative of standards and protected uses.

3.2 Aquatic Wildlife

3.2.1 AFFECTED ENVIRONMENT

Boundaries of Aquatic Analysis Area
The aquatic analysis area for this project consists of the entire upper Tellico River watershed downstream to the confluence with Rough Ridge Creek. This includes those waters in the area of potential site-specific impacts on aquatic habitat and populations, and encompasses waters downstream that potentially could be impacted by project activities.

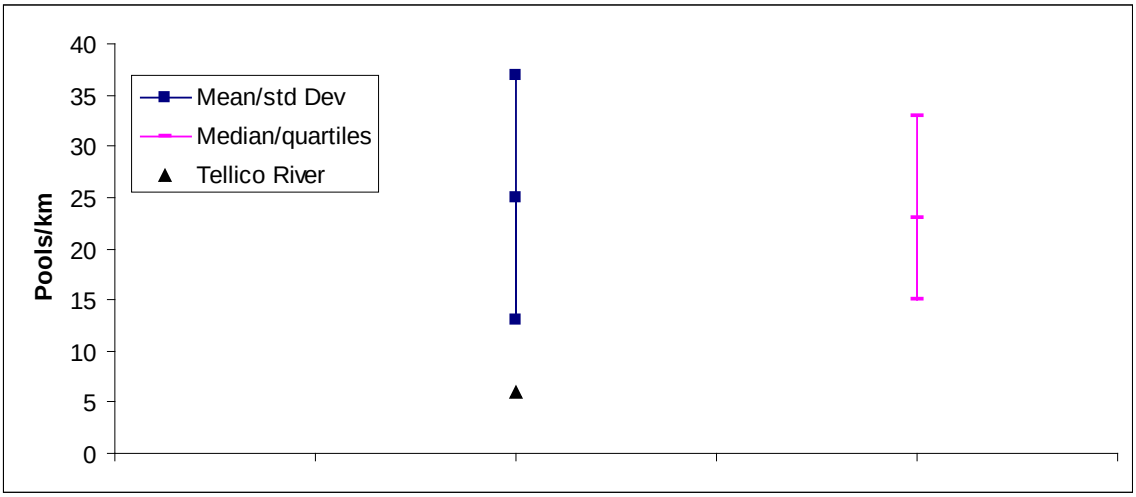
Information presented in the previous Soil and Water section is also used in this analysis.

Existing Condition

There are approximately 25 miles of perennial steam within the Tellico River watershed in North Carolina. Of these miles, approximately 14.80 (60%) are first order streams, 6.81 (27%) are second order streams, and 3.31 (13%) are third order streams.

Stream habitat conditions have been surveyed across the Nantahala National Forest using the Basinwide Visual Estimation Technique (Moran and Roghair 2006, Dolloff et al 1993, Roghair 2003). The upper Tellico River was surveyed using this technique in 2004 and 2005. It has fewer pools per kilometer than the mean number or median number across the forest (Figure 3.2.1.1). Pools are an important habitat type for many fish species; including brook trout, rainbow trout, and brown trout. The lack of pool habitats within the upper Tellico River may reduce the river's ability to support trout species.

Figure 3.2.1.1. Mean and median pools per kilometer of 49 streams across the Nantahala National Forest. Number of pools per kilometer within the Tellico River – 2004 and 2005 survey data.



The relatively few pools present are also of poorer quality than the reference stream conditions (see Figure 3.1.1.4). As pools fill with sediment, the homogenous structure makes

them less suitable for trout. Such pools have few crevices and concealment areas for adult trout to escape predators and rest.

Substrates within the upper Tellico River watershed are embedded by sands and silt (Figure 3.1.1.3). These small substrate particles have been shown to be limiting factors in the spawning success of salmonids. Brook trout spawning success can be reduced by increases in sediments when it accumulates within the spawning gravels (Alexander and Hansen 1986, Argent and Flebbe 1999, Curry and MacNeill 2004, Meyer et al. 2005).

Total Suspended Sediments (TSS) within the watershed have generally been higher near the OHV System than in reference areas (Table 3.1.1.3). Increases in turbidity have been shown to reduce trout foraging abilities by reducing sight distance for feeding trout (Barrett et al. 1992, Sweka and Hartman 2001, and White and Harvey 2007).

Water temperature monitoring has indicated that all streams within the upper Tellico River watershed in North Carolina are suitable for brook trout. The upper thermal tolerance for brook trout is estimated to be between 16 - 22°C (Etnier and Starnes 1993, Eaton and Scheller 1996, and Clark et al 2001). The maximum temperature for the monitoring period (December 2007 – July 2008) for any stream within the watershed was approximately 18°C.

Toxicity tests within and adjacent to three high challenge areas within the OHV System have shown elevated levels of petroleum products (Mahan 2008). We do not yet know if these substances are reaching water, so more testing is planned. Research in aquatic environments has shown that toxic substances are often closely associated with sediments (Krein and Schorer 2000). Direct and indirect effects (i.e. reduced egg and larval fish survival, higher susceptibility to infectious diseases and parasites, and population depletions) have been documented in fishes exposed to petroleum products (Murphy et al. 1999, Arkoosh et al. 1998). Petroleum products have also been shown to accumulate within fatty tissues of fish eggs, reducing the viability of the eggs (Arkoosh et al. 1998). These toxins can also decrease the number of eggs produced and cause deformities in larval fish (Hall and Oris 1991; as cited by Kime 1995). Toxic substances may be further inhibiting reproduction and recruitment of fish populations within the upper Tellico River watershed. Effects of toxins are more likely to occur in those stream reaches receiving sediments from over-topping silt traps.

Acid Deposition – Water Chemistry

Based on elevation and the amount of wet sulfur deposition, the upper Tellico watershed has been identified as having the greatest risk to acidification from acidic deposition from the atmosphere when rating all of the 5th level hydrologic unit codes (HUC) on the Nantahala and Pisgah National Forests. Excessive deposition of acidic compounds of sulfur and nitrogen from the atmosphere can cause an adverse impact to the health of the vegetation and aquatic ecosystems.

Typically, the deposition of sulfur compounds is of greatest concern since it is usually deposited as sulfuric acid, which lowers the pH of the soils. A reduction of soil pH below 4.5 is likely to allow aluminum to become mobile and move into the soil water solution (Elliott et al. 2008). High concentrations of aluminum are toxic to aquatic organisms.

The acid neutralizing capacity (ANC) of a watershed can be calculated as the sum of the bases (calcium, magnesium, potassium and sodium) minus the sum of the mineral acids (sulfate, nitrate, and chloride). Streams having ANC values of greater than 50 microequivalents per liter (μeq/L) are thought to have adequate buffering capacity to offset the future deposition of sulfur and nitrogen compounds. ANC values less than zero (0) are considered chronically acidic and have no buffering capacity. Many aquatic organisms would generally not occur under such conditions, including native brook trout.

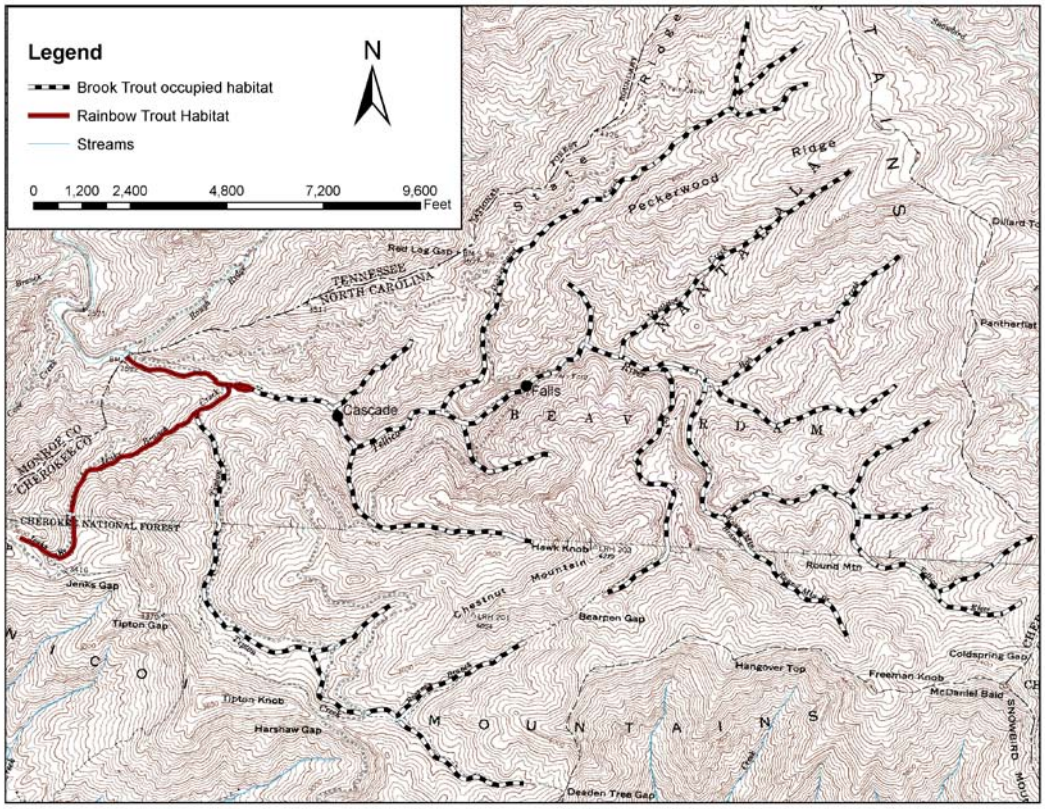
Seven locations in the upper Tellico area have had the water samples processed to estimate the stream ANC. One stream (Jenks Branch) was classified as having adequate buffering capacity (lab ANC = 69.7 μeq/L). The remaining six streams as well as most of the other streams sampled in adjacent watersheds were classified as potentially sensitive. Most of the upper Tellico watershed has a low buffering capacity to offset any sulfur released from the soils or deposited from the atmosphere. Based upon the scientific literature and the inventory results from the watershed it appears acid deposition could be a contributor to why 30 percent of the brook trout range has been lost in the watershed and why the trout densities are lower than expected.

Aquatic populations

The fish community of the upper Tellico River watershed is predominantly a coldwater fishery. Brook trout, rainbow trout, brown trout, blacknose dace, creek chub, and northern hogsuckers inhabit the river. Rainbow trout and brown trout are both non-native species introduced into the watershed for recreational fishing purposes. No rainbow trout or brown trout are currently being stocked by the North Carolina Wildlife Resources Commission (NCWRC) into this watershed. Upper Tellico River watershed trout populations were monitored from 1994-2006 by the NCWRC (Besler et al. 2007).

Fishing pressure in the upper Tellico River watershed is not expected to be any greater than streams in other parts of the forest. Fishing pressure on trout streams on the forest has not been shown to be a limiting factor in trout densities because the NCWRC has developed fishing regulations to prevent overexploitation of the fishery resources (Borawa and Clemmons 1998, Borawa 1999). Furthermore, brook trout streams in the Great Smoky Mountains National Park that were previously closed to fishing showed no changes in fish density or size structure after the streams were reopened to fishing (Kulp and Moore in press).

Figure 3.2.1.2. Distribution of trout within the Tellico River watershed, North Carolina.



Brook trout- Brook trout inhabit most of the watershed from a cascade on the upper Tellico River upstream throughout the tributaries (Figure 3.2.1.2). Although brook trout occasionally occur in the Tellico River near the state line, this species is unable to compete with the rainbow trout and brown trout in this portion of the Tellico River. Therefore, the brook trout population remains confined to the portions of the watershed that are isolated by physical barriers (i.e. falls).

NCWRC monitoring indicated that the reference site (Tipton Creek) contained a mean number of 640 age-0 brook trout per hectare (standard error = 169) while the stream within the OHV System (Peckerwood Creek) contained a mean number of 422 age-0 brook trout per hectare, standard error = 130 (Besler et al. 2007). Although the sample size is small for each site, the Peckerwood Creek site appeared to have lower densities of age-0 brook trout than the Tipton Creek site. No data were gathered during this monitoring to determine the factors affecting the brook trout population numbers.

Brook trout reproductive behavior is classified as substrate modifiers – egg hiding (Balon 1975, Jones et al 1999) – burying their eggs within the gravel substrate. Sediments can cover these nests and smother the developing eggs (Argent and Flebbe 1999). Alexander and Hansen (1986) also documented a reduction of recruitment of age-0 brook trout in a stream experimentally treated with sands. Based upon the available monitoring data from the upper Tellico River watershed and data from other fisheries research, the sediment loading that is coming from the Tellico OHV System is likely to be having a negative effect upon brook trout reproduction. These findings are consistent with studies of salmonids across the United States (Furniss et al 1991, Waters 1995).

Rainbow trout and brown trout – Rainbow trout and brown trout inhabit the mainstem of the Tellico River from a cascade on the upper Tellico River downstream into Tennessee. Rainbow trout also occur within Jenks Branch.

NCWRC monitoring indicated that the age-0 fish densities and standing crops for rainbow trout and brown trout in the upper Tellico River were considerably lower than the reference sites (Besler et al. 2007). Although the sample size is small for each site, the Tellico River sites appear to have lower densities of age-0 rainbow trout and brown trout than any of the other North Carolina sites. No data were gathered during this monitoring to determine the factors affecting the rainbow trout or brown trout population numbers.

Rainbow trout and brown trout reproductive behavior is classified as substrate modifiers – egg hiding (Balon 1975, Jones et al 1999). The spawning behaviors of these species are similar to the spawning behavior of the brook trout; therefore, the negative effects of sedimentation are likely similar for these species (see brook trout discussion above).

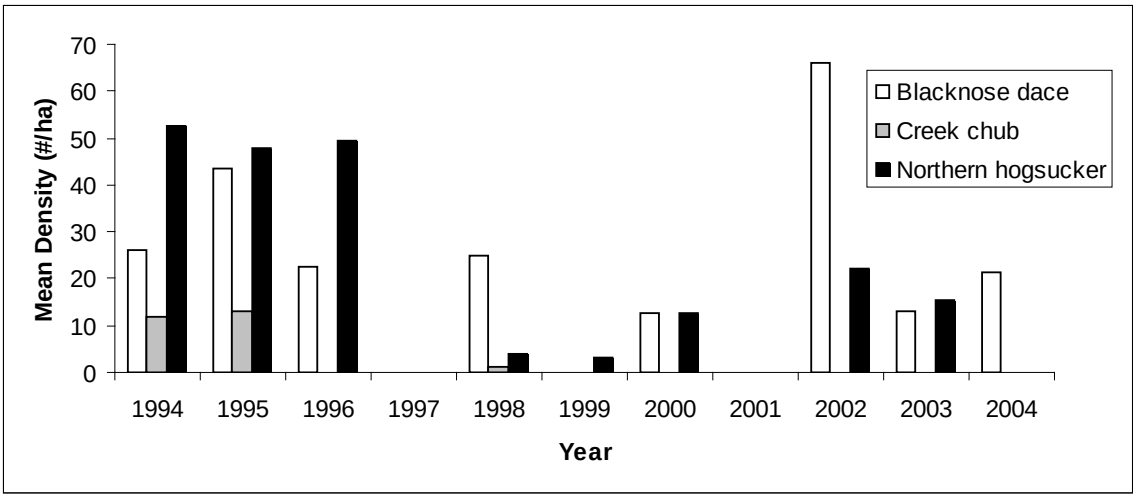
Non-game fish community – The non-game fish community within the analysis area is greatly limited by the physical barriers located on the North Carolina portion of the Tellico River. Blacknose dace, creek chubs, and northern hogsuckers occupy a portion of the Tellico River downstream of the cascade on the upper Tellico River (Figure 3.2.1.2). The North Carolina portion of the Tellico River is the uppermost reach of suitable habitat for these species. No suitable habitats exist for these species within the tributaries.

The mean densities of blacknose dace in the upper Tellico River have shown considerable variation (Figure 3.2.1.3). The population experienced a decline in the late 1990's through the early 2000's. The blacknose dace population has shown some recovery in recent years. The mean densities of creek chubs declined in the 1990's and have not yet recovered (Figure 3.2.1.3). The mean densities of northern hogsuckers exhibited a similar trend as the blacknose dace population.

Much of the variation in mean densities among these populations is likely related to the spawning behaviors of the species. Blacknose dace and northern hogsuckers broadcast their eggs generally over cobbles and large gravels. These species provide no parental care and the larval fishes generally hide under stones within the substrate (Balon 1975). High sedimentation levels within the upper Tellico River watershed have reduced the availability of open spaces within the substrates – the key habitat feature for developing larval fishes.

The creek chub is a nesting species which builds small mounds using small gravels (Jones et al. 1999). The decline in mean densities of this species has likely resulted from a combination of factors including sedimentation of riffle areas, which are important for spawning, and the filling of pools, which are key adult habitats (Etnier and Starnes 1993). Substrate monitoring (see section 3.1 – Soil and Water) has indicated that the upper Tellico River riffles contain a higher portion of sands and silts, which are embedding the larger substrates, than do the reference reaches. Monitoring has also indicated that the pools within the upper Tellico River, which are below the forest-wide average number per kilometer (Figure 3.2.1.1), have been filled with considerable amounts of sands and silts. These conditions produce poor habitats for all life stages of the creek chubs – likely resulting in the observed decline in mean densities (Figure 3.2.1.3).

Figure 3.2.1.3. Mean densities of non-game fish species within the upper Tellico River, North Carolina – 1994-2004.



Aquatic insect community – The aquatic insect community within the upper Tellico River watershed has been monitored since May 2007 by Western Carolina University. . In general, species diversity among all sites was similar for macroinvertebrates (Ferrell 2009). Ferrell (2009) also found a positive correlation of percent silt/clay particles and small aquatic invertebrates (meiofauna). These results suggest that the sedimentation from the OHV activities has altered the aquatic invertebrate community at the smaller scale but the effects are reduced for the larger size invertebrates. A benthological survey was conducted by the NCDENR in 2009 within the Upper Tellico OHV Area. These surveys resulted in an excellent bioclassification for all streams surveyed (NCDENR 2009). While the aquatic insect surveys within the Upper Tellico River watershed have indicated there is no difference among the surveyed streams, aquatic insects are generally poor indicators of ecosystem stress due to sedimentation (Zweig and Rabeni 2001 *in* NCDENR 2009).

Desired Conditions for Aquatic Resources

Protection of specific habitat elements for the brook trout involves maintaining water quality to North Carolina state standards, preventing sedimentation of spawning gravels, and protecting stream bank integrity. Improving brook trout habitat is a forest plan standard (LRMP Amendment 5 page III-185). Furthermore, the desired condition for the Tellico River and its tributaries is to "manage streams for self-sustaining fish populations where conditions are favorable…emphasize habitat for specific Management Indicator Species which represent this group" (LRMP Amendment 5 page III-185).

The forest plan also provides direction to "maintain the natural hydraulic and hydrologic functioning of the stream channel and protect the integrity of the stream system including channel, banks, and stream bottom" (LRMP Amendment 5 page III-187). This direction places emphasis upon reducing negative effects upon riparian dependent resources, which includes wild trout populations and other aquatic organisms.

3.2.2 ENVIRONMENTAL CONSEQUENCES

Environmental consequences to aquatic wildlife resources are evaluated based on impacts to the following: Proposed, Endangered, Threatened, or Sensitive (PETS) aquatic species, aquatic Management Indicator Species (MIS), and aquatic Forest Concern (FC) species.

Aquatic Species Evaluated and Rationale

Previous Survey Information

Thirteen aquatic PETS species are either known to occur or may occur on the Nantahala National Forest. The North Carolina Natural Heritage Database was queried for occurrences of PETS species in Cherokee County. Additionally, species known to occur within the Little Tennessee River system were included since the Tellico River is within this basin. These species were then filtered using their habitat information and the availability of these habitats within the aquatic analysis area. Species that do not have suitable habitat within the project or analysis areas were eliminated from further analysis. Based upon the results of this filtering process no proposed, endangered, threatened, or sensitive aquatic species were evaluated for this analysis. A complete list of species considered is available from the project record.

The federally threatened species yellowfin madtom and spotfin chub, and the federally endangered species duskytail darter and smoky madtom have been reintroduced to the Tellico River near Mile 33 in Tennessee. These populations, listed as non-essential experimental populations by the U. S. Fish and Wildlife Service, are located approximately 15 river miles downstream of the aquatic analysis area. The upper Tellico River and its tributaries are isolated from any downstream threatened, endangered, or sensitive aquatic species because numerous physical barriers are located within the Tellico River downstream of the North Carolina state line. Furthermore, any effects of the alternatives would dissipate prior to reaching these species or their habitats because numerous tributaries enter the Tellico River between the aquatic analysis area and the occupied habitats.

Effects of Alternatives on Federally Endangered, Threatened, Proposed, or Sensitive Aquatic species

There are no known proposed, threatened, or endangered species in the project area. The affected areas of the proposed project are outside the range of the species and these areas currently contain no habitat for any proposed, endangered, threatened, or sensitive aquatic species. As such, there will be no direct or indirect effects to any federally listed species or habitats. In the absence of direct and indirect effects of the proposed action, there would be no cumulative effects to any proposed, endangered, threatened, or sensitive aquatic species.

Management Indicator Species:

Aquatic MIS listed in the LRMP represent all biological communities and special habitats on the Nantahala/Pisgah National Forests. Only those MIS that would be affected by the proposed project are fully evaluated; the following paragraphs explain why certain LRMP MIS were eliminated from further consideration.

Tipton Creek, Peckerwood Creek, and the upper Tellico River were surveyed by the NCWRC, U.S. Forest Service, and TVA.

Table 3.2.2.1: Species data from NCWRC, USFS, and Tennessee Valley Authority (TVA) surveys.

Stream	Year	Species located
Tipton Creek	1990	Wild rainbow trout
Tellico River	1981,1994-2006	Wild rainbow trout, wild brown trout, wild brook trout, northern hogsucker, creek chub, and blacknose dace

Largemouth bass (*Micropterus salmoides*) occur in reservoirs. This habitat does not occur within the analysis area; therefore, largemouth bass and its habitat will not be analyzed further. Smallmouth bass (*Micropterus dolomieu*) inhabit coolwater and warmwater steams. No coolwater or warmwater stream habitats exist for smallmouth bass within the aquatic analysis area; therefore, this species will not be analyzed. Wild brook trout (*Salvelinus fontinalis*), blacknose dace (*Rhinichthys atratulus*), wild rainbow trout (*Oncorhynchus mykiss*) and wild brown trout (*Salmo trutta*) are coldwater fish species; therefore, these species were retained within the analysis. Warmwater streams, coolwater streams, and reservoirs will not be analyzed for this project because none occur within the aquatic analysis area. Therefore, there would be no effects to any warmwater streams, coolwater streams, or reservoirs.

The effects of this project would dissipate prior to reaching the point where any streams become suitable for warmwater or coolwater species.

Wild brook trout, wild rainbow trout, wild brown trout, and blacknose dace were selected as management indicator species for this project given their known presence and the presence of suitable habitat in the waters within the aquatic analysis area. Management activities most likely to affect brook trout, rainbow trout, brown trout, and blacknose dace habitat would be changes in water quality, particularly sedimentation of pools and spawning substrates. Trail condition surveys have indicated that trails within 100 feet of streams have a moderately high probability of contributing sediment to those streams. Trails within 25 feet of streams were found to have the highest probability of contributing sediment to streams. Therefore, changes to the amount of trail within 100 feet and within 25 feet of perennial streams serve as indicators for analysis of the effects of each alternative.

Effects on Aquatic MIS by Alternative

This section references MIS tables in section 3.1.

Alternative A:

Direct and Indirect Effects

The effects of the no action alternative would be the same as the existing conditions described in Chapter 3.2.1. Specifically, these effects would be a continuation of chronic sedimentation from the existing trails, continuing sedimentation of riffles and pools, and the potential for continued declines in fish populations. This alternative would retain approximately 6.05 miles of existing trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain the existing 1.0 miles of trail within 25 feet of

perennial streams (Table 3.1.2.4.2). Approximately 63 springs would be allowed to flow within or across the trails. These springs would continue collecting sediments and transporting these sediments to larger streams.

This alternative would not reduce sedimentation to any streams within the aquatic analysis area. This alternative would not meet forest plan direction because habitats for the aquatic MIS would continue to be degraded by sediments embedding larger substrates and the filling of pools. Stream turbidity would continue to be elevated during storm events by sediment entrained within the storm flows. This increased turbidity would likely limit the feeding ability of the aquatic MIS by reducing the sight distance for fishes.

Cumulative Effects

The boundaries for the cumulative effects analysis for aquatic resources are the same as the boundaries for the Aquatic Analysis Area. Previous activities in the project area include timber harvest and road construction prior to Forest Service acquisition of the property and one timber sale within the Jenks Branch watershed. Currently, the Farmer Branch Project will implement harvesting and regenerating five stands in the watershed for a total of 125 acres. Three stands along Trail 1 and two stands accessed from the Allen Gap parking lot will be harvested over the next few years. The effects of logging have been extensively studied. The Forest Service uses logging techniques designed to minimize erosion and sedimentation. Many of these techniques have been developed at the Coweeta Hydrologic Station in Otto, North Carolina. Monitoring of past and ongoing timber sales, including timber haul road construction, have shown that the BMPs employed during timber harvest are highly effective at minimizing sedimentation. Furthermore, the Tusquitee Ranger District has harvested 38 acres using the 2-age timber harvest method within the Jenks Branch watershed within the last 10 years. Post harvest monitoring has not located any sediment sources related to this timber sale, and none are anticipated from the Farmer Branch sale.

Private lands in the project area are primarily characterized by second home developments. Subdivisions are being developed within the Tipton Creek watershed. These activities include the construction of graveled roads and driveways. These developments are subject to the North Carolina Sedimentation Pollution Control Act of 1973, which should provide protection to the aquatic resources. However, effects to aquatic resources are likely occurring due to private activities because TSS and turbidity data indicate an increase in suspended sediment and pebble counts show a 53% increase in fine sediment deposition below the private in-holding. These activities are leading to adverse cumulative effects. There are no other ongoing activities on private lands known to be affecting the aquatic resources in the project area.

The Tusquitee Ranger District is also implementing the paving of approximately 3,340 feet of Trail 1 adjacent to the Tellico River and lower Tipton Creek. These actions would likely result in a net reduction of sediments entering the Tipton Creek and Tellico River watersheds. The Tusquitee Ranger District is proposing to install dying hemlocks into the Tellico River to improve the river's ability to process sediments and to improve fish habitat. These activities may cause a short-term increase in sediment deposition immediately upstream of the new logs but these additional structures should improve long-term channel stability and help remove sediments from the channel. There are no other actions proposed for the project area on federal lands in the future; therefore, there would be no effects from

future actions. There are no known future actions planned for private lands that would affect the aquatic resources of the project area.

The cumulative effects of Alternative A would be continued sedimentation from the existing 6.05 miles of trails within 100 feet of perennial streams. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs and the improvement of fish habitats following the large woody debris installation that is planned. Additionally, effects from the private development within Tipton Creek are expected to continue. Accumulation of toxic substances in the high challenge areas would also continue. Alternative A would not meet forest plan standards for preventing visible sediment from entering streams or forest direction to restore and enhance habitats for associated aquatic MIS.

Alternative B:

Direct and Indirect Effects

The effects of Alternative B would be a net reduction of 1.14 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for improvement in fish populations as spawning habitat and pool conditions improve. This alternative would retain approximately 4.91 miles of existing trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 0.82 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01 miles of trail within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative B would reduce miles of trail within 100 feet on Trails 2, 4, and 5, and eliminate sections on Trails 9 and 10. Overall, the remaining 4.41 miles of unpaved trail within 100 feet of streams would have BMPs applied that would reduce sediment yields (assuming the application of gravel and adequate maintenance of applied BMPs). BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail, sediment yield would increase from the trail. Because these road segments are near stream channels, these improvements are not expected to eliminate sediment delivery from trails to nearby streams under this alternative. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and several unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated.

This alternative would reduce sedimentation to streams within the aquatic analysis area by closure of many of the most eroding trail sections and repair the remainder of the trails. Habitats for the aquatic MIS would slowly improve as new sediment sources are reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion.

Alternative B would require installation of approximately 52 new culverts to cross ephemeral stream channels. Approximately 30 existing stream crossings would be decommissioned. There may be a short-term (approximately two days at each new, reconstructed, or

decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails and trail crossings are decommissioned or repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of Best Management Practices (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Silt traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or silt traps within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when silt traps over-flow during storm events. This alternative would eliminate 0.18 miles of these most vulnerable locations in the Tellico River Watershed.

The proposed seasonal closure would provide additional aquatic resource protection by avoiding soil disturbing OHV/ATV use during the wettest season. This closure should reduce the amount of erosion and sedimentation, and hasten improvements to the habitats for the aquatic MIS.

The storm-event closure may reduce erosion and sedimentation by eliminating vehicle traffic on soft trail surfaces. These closures would help improve habitats for aquatic MIS.

The proposed camping restrictions would have no effects on aquatic resources because the dispersed camping areas along the upper Tellico River have already been closed. Additional closures would only affect remaining campsites, which are not located in riparian areas.

The proposed four-wheel drive lock-in restriction on OHVs would help reduce erosion by reducing the amount of tire spinning and digging on the trail surface.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs and the improvement of fish habitats following the large woody debris that is planned.

The cumulative effects of Alternative B would be the elimination of sedimentation from the approximately 1.14 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.18 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 4.91 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Accumulation of toxic substances in the high challenge areas would be reduced. Alternative B would reduce visible sediment entering streams. This alternative would also be a positive action in regard to forest plan direction for aquatic resources: to restore and enhance habitats for associated aquatic MIS.

Alternative C:

Direct and Indirect Effects

The effects of Alternative C would be a net reduction of 3.47 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for improvement in fish populations as spawning habitat and pool conditions improve. This alternative would retain approximately 2.58 miles of existing trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 0.37 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01 miles of trail within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative C would reduce miles of trail within 100 feet on Trails 2, 4, and 5, and eliminate sections on Trails 3, 7, 9, 10, and 10A. Overall, the remaining unpaved trail within 100 feet of streams would be converted to system road. Since traffic on these roads is expected to decrease under this alternative, applied BMPs are likely to be more effective at reducing sediment yield from the roads. BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the trail. Because these road segments are near stream channels, the risk remains that sediment would be transported from the roads to nearby streams. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and many unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated.

This alternative would reduce sedimentation to streams within the aquatic analysis area by closure of many of the most eroding trail sections and repair the residual roads. Habitats for the aquatic MIS would slowly improve as new sediment sources are reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion.

Alternative C would require installation of approximately 15 new culverts to cross ephemeral stream channels. Approximately 135 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails crossings are decommissioned and residual road crossings are repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of Best Management Practices (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Silt traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or silt traps within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when silt traps over-flow during storm events. This alternative would eliminate 0.63 miles of these most vulnerable locations in the Tellico River Watershed.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs and the improvement of fish habitats following the large woody debris installation that is planned.

The cumulative effects of Alternative C would be the elimination of sedimentation from the approximately 3.47 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.63 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 2.58 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Accumulation of toxic substances in the high challenge areas would be stopped. Of the six alternatives, Alternative C would provide the highest level of sediment reduction and provide the greatest likelihood of fish habitat recovery. Alternative C would meet forest plan standards for preventing visible sediment from entering streams. This alternative would provide more positive action to move the aquatic resources towards the forest plan direction to restore and enhance habitats for associated aquatic MIS than any of the other alternatives.

Alternative D:

Direct and Indirect Effects

The effects of Alternative D would be a net reduction of 2.50 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for improvement in fish populations as spawning habitat and pool conditions improve. This alternative would retain approximately 3.55 miles of existing trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 0.60 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01 miles of trail within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative D would reduce miles of trail within 100 feet on Trails 2, 3, 4, 5, and 9and eliminate sections on Trails 10 and 10A. Overall, the remaining 2.57 miles of unpaved trail within 100 feet of streams would have BMPs applied that would reduce sediment yield (assuming the application of gravel and adequate maintenance of applied BMPs). BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the trail. Because these road segments are near stream channels, these improvements are not expected to eliminate sediment delivery from trails to nearby streams under this alternative. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and

several unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated.

This alternative would reduce sedimentation to streams within the aquatic analysis area by closure of many of the most eroding trail sections and repair the remainder of the trails. Habitats for the aquatic MIS would slowly improve as new sediment sources are reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion.

Alternative D would require installation of approximately 52 new culverts to cross ephemeral stream channels. Approximately 66 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails and trail crossings are decommissioned or repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of Best Management Practices (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Silt traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or silt traps within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when silt traps over-flow during storm events. This alternative would eliminate 0.40 miles of these most vulnerable locations in the Tellico River Watershed.

The effects of the proposed seasonal closure, storm-event closure, new camping restrictions, and four-wheel drive lock-in would be the same as described for Alternative B.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs and the improvement of fish habitats following the large woody debris installation that is planned.

The cumulative effects of Alternative D would be the elimination of sedimentation from the approximately 2.50 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.40 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 3.55 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Accumulation of toxic substances in the high challenge areas would be stopped. Of the alternatives proposing continued OHV use, Alternative D would provide the lowest amount of risk to aquatic resources.

Alternative D would reduce visible sediment entering streams more than Alternatives A, B, E, and F, but less than C. Alternative D would be a positive action in regard to forest plan direction for aquatic resources: to restore and enhance habitats for associated aquatic MIS. This alternative would provide a higher likelihood of moving the aquatic resources towards this forest plan direction than Alternatives A, B, E, or F.

Alternative E:

Direct and Indirect Effects

The effects of Alternative E would be a net reduction of 0.92 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for some improvement in fish populations as spawning habitat and pool conditions improve. This alternative would retain approximately 5.13 miles of trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 1.55 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 and 0.01 miles of trail within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative E would reduce miles of trail within 100 feet on Trails 2, 4, 5, and 10, and eliminate sections on Trail 9. Overall, the remaining 4.62 miles of unpaved trail within 100 feet of streams would have BMPs applied that would reduce sediment yield (assuming the application of gravel and adequate maintenance of applied BMPs). BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the trail. Because these road segments are near stream channels, these improvements are not expected to eliminate sediment delivery from trails to nearby streams under this alternative. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and several unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated.

This alternative would reduce sedimentation to streams within the aquatic analysis area by closure of some of the most eroding trail sections and repair the remainder of the trails. Habitats for the aquatic MIS would improve somewhat as new sediment sources are slowly reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion. However, Alternative E would likely continue to produce sediment in the Peckerwood Creek watershed and the headwaters of the Tellico River (where Trails 10 and 10A are adjacent to the Tellico River and its tributaries). These headwater streams all contain the southern Appalachian brook trout. Therefore, adverse effects to this species would continue, albeit, at a reduced magnitude.

Alternative E would require installation of approximately 62 new culverts to cross ephemeral stream channels. Approximately 9 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails and trail crossings are decommissioned or repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching.

Effects of construction and reconstruction would be minimized by application of Best Management Practices (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Silt traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or silt traps within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when silt traps over-flow during storm events. This alternative would eliminate 0.12 miles of these most vulnerable locations in the Tellico River Watershed.

Expanding the use of Trail 10 to accommodate full-size OHVs would likely increase use of this trail and possibly increase sedimentation of streams within 25 feet of the trail. Trail condition surveys found that 46 of 47 sites within 25 feet of streams surveyed along Trail 10 were contributing sediment to those streams. The silt traps proposed for this alternative would likely over-top during rain events exceeding 1 inch/day. As the trail condition survey results suggest, these sediments would likely enter the streams – embedding larger substrates and reducing habitat quality for brook trout.

The effects of the proposed seasonal closure would be the same as described for Alternative B.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs and the improvement of fish habitats following the large woody debris installation that is planned.

The cumulative effects of Alternative E would be the elimination of sedimentation from the approximately 0.92 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.12 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 5.13 miles of trails within 100 feet of perennial streams (1.55 miles of which are within 25 feet of perennial streams). This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Accumulation of toxic substances in the high challenge areas would be stopped. This alternative would provide less potential for recovery of the southern Appalachian brook trout habitat within the headwater streams. Of the alternatives proposing continued OHV use, Alternative E would provide a lower level of sediment reduction and habitat improvements for the Aquatic MIS than Alternatives B, C, or D.

While Alternative E would reduce visible sediment entering streams, sediment from Trail 10 in particular may continue to present a challenge to control . This alternative would be a positive action in regard to forest plan direction for aquatic resources: to restore and enhance habitats for associated aquatic MIS. This alternative would provide a higher likelihood of moving the aquatic resources towards the forest plan direction to restore and enhance habitats for associated aquatic MIS than Alternatives A or F.

Alternative F-modified:

Direct and Indirect Effects

The effects of Alternative F-modified would be a net reduction of 0.85 miles of trail within 100 feet of streams. Specifically, these effects would be a reduction of chronic sedimentation from the existing trails, a reduction of sedimentation within riffles and pools, and the potential for improvement in fish populations as spawning habitat and pool conditions improve. This alternative would retain approximately 5.20 miles of trails within 100 feet of perennial streams (Table 3.1.2.4.1). This alternative would also retain approximately 1.56 miles of trail within 25 feet of perennial streams (Table 3.1.2.4.2).

Approximately 0.51 miles and 0.01miles of trail within 100 and 25 feet, respectively, would be paved (Trail 1), resulting in a notable reduction in sediment yield to Tipton Creek. Compared to Alternative A, Alternative F-modified would reduce miles of trail within 100 feet on Trails 2, 4, 5, and 10, and eliminate sections on Trail 9. With the construction of Trail 13, this alternative would add 0.06 miles of system trail within 100 feet of upper Tipton Creek. Overall, the remaining 4.69 miles of unpaved trail within 100 feet of streams would have BMPs applied that would reduce sediment yield (assuming the application of gravel and adequate maintenance of applied BMPs). BMPs would be designed to accommodate a design storm size and duration (e.g., a 1 inch / 24-hour rainfall) based on local precipitation data. When storms exceed the design storm or when BMPs fail sediment yield would increase from the trail. Because these road segments are near stream channels, these improvements are not expected to eliminate sediment delivery from trails to nearby streams under this alternative. A reduction in sediment to streams would be notable in Jenks Branch, Peckerwood Creek, Tellico River and several unnamed tributaries to Tellico River, where trail segments within 100 feet of a stream would be reduced or eliminated. An increase of sediment to streams could occur in the upper Tipton Creek drainage.

This alternative would reduce sedimentation to streams within the aquatic analysis area by closure of some of the most eroding trail sections and repair the remainder of the trails. Habitats for the aquatic MIS would slowly improve as new sediment sources are reduced and old sediments are scoured from the stream channels. Stream turbidity would decline due to the reduction of chronic erosion. However, Alternative F-modified would likely continue to produce sediment in the Peckerwood Creek watershed and the headwaters of the Tellico River (where Trails 10 and 10A are adjacent to the Tellico River and its tributaries). These headwater streams all contain the southern Appalachian brook trout. Therefore, adverse effects to this species would continue, albeit, at a reduced magnitude. Additionally, the proposed Trail 13 would cross the watershed of upper Tipton Creek and Bearpen Branch. Upper Tipton Creek and Bearpen Branch contains one of the few remaining brook trout populations that is currently unaffected by OHV/ATV use. This trail would come within 25 feet of the head of Bearpen Branch. Trail condition surveys have shown that trails within 25 feet of a stream have had a nearly 100% chance of releasing sediments to streams. Sedimentation sources may develop in this new trail reach that could reduce habitat quality for the southern Appalachian brook trout.

Alternative F-modified would require installation of approximately 62 new culverts to cross ephemeral stream channels plus an additional unknown number of culverts to cross springs

exposed during construction. Approximately 9 existing stream crossings would be decommissioned. There may be a short-term (approximately 2 days at each new, reconstructed, or decommissioned stream crossing) increase in sedimentation and turbidity in streams during construction where existing trails and trail crossings are decommissioned or repaired. These short-term effects would dissipate as the disturbed soil is stabilized by seeding and mulching. Effects of construction and reconstruction would be minimized by application of Best Management Practices (e.g. silt fence, brush barriers, seeding, and mulching). These BMPs have proven successful at reducing sedimentation on road construction projects across the forest. Silt traps within 25 feet of perennial streams may continue to release some sediment to streams during storm events exceeding 1 inch/day. Streams with trails and/or silt traps within 25 feet are the most vulnerable to sedimentation because these locations have less surface area to filter sediments when silt traps over-flow during storm events. This alternative would eliminate 0.11 miles of these most vulnerable locations in the Tellico River Watershed.

The effects of retaining and expanding the use of Trails 10 and 10A would be the same as described for Alternative E. Sediments would likely enter the streams – embedding larger substrates and reducing habitat quality for brook trout.

The effects of the proposed seasonal closure would be the same as described for Alternative B.

Cumulative Effects

The effects of past, ongoing, and future actions would be the same as described for Alternative A. The cumulative effects of this alternative would also include the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs and the improvement of fish habitats following the large woody debris installation that is planned.

The cumulative effects of Alternative F-modified would be the elimination of sedimentation from the approximately 0.85 miles of trail within 100 feet of perennial streams, the elimination of approximately 0.11 miles of trail within 25 feet of perennial streams, and a reduction of chronic sedimentation from the remaining 5.20 miles of trails within 100 feet of perennial streams. This alternative may cause a temporary increase in turbidity and sedimentation at the proposed stream crossings but these effects would dissipate as the constructed areas are stabilized after construction is completed. Additionally, effects from the private development within Tipton Creek are expected to continue. Accumulation of toxic substances in the high challenge areas would be stopped. Of the alternatives proposing continued OHV use, Alternative F-modified would provide a lower level of sediment reduction than Alternatives B, C, D, or E.

While Alternative F-modified would reduce visible sediment entering streams from the existing trail system, sediment from Trail 10 in particular may continue to present a challenge to control. A new potential sediment source would be created with Trail 13. This alternative would provide a better opportunity for meeting the forest plan direction to restore and enhance habitats for associated aquatic MIS than Alternative A. However, this alternative may not meet forest plan direction for the upper Tipton Creek watershed because Trail 13 would introduce new sediment effects to the currently unaffected brook trout

population, and add to current increases in sedimentation from the private in-holding along Tipton Creek.

Effects of proposed alternatives on aquatic forest concern species

Forty-two aquatic forest concern species are either known to occur or may occur on the Nantahala National Forest. The North Carolina Natural Heritage Database was queried for occurrences of forest concern species in Cherokee County. Additionally, species known to occur within the Little Tennessee River system were included since the Tellico River is within this basin. Fourteen forest concern species remained after this initial filter. These fourteen species were then filtered using their habitat information and the availability of these habitats within the aquatic analysis area. Based upon the results of this filtering process three forest concern species were evaluated in this analysis (Table 3.2.2.4). These species were analyzed for this project because they are either known to occur within the analysis area or suitable habitat exists for these species. Species that do not have suitable habitat within the analysis area were eliminated from further analysis. A complete list of species considered is available from the project record. The aquatic analysis area for this project consists of the Tellico River from the headwaters downstream to Rough Ridge Branch.

Table 3.2.2.4: Known and potential forest concern aquatic species in Cherokee County evaluated for the Upper Tellico OHV Project (See also Attachments A1 and A2).

Forest Concern Species			
Species	**Type**	**Habitat**	**Occurrence**
Cryptobranchus alleganiensis	Amphibian	Rivers and large streams in Tennessee and Savannah system	May occur in project area*
Baetopus trishae	Mayfly	Specifics unknown	May occur in project area*
Habrophlediodes spp.	Mayfly	Specifics unknown	May occur in project area*

*Where may occur means the species probably occurs in a specified area in the broadest sense. Only very general habitat preferences and species distribution are used to determine if a species may occur. This does not imply their existence in an area, but that their general habitat description is found in the area, so therefore the species may occur.

Direct and Indirect Effects – Forest Concern Species

The direct and indirect effects of each alternative on the forest concern aquatic species would be the same as described for the MIS.

Cumulative Effects – Forest Concern Species

The cumulative effects of implementing any of the action alternatives (Alternatives B, C, D, E, or F) are the effects of the proposed actions and the reduction of sedimentation along Trail 1 adjacent to the Tellico River and lower Tipton Creek where paving occurs and the improvement of fish habitats following the large woody debris installation that is planned. The cumulative effects to the aquatic forest concern species would be the same as those described for MIS above. Although each alternative may impact individuals of the three forest concern species, these impacts would not cause a trend to federal listing because the species habitats are broadly distributed across the forest. Impacts of the alternatives would be limited to streams within the Tellico River watershed and a very small portion of the Cook Creek watershed (Hiwassee River drainage).

Table 3.2.2.5: Determination of effect of the Upper Tellico OHV Project on the evaluated forest concern species.

Species	Alternative					
	A	B	C	D	E	F
Cryptobranchus alleganiensis	May impact[2]	May impact[2]	May impact[1]	May impact[2]	May impact[2]	May impact[2]
Baetopus trishae	May impact[2]	May impact[2]	May impact[1]	May impact[2]	May impact[2]	May impact[2]
Habrophlediodes spp.	May impact[2]	May impact[2]	May impact[1]	May impact[2]	May impact[2]	May impact[2]

1. May impact individuals during stream crossing construction/removal but would not affect viability of the species.
2. May impact species locally but would not affect forest-wide viability.

Forest concern species *Cryptobranchus alleganiensis, Baetopus trishae,* and *Habrophlediodes spp.* may occur within the project area. This project may impact individuals of these species but is not likely to cause a trend to federal listing or a loss of viability of the above species because habitats for these species are common across their range.

3.2.3. SUMMARY OF EFFECTS TO AQUATIC WILDLIFE HABITAT

The opportunity to move aquatic resources toward the forest plan direction varies by alternative. The alternative with the greatest expected positive benefit is Alternative C, followed by D, B, and E, in that order. Alternative F-modified would be the least beneficial of the action alternatives. Unlike Alternative A (no action), Alternative F-modified would eliminate some existing sediment sources, but it also introduces disturbance in a previously undisturbed portion of the watershed. See Table 3.2.3.1 for summary indicator information.

Table 3.2.3.1. Indicators of Effects of the Alternatives on Aquatic Habitat

Effects Indicators	Alternatives					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Reduction in miles of Road or Trail within 100 feet of streams	0	1.13	3.47	2.48	0.91	0.85
Reduction in miles of Road or Trail within 25 feet of streams	0	0.18	0.63	0.34	0.12	0.11
Number of new/decommissioned culverts*	0	52/30	15/135	52/66	62/9	62+/9
Benefits from Seasonal Closures	No	Yes	**	Yes	Yes	Yes
Benefits from Storm-Event Closures	No	Yes	**	Yes	No	No
Benefits from 4WD Lock-in	No	Yes	**	Yes	No	No
Affects brook trout population in upper Tipton Creek watershed	No	No	No	No	No	Yes

*Installation of new culverts and removal of decommissioned culverts temporarily stirs up sediment, but the effect is very short term (48 hours).
**Closure of the OHV System as proposed in Alternative C would be expected to benefit habitat to a greater degree than the benefits from seasonal and storm-event closures and 4wd lock-in restrictions.

Consistency with State and Forest Plan Standards

The State's antidegradation policy requires that at a minimum, existing water uses and level of water quality necessary to protect the existing uses shall be maintained and protected (NC DWQ 2007). Streams within the upper Tellico River Watershed have not been identified as "water

quality limited" by the North Carolina DENR and water quality supports existing protected uses, including the most limiting use of "aquatic life".

However, excessive erosion of the Upper Tellico OHV System and subsequent loading of trail-derived sediment to intermittent and perennial streams has caused adverse effects on the aquatic ecosystem and stress on aquatic life propagation and survival. Currently, the Forest Plan and State of N.C. Performance Standard (NC DFR 2007) to "prevent visible sediment from entering intermittent or perennial streams or perennial waterbodies" is not being met in the upper Tellico River watershed. Since this standard is not met, the turbidity standard is often not met during storm runoff events.

All of the "action" alternatives (B-F) are likely to reduce the adverse impacts to protected water uses, specifically aquatic life propagation and survival, by doing all or part of the following:

- Reducing the number of miles of trail on severe hazard soils
- Reducing the miles of trail within 100 and 25 feet of streams
- Improving stream crossings
- Implementing seasonal and/or storm-event trail closures
- Implementing road and trail Best Management Practices to protect water quality
- Implementing adequate annual maintenance
- Implementing a rapid response plan to cleanup vehicle fluid spills

However, not all proposed alternatives are equal in their beneficial effects to the aquatic resource, and range in likelihood of meeting the Forest Plan and State of North Carolina Performance Standards for sediment. Based on information presented in Sections 3.1.2 and 3.2.2, alternatives can be ordered from least to greatest likelihood of meeting the sediment standard, the turbidity standard, and maintaining protected uses as follows:

Least Likely →	→	→	→	→	→	→	→	→	→	→ Most Likely
Alt. A	Alt. F	Alt. E	Alt. B	Alt. D	Alt. C					

3.3 Plants

3.3.1 AFFECTED ENVIRONMENT

Only botanical resources within, or adjacent to, the proposed treatment areas were analyzed in detail. For Alternatives A through E, this analysis area was defined as the existing OHV trail system in the upper Tellico River watershed, including the Peckerwood Creek, Mistletoe Creek, Bob Creek, Round Mountain Branch, Tipton Creek (west of Trail 1), and Jenks Branch drainages. For Alternative F-modified, the analysis area was defined as the existing trail system in the upper Tellico River watershed plus the proposed trail system in the Bearpen Branch drainage (east of Trail 1). Botanical resources of concern in these areas include rich cove and northern hardwood forests and their associated Management Indicator Species ginseng and ramps, forests ≥ 100 years old, one "forest concern" species (*Carex purpurifera*), one "sensitive" species (*Megaceros aenigmaticus*),and one unique botanical community (boulderfields). Potential spread of non-native invasive plants is also analyzed.

Plant Communities

Rich Cove and Northern Hardwoods Forest. There are approximately 110,000 acres of rich cove forest and approximately 52,000 acres of northern hardwood forest across Nantahala and Pisgah National Forests. The trend for both these communities is stable (Forest Service USDA 2001).

Community analysis has traditionally focused on attributes above the species level, such as trophic structure, food webs and energy flow (e. g., Odum, 1971, Dodson, *et al.* 1998). Effects to these attributes in upper Tellico extend to the existing area occupied by the trail system plus new trail construction, plus the adjacent area that may be impacted by silt, minus the extent of area restored through trail decommissioning. Because the trail clearings will persist indefinitely, the effects of the clearings will also persist indefinitely.

The number of trail miles crossing each of the forest types was estimated using Forest Service GIS maps of the stands in the analysis area, overlain by GIS maps of the trails. Existing OHV trails cross approximately 12.1 miles of cove forests in the analysis area. Field surveys, however, indicated that two thirds of these miles cross acidic cove forests, dominated by white pines, eastern hemlocks and rosebay rhododendrons. These acidic coves are low-diversity communities typically excluded from analyses for rich cove forests. As a result, existing trails cross an estimated 4.0 miles of rich cove forests in the analysis area. Assuming an average tread width of ten feet, these 4.0 miles represent 4.8 acres of rich cove forests. Existing OHV trails cross approximately 5.7 miles of northern hardwood forests in the analysis area. Assuming an average tread width of ten feet, these 5.7 miles represent 6.9 acres of northern hardwood forests.

Forest communities ≥ 100 yr. The trend for forest communities ≥ 100 yr old on the Nantahala and Pisgah National Forests is increasing, from 47,591 acres in 1980 to 166,078 acres in 2000 (Forest Service USDA 2001). In general, the age class of a forest community is affected only by regeneration harvest or permanent clearing. As a result, analyses for direct and indirect effects to forest communities ≥ 100 years old will be confined to the areas cleared during trail construction. Because the clearings will persist indefinitely, the effects of the clearings will also persist indefinitely.

Although all forests have the capacity to be ≥ 100 years old, only forest communities indicated as ≥ 100 year old in Forest Service stand data, and crossed by OHV trails, were considered for this analysis. The ages of the other forest communities in the analysis area were attributed to past timber management, and considered outside the scope of this analysis.

The number of trail miles crossing forest communities ≥ 100 years old was estimated using Forest Service GIS maps of the forest stands in the analysis area overlain by GIS maps of the trails. Existing OHV trails cross approximately 1.2 miles of forest communities ≥ 100 yr in the analysis area. Assuming an average tread of ten feet, these 1.2 miles represent 1.5 acres of forest communities ≥ 100 yr.

Management Indicator Species

Ginseng and Ramps. Ginseng is a management indicator species (MIS) associated with rich cove forests and ramps is an MIS associated with northern hardwood forests. Ginseng and ramps both grow in mesic, forest communities characterized by closed canopies. Effects to ginseng and ramps habitat correspond to effects to their associated forest community types.

The forest-wide trend for ginseng is decreasing, primarily due to direct harvest for commercial sale (Forest Service, USDA 2001). The forest-wide trend for ramps, however, is stable (Gary Kauffman, USFS Botanist, Asheville, NC, personal communication 2008).

Because none of the existing OHV trails contain ginseng plants or ramps, direct and indirect effects to these species were confined to areas of new trail construction, the spread of erosional silt plumes, and the decommissioning of existing trails. New trails affect ginseng and ramps by eliminating either the plants or their habitat. Silt plumes affect ginseng and ramps by burying either the plants or their habitat. Trail decommissioning affects ginseng and ramps by potentially allowing the restoration of their habitat previously given over to the trails. Trails removed from the OHV System, but that remain as open or system roads, do not allow potential resotration of habitat.

Indirect effects to neighboring plants are usually estimated using a one mile radius around the activity areas. These indirect effects may include both reductions in the gene pool as well as reductions in the gene flow among neighboring plants, potentially resulting in more inbreeding, decreased seed set, and less vigorous seedlings. Brief surveys through the rich cove and northern hardwood forests in the analysis area, however, located no ginseng plants or ramps. Ginseng is a medicinal herb, traditionally harvested throughout the southern Appalachians for both cash export and personal use. Ramps are a culinary herb, also widely collected in the southern Appalachians. As a result, past actions, including commercial timber harvest and plant collection, may have reduced the populations in the analysis area to undetectable levels. Given the low density of plants in the surrounding communities, indirect effects to both ginseng and ramps are considered minimal, especially in comparison to the direct effects from the proposal, and therefore will not be considered further.

Forest Concern Species.

Because plants are rooted species that must be present in the proposed treatment areas to undergo effects, the analysis area for forest concern plant species was confined to the

expected impact zone surrounding the proposed areas. The expected impact zone is typically slightly larger than the proposed treatment area because impacts such as increased sunlight and decreased humidity may extend beyond the areas undergoing active management. These effects can be estimated to extend into the surrounding forest a distance equal to half the height of the canopy, or about 40 – 50 feet beyond the boundaries of the proposed treatment areas. Because the clearings will persist indefinitely, the effects of the clearings will also persist indefinitely, and may involve changes in both growing conditions as well as the surrounding vegetation.

All forest concern plant species listed by the National Forests in North Carolina for the Nantahala and Pisgah National Forests were considered for this analysis. Only forest concern species located inside expected impact zones during the field surveys, or with previous collection data inside these zones, were analyzed in detail. A complete list of species considered is available from the project record.

The Biotics Database was queried for forest concern plant species growing in the expected impact zones. The database contained one record for necklace sedge (*Carex projecta*), a forest concern species, within one mile of the expected impact zones. The database contained no other records for any forest concern plant species in these zones.

Field surveys for forest concern plant species growing in the expected impact zones were conducted by Wilson Rankin, USFS botanist, in August, 2008. Field surveys consisted of a timed meander with increased intensity in the most diverse areas. Surveys were continued until no new species or microhabitats were detected (Goff, *et al*. 1982).

One forest concern species was located during the field surveys: several clumps of purple sedge (*Carex purpurifera*) in the Trail 13 corridor, and several additional clumps in the tread of the proposed trail connecting Trails 4 and 5. Because purple sedge was located in a proposed treatment area, direct and indirect effects can be expected from Forest Service activities, and the species underwent further analysis for this project (Table 3.3.1.1). Field surveys also searched for necklace sedge, but failed to locate the species in the analysis area. Because the species was not located during the field survey, it was not analyzed further. No other forest concern species were located during the field surveys, and therefore will not be analyzed further.

Table 3.3.1.1 Summary of forest concern species undergoing effects analysis for the Upper Tellico OHV Project.

Species	Habitat	Reason for Effects Analysis
Carex purpurifera	Rich Cove Forest, Montane Alluvial Forest	Located during field surveys inside a proposed treatment area

Carex purpurifera grows in rich cove and oak-hickory forests, communities that compose most of the analysis area. Because field surveys revealed most of this habitat was not occupied by the sedge, analyses for effects will be confined to only those locations where the plants were found. Field surveys located plants in the tread of the proposed Trail 5 reroute to Trail 4 (Alternatives B, D, E and F), and the proposed Trail 13 (Alternative F-modified).

Non-Native Invasive Species.

Because non-native, invasive plants are generally associated with disturbed areas, analysis areas for direct, indirect, past and cumulative effects to non-native invasive plant species were confined to proposed treatment areas. Because invasive species generally cannot be correlated with specific past projects, past effects must be summarized by the current condition in the analysis areas, as determined by field surveys. Because invasive plants can maintain themselves indefinitely in the landscape, there is no future boundary for effects for these species.

In the proposed treatment areas, the most invasive species were *Microstegium vimineum*, *Paulownia tomentosa*, *Rosa multiflora* and *Centaurea jacea*. In general, these species grew on the edges of the OHV trails, a total of approximately three acres, most of which were located along Trail 1. Considering the scope and length of the trail system, effects due to non-native invasive species in the analysis area are relatively small. Because the spread of non-native invasives is facilitated by local seed sources, the low level of invasives in the analysis area should help minimize the expected effects of the proposed treatments.

Boulderfield Botanical Communities

Field surveys by Wilson Rankin, Botanist for the Nantahala National Forest, located three boulderfield communities in the proposed Trail 13 corridor (see description of Alternative F-modified). These communities are considered unusual in North Carolina by the North Carolina Heritage Program, and are associated with the forest concern wildlife species rock shrew, five forest concern plant species, and eight sensitive plant species. As a result, these boulderfields are identified as unique (Forest Service USDA 2005) and are included in the analysis of effects.

Constructing a trail for motorized vehicles through a boulderfield can require high-impact procedures, such as blasting. Because of the unusually severe impacts expected from the construction, direct and indirect effects to boulderfield communities may impact disproportionately larger areas than expected in other forest communities. In addition, the continuing human activity associated with the trail may reduce the value of the community as a habitat for boulderfield plants and animals. Because the trails will persist indefinitely, the effects of the trails will also persist indefinitely. The three boulderfield communities total approximately four acres.

Sensitive Species.

Wilson Rankin, Botanist for the Nantahala National Forest, surveyed the proposed treatment areas in August, 2008. The survey located three additional populations of the Tusquitee hornwort (*Megaceros aenigmaticus*) in expected impact zones at stream crossings in the upper Tellico River watershed: one population each on Trails 4, 8 and 10A, at either stream crossings or large seeps next to the trail. The species was most common in small, blue-line streams and tributaries containing shallow, clean water with moderate flows. Because the species was found in expected impact zones, *Megaceros aenigmaticus* underwent further analysis for effects.

Field surveys failed to locate any other populations of endangered, threatened or sensitive plant species. Because no other endangered, threatened or sensitive plant species were located in the proposed treatment areas, none of these species underwent further analysis for potential effects.

3.3.2 ENVIRONMENTAL CONSEQUENCES

The direct, indirect, and cumulative effects of each alternative are discussed below, followed by an effects comparison table at the end of section 3.3.2.

Alternative A:

A1. Plant Communities and MIS

Direct and Indirect Effects - Because it proposes no trail construction or trail decommissioning, and does not address the spread of silt plumes beyond measures already implemented, Alternative A would produce no additional direct or indirect effects to rich cove forests, northern hardwood forests, forest communities ≥ 100 years old, ginseng, or ramps other than the effects produced by the current trail system.

Cumulative Effects - Cumulative effects are the combined total of past, ongoing and future management actions in the analysis area.

For rich cove forests, northern hardwood forests, and forest communities ≥ 100 years old, past effects can be summarized by the existing condition of the forests in, and adjacent to, the existing trails. Large sections of the trail system were placed on highly erosive silt loam soils, with steep grades and poor control measures. As a result, portions of the trails have become deeply eroded, producing gullies as deep as fifteen feet. In addition, silt plumes wash into the neighboring forests, burying native herbs. For example, the silt plume emanating from the western end of Trail 12 extends at least 150 feet into the forest, covering the forest with several inches of silt in a path 50 feet wide. No native herbs were growing in this plume. Because herbaceous diversity is one of the defining characteristics of these forest communities, silt plumes that remove this diversity would be considered a severe impact. Since ginseng and ramps grow in the herbaceous layer, silt plumes are also considered a severe impact to these species.

Cumulative effects to ginseng can be estimated based on effects to its habitat, rich cove forests and cumulative effects to ramps can be estimated based on effects to its habitat, northern hardwood forests.

Rich Cove Forests and Ginseng

Field surveys determined that the total impact of silt plumes is roughly equivalent to the total area of the trails crossing rich cove forest, estimated above as 4.8 acres. Total past effects to rich cove forests and ginseng (area of trail plus area of silt plume) therefore, can be estimated at approximately 9.6 acres, either eliminated or severely impacted by OHV trails.

The analysis area contains two other Forest Service projects, the Davis Creek Road Paving Project and the Fain Ford Bridge Project. Neither of these two projects will impact rich cove

forests or ginseng, and neither project will be discussed further. The analysis area contains no other ongoing or foreseeable Forest Service or private actions that may impact rich cove forests.

As a result, the cumulative effect of Alternative A is 9.6 acres of rich cove forest and ginseng habitat either eliminated or severely impacted.

The cumulative effects represent a total impact of < 0.01 % of this biological community across the Pisgah and Nantahala National Forests (NP Forests). As a result, this alternative is unlikely to substantially alter the current trend for rich cove forests or ginseng.

Northern Hardwood Forests and Ramps

Field surveys determined the total impact of silt plumes is roughly equivalent to the total area of the trails crossing northern hardwoods forest, estimated above as 6.9 acres. Total past effects to northern hardwood forests and ramps (area of trail plus area of silt plume), therefore, can be estimated at approximately 13.8 acres, either eliminated or severely impacted by OHV trails.

The analysis area contains two other Forest Service projects, the Davis Creek Road Paving Project and the Fain Ford Bridge Project. Neither of these two projects will impact northern hardwood forests or ramps, and neither project will be discussed further. The analysis area contains no other ongoing or foreseeable Forest Service or private actions that may impact northern hardwood forests.

As a result, the cumulative effect of Alternative A is 13.8 acres of forest either eliminated or severely impacted.

The cumulative effects represent a total impact of < 0.02 % of this biological community across the national forests. As a result, this alternative is unlikely to substantially alter the current trend for northern hardwood forests or ramps.

Forest communities ≥ 100 years old

Field surveys determined the total impact of silt plumes is roughly equivalent to the total area of the trails crossing forest communities ≥ 100 yr old, estimated above as 1.5 acres. Total past effects to forest communities ≥ 100 yr old, therefore, can be estimated at approximately 3.0 acres, either eliminated or severely impacted by OHV trails.

The analysis area contains no other ongoing Forest Service projects. The analysis area contains two future Forest Service projects, the Davis Creek Road Paving Project and the Fain Ford Bridge Project. Neither of these two projects will impact forest communities ≥ 100 yr old, however, and neither project will be discussed further. The analysis area contains no other ongoing or foreseeable Forest Service or private actions that may impact forest communities ≥ 100 yr old.

As a result, the cumulative effect Alternative A is 3.0 acres of forest either eliminated or severely impacted.

The cumulative effects represent a total impact of < 0.02 % of this special habitat component across the national forests. As a result, this alternative is unlikely to substantially alter the current trend for forest communities ≥ 100 yr.

A2. Forest Concern Species

Purple Sedge

Direct and Indirect Effects - Because no *Carex purpurifera* plants were found in, or adjacent to, any trail in the current OHV System, Alternative A will have no direct or indirect effects to the species.

Cumulative Effects - In the absence of any direct or indirect effects, Alternative A would have no cumulative effects to *Carex purpurifera*.

A3. Non-native Invasive Species.

Direct and Indirect Effects - Ground disturbance and the increased light conditions resulting from road construction may increase the amount of acreage suitable for invasive exotic species (Trombulak and Frissell 2000). Because it would construct no miles of new trail, Alternative A would produce no direct or indirect effects for non-native, invasive plant species other than the continuing effects of the trail system.

Cumulative Effects - In absence of any direct or indirect effects, Alternative A would produce no cumulative effects for non-native invasive species in the analysis area.

A4. Boulderfield Botanical Communities.

Direct and Indirect Effects - Because no boulderfield communities plants were found in, or adjacent to, any trail in the current OHV System, Alternative A will have no direct or indirect effects to the species.

Cumulative Effects - In the absence of any direct or indirect effects, Alternative A would have no cumulative effects to boulderfield communities.

A5. Sensitive Species

Megaceros aenigmaticus (Tusquitee Hornwort)

Direct and Indirect Effects - Alternative A proposes no new management activities. In the absence of management, habitat for *Megaceros aenigmaticus* should remain unchanged by Forest Service actions. Sedimentation from the existing trails, however, may impact populations of the species both directly, by burying the plants, and indirectly, by either scouring or altering stream flows through the populations. Plants near trail crossings may also be indirectly affected by pollution, primarily petroleum distillates, degrading the water quality of the streams.

For *Megaceros*, effects from sedimentation can be expected to extend approximately 75 feet downstream of trail crossings, and, for one-time impacts such as replacing a culvert, would

persist until the next bankfull flow, which occurs, on average, every 2.5 years (Jason Farmer, personal communication 2008). For continuing impacts, however, effects would persist indefinitely.

Both direct and indirect effects would decrease the number, extent and vigor of *Megaceros* populations in the small streams and tributaries running through the trail system. Because these effects occur primarily at crossings, the number of blue line stream and tributary crossings reflects, to some degree, the relative impact on populations of *Megaceros*. As a result, alternatives that minimize or improve stream crossings should improve habitat for *Megaceros* by reducing siltation and pollution in the streams. Compared to the other alternatives, Alternative A contains the second highest number of crossings (Table 3.3.2.1).

Table 3.3.2.1 Relative effects to *Megaceros* habitat, as estimated by number of trail crossings.

Alternative	Miles of Trail	Existing Blue Line Stream Crossings[1,2]	Proposed Changes in Stream Crossings
Alternative A	39.3	25	No change
Alternative B	24.0	21	16 % decrease
Alternative C	0.0	3	88 % decrease
Alternative D-m	17.3	23	8 % decrease
Alternative E	29.3	17	32 % decrease
Alternative F-m	38.0	26	4 % increase

1 = Number of blue line stream crossings in potentially suitable *Megaceros* habitat in the upper Tellico River watershed. The Tellico River below and including Fain Ford is not considered suitable habitat because *Megaceros* is typically found in smaller, more shaded tributaries.
2 = Alternative F-modified includes one blue line stream crossing at Bearpen Branch.

Although three small populations of *Megaceros* may be directly and indirectly effected by current conditions, maintenance or construction at trail crossings, the watersheds in the Tellico OHV System contain large amounts of unsurveyed, suitable habitat. For example, field surveys suggest that blue line tributaries of the Tellico River above Fain Ford total 13.6 miles of suitable habitat. Assuming 100 feet of stream disturbance at each trail crossing, the 25 stream crossings in Alternative A would affect approximately 0.5 miles of suitable habitat for *Megaceros*, or < 4.0 % of the potential habitat in the upper Tellico watershed. In addition, populations were located at 3 of the 25 (12 %) blue line stream crosssings in Alternative A, suggesting a relatively high occurrence of the species in suitable habitat in the watershed.

Cumulative Effects - Cumulative effects are the combined total of past, ongoing and future management actions. According to previous NEPA analyses, ten past actions on the Nantahala National Forest have impacted populations of *Megaceros* since 1997 (Table 3.3.2.2). One of the projects may have improved habitat for the species by reducing stream sedimentation. As a result, only nine of the projects may have negatively impacted populations of *Megaceros*, primarily by indirect impacts associated with sedimentation from road construction.

Table 3.3.2.2 Past projects on the Nantahala National Forest impacting populations of *Megaceros aenigmaticus*.

District	Project	Year	Determination of Effect
Cheoah	Stecoah Timber Sale	2005	*May impact individuals but no trend towards federal listing*
Cheoah	A9 Stecoah Gap Road Reconstruction	2003	*May impact individuals but no trend towards federal listing*
Tusquitee	Ritz Easement	2002	*May impact individuals but no trend towards federal listing*
Cheoah	Old Field Gap Road (SR 1249)	2001	*May impact inviduals but no trend towards federal listing*
Tusquitee	FY2002 Prescribed Burn	2001	*May impact individuals but no trend towards federal listing*
Cheoah	Lovingood Road Reconstruction	2000	Possible positive indirect effects from decreased sedimentation
Tusquitee	Buck Creek DOT	2000	*May impact individuals but no trend towards federal listing*
Wayah	Thrash Land Exchange	2000	*May impact individuals but no trend towards federal listing*
Tusquitee	Tuni Gap Road	1999	*May impact individuals but no trend towards federal listing*
Cheoah	Fontana Village Horse Trail	1998	*May impact individuals but no trend towards federal listing*

The Tellico OHV analysis area contains no ongoing private projects that may impact *Megaceros*. The analysis area contains two other Forest Service projects, however, that could impact *Megaceros*. The Davis Creek Road Paving project will realign and pave approximately 0.63 miles between the Tennessee state line and Trail 5. The Fain Ford Bridge Project will construct a bridge across the Tellico River, realigning the Trail 4 crossing, an estimated impact of 0.1 miles. No *Megaceros* plants, however, were located in the expected impact zones of either project. As a result, the projects will produce no direct, indirect or cumulative effects for *Megaceros*. The analysis area contains no other foreseeable USFS or private projects that would impact populations of *Megaceros*.

Adding the three populations that may be directly and indirectly affected by Alternative A to the populations affected by past actions, the cumulative effects of Alternative A represent negative impacts to 13 of the 35 populations of *Megaceros* documented in western North Carolina. On the other hand, undisturbed populations of *Megaceros* are common in the region, and the upper Tellico watershed may contain additional, undocumented populations. Many of the documented populations are quite extensive, and unlikely to be extirpated by current Forest Service direction for stream habitats. As a result, **Alternative A may impact individuals of *Megaceros*, but is unlikely to cause a trend towards federal listing or a loss of viability for the species.**

Alternative B:

B1. Plant Communities and MIS

Rich Cove Forests and ginseng

Direct and Indirect Effects - Alternative B would construct approximately 1.2 miles of new trail through cove forests. Using the one third metric described above to separate rich coves from acidic coves, Alternative B would construct an estimated 0.4 miles of new trail through rich coves. Assuming a ten foot tread, this new construction would destroy approximately 0.5 acre of rich cove forests. Alternative B would also close an estimated 2.3 miles of trail crossing rich cove forests. Assuming a ten foot tread, and an equal area of silt plumes that would become inactive, Alternative B would potentially allow the restoration of 1.8 acres of rich cove forest.

In addition, Alternative B would pave/reconstruct. Although paving would alleviate some of the erosion producing silt plumes, the road would continue to provide conditions suitable for erosion along the ditches. As a result, the effects due to erosion are estimated at half the effects from trail closure, or five feet per linear foot of paving. Trail 1 crosses 2.3 miles of cove forests, producing an estimate of 0.8 miles of rich cove forests and 0.9 acre of inactivated silt plumes. Added to the acres lost to trail construction and potentially restored from trail closures, Alternative B would produce a gain of 2.2 acres of rich cove forest and ginseng habitat.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to rich cove forests total 9.6 acres either eliminated or severely impacted. Alternative B would reduce the area of impact by 2.2 acres over the current condition. The area contains no other future activities that will affect rich cove forests. As a result, the cumulative effect of Alternative B is 7.4 net acres of rich cove forest either eliminated or severely impacted.

The cumulative effects of Alternative B represent a total impact of < 0.01 % of this biological community across the national forests. As a result, the project is unlikely to substantially alter the current trend for rich cove forests or ginseng.

Northern Hardwood Forests and Ramps

Direct and Indirect Effects - Alternative B would construct no miles of new trail through northern hardwood forests. Alternative B would also close 0.2 miles of trail crossing northern hardwood forests. Assuming a ten foot tread, and an equal amount of silt plumes that would become inactive, Alternative B would potentially allow the restoration of 0.5 acre of northern hardwoods forest and ramps habitat, for a gain of 0.5 acre across the analysis area.

Cumulative Effects – Using the analysis presented for Alternative A, past and ongoing effects to northern hardwood forests total 13.8 acres either eliminated or severely impacted. Alternative B would reduce the area of impact by 0.5 acre over the current condition. The area contains no other future activities that will affect northern hardwood forests. As a result, the cumulative effect of Alternative B is 13.3 net acres of northern hardwood forest either eliminated or severely impacted.

The cumulative effects of Alternative B represent a total impact of < 0.02 % of this biological community across the national forests. As a result, the project is unlikely to substantially alter the current trend for northern hardwood forests or ramps.

Forest communities ≥ 100 years old.

Direct and Indirect Effects - Alternative B would construct no miles of new trail through forest communities ≥ 100 yr old. Alternative B would also close no miles of trail crossing forest communities ≥ 100 yr old. On the other hand, Alternative B would close 6.8 net miles of other OHV trails that could also be restored into forest communities ≥ 100 yr old. Assuming a ten foot tread, these 6.8 miles represent 8.2 acres. Alternative B therefore represents a potential future gain of 8.2 acres of forest communities ≥ 100 yr old across the analysis area.

Cumulative Effects – Using the analysis presented for Alternative A, past effects to forest communities ≥ 100 yr old total 3.0 acres either eliminated or severely impacted. Alternative B will produce an estimated gain of 8.2 acres of forest communities ≥ 100 yr old. The area contains no other future activities that will affect forest communities ≥ 100 yr old. As a result, the cumulative effect of Alternative B is a potential net gain (3 acres currently eliminated plus 8.2 acres added) of 5.2 acres of forest communities ≥ 100 yr old.

The cumulative effects represent a total impact of < 0.02 % of this special habitat component across the national forests. As a result, Altnerative B is unlikely to substantially alter the current trend for forest communities ≥ 100 yr.

B2. Forest Concern Species

Purple Sedge

Direct and Indirect Effects - Alternative B will extirpate the plants found growing in the tread of the proposed Trail 5 reroute. Reducing the number of plants in a population may also produce indirect effects to neighboring plants. These indirect effects may include both reductions in the gene pool as well as reductions in the gene flow among plants, potentially resulting in more inbreeding, decreased seed set, and less vigorous seedlings. Due to the small size of the population in the proposed treatment area, however, effects to gene flow should be minimal and unlikely to influence the viability of any surrounding populations. As a result, indirect effects from the proposed activities will not be considered further.

Cumulative Effects - According to the Forest Plan, forest concern species require a determination of effect, which addresses species viability. Because all populations on the forest contribute to the viability of a species, viability issues are addressed at the forest level.

The Biotics Database contains five records for *Carex purpurifera*, all of which occur on the Nantahala National Forest. These records do not include new populations found during the Fatback and Thunderstruck projects.

Five past actions on the Nantahala National Forest may have impacted populations of *Carex purpurifera* since 1997 (Table 3.3.2.1). All of these projects fall within the estimated 20 year period for direct and indirect effects from timber management. The effects from the King Land Exchange were based on populations assumed to be present on the site. The effects from the Cable Cove Waterline probably encompassed a few plants over < 0.1 acre. The Thunderstruck project impacted a single clump of plants growing in the bed of an access road; the plants were presumably extirpated during road maintenance. The Farmer Branch

project contains an extensive population of *Carex purpurifera*, growing in previously-disturbed forests.

Table 3.3.2.1 Past projects potentially impacting populations of *Carex purpurifera*. The determination of effect comes from the Forest Service NEPA analyses for the projects.

District	Project	Year	Determination of Effect	Level of Effect
Nantahala*	Fatback Timber Sale	2007	*May impact individuals but no trend towards federal listing*	Direct and Indirect Effects
Tusquitee	Thunderstruck Timber Sale	2007	*May impact individuals but no trend towards federal listing*	Direct and Indirect Effects
Tusquitee	Farmer Branch Timber Sale	2006	*May impact individuals but no trend towards federal listing*	Direct and Indirect Effects
Nantahala*	King Land Exchange	2002	*May impact individuals but no trend towards federal listing*	Direct and Indirect Effects
Tusquitee	Cable Cove Waterline	2002	*May impact individuals but no trend towards federal listing*	Direct and Indirect Effects

* Formerly the Wayah Ranger District

The analysis area contains two future Forest Service projects, the Davis Creek Road Paving Project and the Fain Ford Bridge Project. Neither of these two projects will impact purple sedge plants, and neither project will be discussed further. The analysis area contains no other ongoing or foreseeable Forest Service or private actions that may impact *Carex purpurifera*.

Over the past 20 years, therefore, Forest Service actions have affected five of the seven known populations of *Carex purpurifera* on the national forest. None of the populations, however, have been extirpated, and most of the population located in the Tellico OHV analysis area will not be affected by the proposed actions.

Determination of Effect for *Carex purpurifera*. The national forest contains at least three undisturbed populations of *Carex purpurifera*. At least one population is extensive, and, as noted during the Farmer Branch Project, the species appears to be resilient to disturbance. As a result, **Alternative B may impact individuals, but is unlikely to cause a trend toward federal listing or loss of viability for the species.**

B3. Non-native Invasive Species

Direct and Indirect Effects **-** Using the analysis presented under Alternative A, Alternative B would construct 1.2 miles of new trails, for a potential increase of 0.5 acre of habitat suitable for invasive plants.

Cumulative Effects - The analysis area, including road and trailsides, contains approximately three acres of non-native, invasive plant species. The analysis area contains no other ongoing Forest Service projects. The analysis area contains two future Forest Service projects, both of which may produce direct effects for non-native, invasive plants. The Davis Creek Road Paving project will realign and pave approximately 0.63 miles between the Tennessee state line and Trail 5. The Fain Ford Bridge Project will construct a bridge and across the Tellico River, realigning the Trail 4 crossing, an estimated distance of 0.1 miles. Using the analysis presented above, these two projects will produce a direct effect of 0.85 miles of trail and road construction, producing 0.4 acre of suitable habitat for non-native invasive species. The

analysis area contains no other foreseeable Forest Service or private projects that would potentially create habitat for invasive plant species.

For Alternative B, therefore, the cumulative effect of Alternative B totals approximately 3.9 acres of habitat suitable for invasive plants.

B4. Boulderfield Botanical Communities

Direct and Indirect Effects -. Same as Alternative A.

Cumulative Effects - Same as Alternative A.

B5. Sensitive Species

Megaceros aenigmaticus (Tusquitee Hornwort)

Direct and Indirect Effects

Using the analysis for Alternative A, Alternative B would directly impact, through either trail maintenance or continued current impacts, all three of the populations of *Megaceros* located during the field surveys for the project.

Alternative B will also decrease the number of blue line stream crossing in the OHV System from 25 crossings to 21 crossings. Because impacts are considered proportional to the number of blue line crossings, Alternative B should reduce the current impacts to *Megaceros* habitat in the upper Tellico watershed by 16 %.

Cumulative Effects

Same as Alternative A.

Alternative C:

C1. Plant Communities and MIS

Rich Cove Forests and Ginseng.

Direct and Indirect Effects - Using the analysis presented for Alternative B, Alternative C would construct no miles of new trail through cove forests, eliminating no acres of rich cove forests. Alternative C would also close an estimated 5.0 miles of trail, allowing the restoration of 4.9 acres, and pave/reconstruct, allowing the restoration of 0.9 acre, for a gain of 5.8 acres of rich cove forest and ginseng habitat across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to rich cove forests total 9.6 acres either eliminated or severely impacted. Alternative C would reduce the area of impact by 5.8 acres over the current condition. The area contains no other future activities that will affect rich cove forests. As a result, the cumulative effect of Alternative C is 3.8 net acres of forest either eliminated or severely impacted.

The cumulative effects represent a total impact of < 0.01 % of this biological community across the national forests. As a result, Alternative C is unlikely to substantially alter the current trend for rich cove forests or ginseng.

Northern Hardwood Forests and Ramps.

Direct and Indirect Effects - Using the analysis presented for Alternative B, Alternative C would construct no miles of new trail through northern hardwood forests, eliminating no acres of northern hardwood forests. Alternative C would close an estimated 4.6 miles of trail, potentially allowing the restoration of 11.2 acres of northern hardwoods forest and ramp habitat, for a net gain of 11.2 acres across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past and ongoing effects to northern hardwood forests total 13.8 acres either eliminated or severely impacted. Alternative C would reduce the area of impact by 11.2 acres over the current condition. The area contains no other future activities that will affect northern hardwood forests. As a result, the cumulative effect of Alternative C is 2.6 net acres of forest either eliminated or severely impacted.

The cumulative effects represent a total impact of < 0.02 % of this biological community across the national forests. As a result, Alternative C is unlikely to substantially alter the current trend for northern hardwood forests or ramps.

Forest communities ≥ 100 years old.

Direct and Indirect Effects - Alternative C would construct no miles of new trail through forest communities ≥ 100 yr old. Alternative C would close 0.9 miles of trail crossing forest communities ≥ 100 yr old that would potentially allow restoration of these communities. Assuming a ten foot tread, and an equal amount of silt plumes that would become inactive, Alternative C would potentially allow the restoration of 2.2 acres of forest communities ≥ 100 yr old. In addition, Alternative C would close 23.3 miles of other OHV trails that could also be restored into forest communities ≥ 100 yr old. Assuming a ten foot tread, these 23.3 miles represent 28.2 additional acres. In all, Alternative C represents a potential gain of 30.4 acres of forest communities ≥ 100 yr old across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to forest communities ≥ 100 yr old total 3.0 acres either eliminated or severely impacted. Alternative C will produce an estimated gain of 30.4 acres of forest communities ≥ 100 yr old. The area contains no other future activities that will affect forest communities ≥ 100 yr old. As a result, the cumulative effect of Alternative C is a potential net gain of 27.4 acres of forest communities ≥ 100 yr old.

The cumulative effects represent a total impact of < 0.02 % of this special habitat component across the national forests. As a result, Alternative C is unlikely to substantially alter the current trend for forest communities ≥ 100 yr.

C2. Forest Concern Species

Purple Sedge.

Direct and Indirect Effects - Because no *Carex purpurifera* plants were found in, or adjacent to, any trail in the current OHV System, trail proposed for decommissioning, or new trail proposed for construction, Alternative C will have no direct or indirect effects to the species.

Cumulative Effects - In the absence of any direct or indirect effects, Alternative C will have no cumulative effects to *Carex purpurifera*.

C3. Non-native Invasive Species

Direct and Indirect Effects - Alternative C would construct no miles of new trails. As a result, Alternative C would produce no direct or indirect effects for non-native invasive species.

Cumulative Effects - In absence of any direct or indirect effects, Alternative C would produce no cumulative effects for non-native invasive species in the analysis area.

C4. Boulderfield Botanical Communities

Direct and Indirect Effects - Same as Alternative A.

Cumulative Effects - Same as Alternative A.

C5. Sensitive Species

Megaceros aenigmaticus (Tusquitee Hornwort)

Direct and Indirect Effects

By decommissioning Trails 8 and 10A, Alternative C would reduce the current impacts to two of the three populations of *Megaceros* located during the field surveys for this project. Current impacts would continue on the population next to Trail 4, which, although closed to OHV traffice, would remain as a system road.

Alternative C will also decrease the number of blue line stream crossing in the OHV System from 25 crossings to 3 crossings. Because impacts are considered proportional to the number of blue line crossings, Alternative C should reduce the impacts to *Megaceros* habitat in the upper Tellico watershed by 88 %, in comparison to the no action alternative, Alternative A.

Cumulative Effects

Using the analysis for Atlernative A, the cumulative effects of Alternative C represent negative impacts to 11 of the 35 populations of *Megaceros* documented in western North Carolina. On the other hand, undisturbed populations of *Megaceros* are common in the region, and the upper Tellico watershed may contain additional, undocumented populations. Many of the documented populations are quite extensive, and unlikely to be extirpated by

current Forest Service direction for stream habitats. As a result, Alternative C may impact individuals of *Megaceros*, but is unlikely to cause a trend towards federal listing or a loss of viability for the species.

Alternative D-modified:

D1. Plant Communities and MIS

Rich Cove Forests and Ginseng

Direct and Indirect Effects - Using the analysis presented for Alternative B, Alternative D-modified would construct approximately 1.2 miles of new trail through cove forests, eliminating an estimated 0.5 acre of rich cove forests. Alternative D-modified would also close an estimated 2.9 miles of trail, allowing the restoration of 2.3 acres, and pave/reconstruct, allowing the restoration of 0.9 acre, for a gain of 2.7 acres of rich cove forest and ginseng habitat across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to rich cove forests total 9.6 acres either eliminated or severely impacted. Alternative D-modified would reduce the area of impact by 2.7 acres over the current condition. The area contains no other future activities that will affect rich cove forests. As a result, the cumulative effect of this alternative is 6.9 acres of forest either eliminated or severely impacted.
The cumulative effects represent a total impact of < 0.01 % of this biological community across the national forests. As a result, Alternative D-modified is unlikely to substantially alter the current trend for rich cove forests or ginseng.

Northern Hardwood Forests and Ramps

Direct and Indirect Effects - Using the analysis presented for Alternative B, Alternative D-modified would construct no miles of new trail through northern hardwood forests, eliminating no acres of northern hardwood forests. Alternative D-modified would close an estimated 3.7 miles of trail, potentially allowing the restoration of 9.0 acres of northern hardwoods forest and ramps habitat, for a gain of 9.0 acres across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past and ongoing effects to northern hardwood forests total 13.8 acres either eliminated or severely impacted. Alternative D-modified would reduce the area of impact by 9.0 acres over the current condition. The area contains no other future activities that will affect northern hardwood forests. As a result, the cumulative effect of this alternative is 4.8 acres of forest either eliminated or severely impacted.

The cumulative effects represent a total impact of < 0.02 % of this biological community across the national forests. As a result, Alternative D-modified is unlikely to substantially alter the current trend for northern hardwood forests or ramps.

Forest communities ≥ 100 years old

Direct and Indirect Effects - Alternative D-modified would construct no miles of new trail through forest communities ≥ 100 yr old. Alternative D-modified would close 0.8 miles of

trail crossing forest communities ≥ 100 yr old that would potentially allow restoration of these communities. Assuming a ten foot tread, and an equal amount of silt plumes that would become inactive, Alternative D-modified would potentially allow the restoration of 1.9 acres of forest communities ≥ 100 yr old. In addition, Alternative D-modified would close 13.2 net miles of other OHV trails that could also be restored into forest communities ≥ 100 yr old. Assuming a ten foot tread, these 13.2 miles represent 16.0 additional acres. In all, Alternative D-modified represents a potential future gain of 17.9 acres of forest communities ≥ 100 yr old across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to forest communities ≥ 100 yr old total 3.0 acres either eliminated or severely impacted. Alternative D-modified would produce an estimated gain of 17.9 acres of forest communities ≥ 100 yr old. The area contains no other future activities that will affect forest communities ≥ 100 yr old. As a result, the cumulative effect of this alternative is a potential net gain of 14.9 acres of forest communities ≥ 100 yr old.

The cumulative effects represent a total impact of < 0.02 % of this special habitat component across the national forests. As a result, Alternative D-modified is unlikely to substantially alter the current trend for forest communities ≥ 100 yr.

D2. Forest Concern Species

Purple Sedge

Direct and Indirect Effects - Same as Alternative B.

Cumulative Effects - Same as Alternative B.

D3. Non-native Invasive Species

Direct and Indirect Effects - Using the analysis presented for Alternative A, Alternative D-modified would construct 1.2 miles of new trails, for an increase of 0.5 acre of habitat suitable for invasive plants.

Cumulative Effects - Using the analysis presented for Alternative B, the cumulative effect of Alternative D-modified totals approximately 3.9 acres of habitat suitable for invasive plants.

D4. Boulderfield Botanical Communities

Direct and Indirect Effects - Same as Alternative A.

Cumulative Effects - Same as Alternative A

D5. Sensitive Species

Megaceros aenigmaticus (Tusquitee Hornwort)

Direct and Indirect Effects

By decommissioning Trail 10A, Alternative D-modified would reduce the current impacts to one of the three the populations of *Megaceros* located during the field surveys for the project. Current impacts would continue on the populations next to Trails 4 and 8.

Alternative D-modified will also decrease the number of blue line stream crossing in the OHV System from 25 crossings to 23 crossings. Because impacts are considered proportional to the number of blue line crossings, Alternative D-modified should reduce the impacts to *Megaceros* habitat in the upper Tellico watershed by 8 %, in comparison to the no action alternative, Alternative A.

Cumulative Effects

Using the analysis for Alternative A, the cumulative effects of Alternative D-modified represent negative impacts to 12 of the 35 populations of *Megaceros* documented in western North Carolina. On the other hand, undisturbed populations of *Megaceros* are common in the region, and the upper Tellico watershed may contain additional, undocumented populations. Many of the documented populations are quite extensive, and unlikely to be extirpated by current Forest Service direction for stream habitats. As a result, Alternative D-modified may impact individuals of *Megaceros*, but is unlikely to cause a trend towards federal listing or a loss of viability for the species.

Alternative E:

E1. Plant Communities and MIS

Rich Cove Forests and Ginseng

Direct and Indirect Effects - Using the analysis presented for Alternative B, Alternative E would construct approximately 2.3 miles of new trail through cove forests, eliminating an estimated 0.9 acre of rich cove forests. Alternative E would also close an estimated 1.8 miles of trail, allowing the restoration of 1.4 acres of rich cove forest, and pave/reconstruct, allowing the restoration of 0.9 acre of rich cove forest, for a gain of 1.4 acres across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to rich cove forests total 9.6 acres either eliminated or severely impacted. Alternative E would reduce the area of impact by 1.4 acres over the current condition. The area contains no other future activities that will affect rich cove forests. As a result, the cumulative effect of Alternative E is 8.2 net acres of forest either eliminated or severely impacted.

The cumulative effects represent a total impact of < 0.01 % of this biological community across the national forests. As a result, this alternative is unlikely to substantially alter the current trend for rich cove forests.

Northern Hardwood Forests and Ramps

Direct and Indirect Effects - Using the analysis presented for Alternative B, Alternative E would construct no miles of new trail through northern hardwood forests, eliminating no acres of northern hardwood forests. Alternative E would also close no miles of trail, allowing no restoration, for no gain or loss of acres across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past and ongoing effects to northern hardwood forests total 13.8 acres either eliminated or severely impacted. Alternative E will produce no additional net gain or loss of northern hardwood forests. The area contains no other future activities that will affect northern hardwood forests. As a result, there is no cumulative effect from this alternative.

As a result, this alternative would not alter the current trend for northern hardwood forests.

Forest communities ≥ 100 years old

Direct and Indirect Effects - Alternative E would construct no miles of new trail through forest communities ≥ 100 yr old. Alternative E would also close no miles of trail crossing forest communities ≥ 100 yr old. On the other hand, Alternative E would close 1.6 net miles of other OHV trails that could also be restored into forest communities ≥ 100 yr old. Assuming a ten foot tread, these 1.6 miles represent 1.9 acres. Alternative E therefore represents a potential gain of 1.9 acres of forest communities ≥ 100 yr old across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to forest communities ≥ 100 yr old total 3.0 acres either eliminated or severely impacted. Alternative E would reduce the area of impact by 1.9 acres over the current condition. The area contains no other future activities that will affect forest communities ≥ 100 yr old. As a result, the cumulative effect of this alternative is a net loss of 1.1 acres of forest communities ≥ 100 yr old.

The cumulative effects represent a total impact of < 0.02 % of this special habitat component across the national forests. As a result, this alternative is unlikely to substantially alter the current trend for forest communities ≥ 100 yr.

E2. Forest Concern Species

Purple Sedge

Direct and Indirect Effects - Same as Alternative B.

Cumulative Effects - Same as Alternative B.

E3. Non-native Invasive Species.

Direct and Indirect Effects - Using the analysis presented for Alternative A, Alternative E would construct 2.7 miles of new trails, for a potential increase of 1.1 acres of habitat suitable for invasive plants.

Cumulative Effects - Using the analysis presented for Alternative B, the cumulative effect of Alternative E totals approximately 4.5 acres of habitat suitable for invasives.

E4. Boulderfield Botanical Communities

Direct and Indirect Effects - Same as Alternative A.

Cumulative Effects - Same as Alternative A.

E5. Sensitive Species

Megaceros aenigmaticus (Tusquitee Hornwort)

Direct and Indirect Effects

Using the analysis for Alternative A, Alternative E would directly impact, through either trail maintenance or continued current impacts, all three of the populations of *Megaceros* located during the field surveys for the project.

Alternative E will also decrease the number of blue line stream crossings in the OHV System from 25 crossings to 17 crossings. Because impacts are considered proportional to the number of blue line crossings, Alternative E should reduce the impacts to *Megaceros* habitat in the upper Tellico watershed by 32 %, in comparison to the no action alternative, Alternative A.

Cumulative Effects

Same as Alternative A.

Alternative F-modified:

F1. Plant Communities and MIS

Rich Cove Forests and Ginseng

Direct and Indirect Effects - Using the analysis presented for Alternative B, Alternative F-modified would construct approximately 4.5 miles of new trail through cove forests, eliminating an estimated 1.8 acres of rich cove forests and ginseng habitat. Alternative F-modified would also close an estimated 1.0 miles of trail, allowing the restoration of 0.8 acre of rich cove forest, and pave/reconstruct, allowing the restoration of 0.9 acre of rich cove forest, for a loss of 0.1 acre across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to rich cove forests total 9.6 acres either eliminated or severely impacted. Alternative F-modified would produce an estimated additional loss of 0.1 acre of rich cove forests. The area contains no

other future activities that will affect rich cove forests. As a result, the cumulative effect of Alternative F-modified is 9.7 acres of rich cove forest and ginseng habitat either eliminated or severely impacted.

The cumulative effects represent a total impact of < 0.01 % of this biological community across the national forests. As a result, this alternative is unlikely to substantially alter the current trend for rich cove forests or ginseng.

Northern Hardwood Forests and Ramps

Direct and Indirect Effects - Using the analysis presented for Alternative B, Alternative F-modified would construct no miles of new trail through northern hardwood forests, eliminating no acres of northern hardwood forests and ramps habitat. Alternative F-modified would also close no miles of trail, producing no additional gain or loss across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past and ongoing effects to northern hardwood forests total 13.8 acres either eliminated or severely impacted. Alternative F-modified would produce no cumulative gain or loss of northern hardwood forests or ramps habitat.

The cumulative effects represent a total impact of < 0.02 % of this biological community across the national forests. As a result, the project is unlikely to substantially alter the current trend for northern hardwood forests or ramps.

Forest communities ≥ 100 years old

Direct and Indirect Effects - Alternative F-modified would construct approximately 0.7 miles of new trail through forest communities ≥ 100 yr old. Assuming a 20 foot wide, well-constructed road corridor that does not produce an equivalent area of silt plumes, these 0.7 miles of new trail would destroy 1.6 acres of forest communities ≥ 100 yr old. Alternative F-modified would close no miles of trail crossing forest communities ≥ 100 yr old. On the other hand, Alternative F-modified would close 0.6 net miles of other OHV trails that could also be restored into forest communities ≥ 100 yr old. Assuming a ten foot tread, these 0.6 miles represent 0.7 acre. Alternative F-modified therefore represents a potential net loss of 0.9 acre of forest communities ≥ 100 yr old across the analysis area.

Cumulative Effects - Using the analysis presented for Alternative A, past effects to forest communities ≥ 100 yr old total 3.0 acres either eliminated or severely impacted. Alternative F-modified will produce an estimated additional loss of 0.9 acre of forest communities ≥ 100 yr old. The area contains no other future activities that will affect forest communities ≥ 100 yr old. As a result, the cumulative effect of Alternative F-modified is a net loss of 3.9 acres of forest communities ≥ 100 yr old.

The cumulative effects represent a total impact of < 0.02 % of this special habitat component across the national forests. As a result, Alternative F-modified is unlikely to substantially alter the current trend for forest communities ≥ 100 yr.

F2. Forest Concern Species

Purple Sedge

Direct and Indirect Effects - Same as Alternative B.

Cumulative Effects - Same as Alternative B.

F3. Non-native Invasive Species

Direct and Indirect Effects - Using the analysis presented for Alternative A, Alternative F-modified would construct 10.1 miles of new trails, for a potential increase of 4.0 acres of habitat suitable for invasives.

Cumulative Effects - Using the analysis presented for Alternative B, the cumulative effect of Alternative F-modified totals approximately 7.4 acres of habitat suitable for invasives.

F4. Boulderfield Botanical Communities

Direct and Indirect Effects - Alternative F-modified will construct a new trail through three boulderfield communities, estimated during field surveys at a total of four acres. Tread width will be 8 – 10 feet, producing a construction corridor estimated to be 20 – 30 feet. Boulders in the construction corridor will either be removed or blasted with heavy equipment. Because boulderfield communities are defined by the presence of tightly-packed boulders, blasting and removing the boulders removes the community as well. Trail construction, therefore, will directly eliminate the communities in a construction corridor approximately thirty feet wide. For the two smaller boulderfield of one half acre each, direct effects may eliminate 15% of the community. For the larger boulderfield west of Allen Gap, estimated at three acres, direct effects may eliminate 8 – 10% of the community.

In general, the trails will cross the centers of the boulderfields, maximizing the direct and indirect effects of the activity. Trail corridors will become continuing sources of pollution, primarily siltation and petroleum distillates, as well as human activity. In general, the boulderfields are so small, and the disturbance corridors so large in comparison, that species sensitive to these impacts are unlikely to find suitable refugia in the remaining portions of the boulderfield. As a result, indirect effects may effectively impact the entire boulderfields, producing a net loss of four acres of boulderfield community.

Cumulative Effects - The Biotics Database contains sixteen records for boulderfield communities, not including the boulderfields located during the surveys for the Tellico OHV project. Three of the boulderfields in the Biotics Database are located on the Nantahala National Forest.

No past actions on the Nantahala National Forest have impacted boulderfield communities since 1997. The analysis area contains two other Forest Service projects, the Davis Creek Road Paving Project and the Fain Ford Bridge Project. Neither of these two projects will impact boulderfield communities, and neither project will be discussed further. The analysis area contains no other ongoing or foreseeable Forest Service or private actions that may impact boulderfield communities.

Alternative F-modified may effectively eliminate three boulderfield communities totaling four acres through direct and indirect effects associated with the construction of Trail 13. The Forest, however, contains at least three examples of boulderfield communities that will not be disturbed.

F5. Sensitive Species

Megaceros aenigmaticus (Tusquitee Hornwort)

Direct and Indirect Effects

Using the analysis for Alternative A, Alternative F-modified would directly impact, through either trail maintenance or continued current impacts, all three of the populations of *Megaceros* located during the field surveys for the project. Alternative F-modified would also increase the likelihood of impacts to potential *Megaceros* populations in the Bearpen Branch watershed through new trail construction.

Alternative F-modified will also increase the number of blue line stream crossing in the OHV System to 25 crossings from 26 crossings. Because impacts are considered proportional to the number of blue line crossings, Alternative F-modified will probably increase the impacts to *Megaceros* habitat in the proposed trail system by 4 %, in comparison to the no action alternative, Alternative A.

Cumulative Effects

Same as Alternative A.

3.3.3 SUMMARY OF EFFECTS ON BOTANICAL RESOURCES

Tables 3.3.3.1 and 3.3.3.2 on the following two pages summarize the effects of the alternatives on the botanical resources of concern in the upper Tellico area.

Table 3.3.3.1. Effects on Plant Communities and Management Indicator Species.

	Rich Cove Forests & Ginseng Habitat	Northern Hardwood Forests & Ramps Habitat	Forest Communities ≥ 100 years old
Alternative A			
Direct, Indirect & Cumulative Effects	9.6 acres forest habitat impacted or eliminated	13.8 acres forest habitat impacted or eliminated	3 acres forest community impacted or eliminated
Alternative B			
Direct & Indirect Effects	Gain 2.2 acres	Gain 0.5 acre	Gain 8.2 acres
Cumulative Effects	7.4 acres remain impacted or eliminated	13.3 acres remain impacted or eliminated	Net gain of 5.2 acres
Alternative C			
Direct & Indirect Effects	Gain 5.8 acres	Gain 11.2 acres	Gain 30.4 acres
Cumulative Effects	3.8 acres remain impacted or eliminated	2.6 acres remain impacted or eliminated	Net gain of 27.4 acres
Alternative D-modified			
Direct & Indirect Effects	Gain 2.7 acres	Gain 9.0 acres	Gain 17.9 acres
Cumulative Effects	6.9 acres remain impacted or eliminated	4.8 acres remain impacted or eliminated	Net gain of 14.9 acres
Alternative E			
Direct & Indirect Effects	Gain 1.4 acres	No gain/No loss	Gain 1.9 acres
Cumulative Effects	8.2 acres remain impacted or eliminated	13.8 acres remain impacted or eliminated	1.1 acres impacted
Alternative F-modified			
Direct & Indirect Effects	Lose 0.1 acre	No gain/No loss	Lose 0.9 acr
Cumulative Effects	9.7 acres impacted or eliminated	13.8 acres remain impacted or eliminated	3.9 acres impacted or eliminated

Table 3.3.3.2. Effects on Forest Concern Species, Non-Native Invasive Species, Boulderfield Botanical Communities, and Sensitive Species.

	Forest Concern Species *Carex purpurifera*	Non-Native Invasive Species	Boulderfield Botanical Communities	Sensitve Species *Megaceros aenigmaticus*
Alternative A				
Direct & Indirect Effects	None	3.0 acres suitable for occupation	No effect	May impact individuals
Cumulative Effects	None	3.4 acres suitable for occupation	No effect	Unlikely to cause a trend toward federal listing
Alternative B				
Direct & Indirect Effects	May impact individuals	Potential increase of 0.5 acre suitable for occupation	No effect	May impact individuals
Cumulative Effects	Unlikely to cause a trend toward federal listing	Net 3.9 acres suitable for occupation	No effect	Unlikely to cause a trend toward federal listing
Alternative C				
Direct & Indirect Effects	No effect	No effect	No effect	May impact individuals
Cumulative Effects	No effect	No effect	No effect	Unlikely to cause a trend toward federal listing
Alternative D-modified				
Direct & Indirect Effects	May impact individuals	Potential increase of 0.5 acre suitable for occupation	No effect	May impact individuals
Cumulative Effects	Unlikely to cause a trend toward federal listing	Net 3.9 acres suitable for occupation	No effect	Unlikely to cause a trend toward federal listing
Alternative E				
Direct & Indirect Effects	May impact individuals	Potential increase of 1.1 acres suitable for occupation	No effect	May impact individuals
Cumulative Effects	Unlikely to cause a trend toward federal listing	Net 4.5 acres suitable for occupation	No effect	Unlikely to cause a trend toward federal listing
Alternative F-modified				
Direct & Indirect Effects	May impact individuals	Potential increase of 4.0 acres suitable for occupation	Lose 4.0 acres (the entire extent of the communities)	May impact individuals
Cumulative Effects	Unlikely to cause a trend toward federal listing	Net 7.4 acres suitable for occupation	3 boulderfield communities remain undisturbed across the Forest	Unlikely to cause a trend toward federal listing

3.4 Terrestrial Wildlife

The area encompassing the Upper Tellico OHV System is a landscape with steep mountains covered predominantly by mature hardwood forests. The area receives abundant moisture and is riddled with seeps and springs that feed into larger streams and eventually the Tellico River itself. It also contains drier upland sites, moist rocky areas, and a small area of boulderfield forest.

The terrestrial wildlife analysis evaluates effects of the six alternatives on three categories of species:

a) Management Indicator Species (MIS),
b) Forest Concern Species (FC), and
c) Proposed, Endangered, Threatened, and Sensitive Species (PETS)

3.4.1a AFFECTED ENVIRONMENT – MIS

The majority of the OHV System is located in either MA 1B or 2C. Smaller portions of the trail network are within MA 4D or 4C. Each management area has unique desired conditions and expectations for wildlife habitat. The expectation for wildlife habitat in MA 1B is to provide for those species that can tolerate some disturbance from motorized vehicles, such as ruffed grouse and white-tailed deer. MA 2C, also associated with motorized recreation, differs from MA 1B in that forests are expected to be older and provide habitat for species that use standing dead trees, such as pileated woodpecker. In MAs 4D and 4C less disturbance is desired, and wildlife habitat is expected to provide for animals such as black bear that prefer older forests and less disturbance from motorized vehicles.

None of the proposed alternatives contain activities that will alter forest stand composition or age class structure. Therefore, the primary effect from any proposed changes to the trail system involves increases or decreases in the amount of noise and disturbance associated with use of the trail system. And because of this, this analysis will address potential effects from a general wildlife habitat perspective, rather than individual management areas.
The Tellico OHV area encompasses approximately 8,000 acres of forested habitat.

Wherever trails are within 100 feet of perennial streams they are in MA 18, riparian areas. Riparian areas are located along perennial waterbodies and may serve as travel corridors for animals. They are expected to have a diverse assemblage of mature trees which can provide large woody material for wildlife and fisheries habitat. Abundant vegetative ground cover is desired to help maintain the natural hydrologic function as well as provide food and cover for associated wildlife. For example, the Acadian flycatcher is one songbird strongly associated with riparian habitat. Riparian areas encompass approximately 8% (652 acres) of the Tellico OHV area.

The Nantahala/Pisgah LRMP lists eight terrestrial wildlife species as potential management indicator species (MIS) to help evaluate the effects of proposed actions on wildlife habitat across the Forests. Each MIS is associated with particular habitat elements that may (or may not) be affected by a project. Table 3.4.1a.1 below lists the eight potential MIS, key habitat components, and the rationale for whether or not each is selected for further analysis of effects from this project.

Table 3.4.1a.1. Terrestrial Wildlife MIS: Key habitat components, likelihood of occurrence, and rationale for selection (or nonselection) for analysis.

Species	Habitat Components	Likelihood of Occurrence	Selected for Analysis?	Rationale
Black Bear	**Old forest, hard mast, sensitive to noise and human disturbance**	**May occur**	**Yes**	**Species is sensitive to noise and human disturbance.**
White-tailed Deer	Grass/forb habitat, hard mast, tolerant of some level of human disturbance	May occur	No	This project does not propose measurable changes to key habitat components under any alternative.
Pileated Woodpecker	Standing dead trees	Likely to occur	No	This project does not propose measurable changes to key habitat components under any alternative.
Ruffed Grouse	11-20 year old forest, down woody material, soft mast, tolerant of some level of human disturbance	Likely to occur	No	This project does not propose measurable changes to key habitat components under any alternative.
Acadian Flycatcher	**Riparian forests**	**May occur**	**Yes**	**Project activities may affect riparian forests.**
Ovenbird	**Large contiguous areas of mature deciduous forest**	**May occur**	**Yes**	**Species is sensitive to noise and human disturbance.**
Pine Warbler	Yellow pine forests	May occur	No	This project does not propose measurable changes to key habitat components under any alternative.
Rufous-sided Towhee	0 – 10 year old forest	May occur	No	This project does not propose measurable changes to key habitat components under any alternative.

In summary, three wildlife species were chosen (in bold type) as management indicator species based on their sensitivity to activities proposed in the Tellico OHV area. Black bear and ovenbird were chosen based on their reliance on older, contiguous forests and sensitivity to disturbance. Acadian flycatchers were chosen based on their reliance on intact and functioning riparian areas.

Five species were not selected because none of the alternatives propose to measurably change stand age or composition, habitat characteristics these species are sensitive to. These species are: white-tailed deer, pileated woodpecker, ruffed grouse, pine warbler, and rufous-sided towhee.

Selected MIS Trends

Detailed information about forest-wide MIS habitats and population trends is contained in the *Management Indicator Species Report* (National Forests in North Carolina 2005), which is the primary source of information for the summaries below. The analysis of effects will indicate if any change in trend is expected as a result of the proposed activities. It is understood that these species are not the only species present that may be sensitive to changes in the environment, but rather that they serve as indicators for a more general wildlife community with the Tellico OHV area.

Black Bear - According to estimates of suitable habitat and known population data, both suitable habitat and populations of black bear are increasing across the Forests, and this trend is likely to continue.

Acadian Flycatcher - Although Acadian flycatcher populations appear to be declining range-wide, they appear to be on a slight upward trend on the Pisgah and Nantahala National Forests. Long-term persistence of this species in the Forests is likely given current population trends and protection standards for riparian forests identified in the LRMP.

Ovenbird - Long-term breeding bird studies from the past thirty-five years indicate stable populations. However, ovenbird populations were found to be increasing slightly in the northern part of the species' range, and decreasing slightly at the edges of this range, including the Blue Ridge Mountains. It is likely that ovenbird populations will persist on the Pisgah and Nantahala National Forests given the large amount of suitable habitat and standards for proactive management for this and other forest interior birds.

Proposed Activities that May Affect MIS Habitat

Proposed activities that may affect terrestrial MIS habitat components include:

1. The amount of new trail construction and trail decommissioning (habitat lost and habitat gained, respectively, expressed as acres of habitat) may affect *habitat quantity* for black bear and ovenbird.

   New trail construction may involve the removal of a few trees that could locally alter the quality of old forest condition and hard mast production. Trail decommissioning includes correcting entrenchments and planting with herbaceous and woody vegetation. This activity would create some short-term grass/forb habitat and eventually restore forested habitats to these areas;

2. The area of concentrated recreation use (level of human disturbance, expressed as road or trail density) may affect *habitat quality* for black bear and ovenbird) by affecting the type and amount of noise and human use in the area; and

3. The same activities, when located within a riparian corridor, may affect *habitat quantity and quality* for the Acadian flycatcher. Trails or other structures (e.g. stream crossings) that are added or removed in riparian areas would decrease or increase availability of this habitat.

3.4.1b ENVIRONMENTAL CONSEQUENCES - MIS

Direct and Indirect Effects

Table 3.4.1b.1 displays direct effects on terrestrial wildlife habitat components by alternative. In this analysis, trail miles are expressed as acres of habitat using the formula:

$$\frac{\textit{miles of trail (expressed in feet) x mean tread width (expressed in feet, from field measurements for each trail)}}{\textit{43,560 square feet per acre}}$$

Table 3.4.1b.1. Terrestrial habitat components affected by each alternative.

Species	Habitat Components	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Black Bear	Loss of older forest, hard mast producers (acres of disturbed habitat)	52.63	48.79	25.12	37.13	50.12	49.89
	Changes to level of human disturbance (road/trail density, mi/sq mi)	**3.07**	**2.88**	**1.19**	**1.99**	**2.94**	**3.38**
Ovenbird	Loss of contiguous forest (acres of disturbed habitat)	52.63	48.79	25.12	37.13	50.12	49.89
	Changes to level of human disturbance (road/trail density, mi/sq mi)	**3.07**	**2.88**	**1.19**	**1.99**	**2.94**	**3.38**
Acadian flycatcher	Loss of riparian habitat (acres of disturbed riparian habitat)	8.55	7.39	4.26	6.13	7.62	7.60

For black bear and ovenbird, contiguous older forest habitat directly affected by each alternative is small in comparison to the amount available within the upper Tellico watershed. The same is true for riparian habitats affected when addressing the Acadian flycatcher (Table 3.4.1b.2). In terms of direct effects to habitat quantity, none of the alternatives results in a detectable amount of affected habitat. And, for black bear and ovenbird, any detectable effects across the area are even smaller when considering that the small amount of habitat affected is spread across approximately 8,000 acres, and not located in a single area. Again, the same relationship is true for Acadian flycatchers and affected riparian habitats.

Table 3.4.1b.2. Percent of contiguous older forest and riparian habitats within the Tellico OHV area affected by each alternative.

Species	Alt.A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Black bear and ovenbird (contiguous older forest)	0.66%	0.61%	0.31%	0.46%	0.63%	0.62%
Acadian flycatcher (riparian areas)	1.31%	1.13%	0.65%	0.94%	1.17%	1.17%

Indirect effects to the species, resulting from the direct effects summarized above, are discussed below.

Black Bear – Slight changes to hard mast and the amount of older forest are overshadowed in this area by the high level of human disturbance in the area of the Tellico OHV System. This disturbance devalues much of the area as black bear habitat except for Alternatives C and D, where human disturbance would decrease to a level where black bear could use portions of the area west of the main Trail 1 corridor and southeast of the Trail 5 & 6 corridors (portions of these trails will remain open under all alternatives). It is likely that under Alternatives A, B, E, and F that black bear would avoid the Tellico OHV area because of higher open road densities in the area (and therefore more human disturbance), even though an abundance of contiguous older forest is present. Open road density estimates used in this analysis refer to habitat suitability for black bear, rather than to LRMP standards for specific management areas (since multiple MAs are present within the suitable habitat for black bear). Generally speaking, black bear can tolerate open road densities less than one mile per square mile before their behavior is altered (Mitchell and Powell 2003; Mitchell et al. 2002; Brody and Pelton 1989). Proposed winter closure (Alternatives B through F) will facilitate effective black bear denning by reducing disturbance during this critical time.

Ovenbird – Slight changes to the amount of contiguous older forest are overshadowed in this area by the high level of human disturbance that devalues much of the area as ovenbird habitat except for Alternative C, where the level of human disturbance may decrease enough to support nesting ovenbird populations (highlighted portion of Table 3.4.1b.1). Open road density exceeds Forest Plan standards under Alternatives A, B, E, and F. It is likely that under any of these Alternatives, ovenbird would avoid inhabiting (and nesting within) the area adjacent to the Tellico OHV system, even though there is an abundance of contiguous older forest present (Larson et al. 2003, Van Horn et al. 1995). Alternatives C and D both achieve open road densities compatible with ovenbird use of suitable habitat. Proposed winter closure (Alternatives B through F) will not affect ovenbird populations since they are neotropical migrants and are not occupying local habitat during this period.

Therefore, for black bear and ovenbird, Alternative C proposes to have the greatest benefit through reduced open road density, followed in decreasing order by Alternatives D, E, B, A, and F.

Acadian Flycatcher – All alternatives impact a very small amount of riparian habitat within the Tellico OHV area (Table 3.4.1b.2). Nonetheless, Alternative C potentially affects the least amount of riparian habitat, followed in increasing order by alternatives C, B, E & F, and A.

Cumulative Effects

While many of the OHV trails that existed prior to federal ownership were closed out years ago (and have been largely restored to productivity), much of the area remains undesirable as habitat for a number of wildlife species due to the high level of human disturbance.

Other past (i.e. occurring within the last 5 years), present, and reasonably foreseeable future actions with potentially overlapping impacts to wildlife habitat in the upper Tellico area (as defined above) include:

1. The Jenks Branch Project regenerated 38 acres of timber in the MA 4D portions of the Tellico OHV area, supplemented natural regeneration by planting oak seedlings, and

established approximately 0.6 acres of grass/forb habitat (totaling 0.48% of the area). These activities improved habitat slightly for black bear, and did not measurably affect ovenbird. Acadian flycatcher were not affected since no activity took place within designated riparian areas, per LRMP direction.

2. The Farmer Branch Project will harvest and regenerate 125 acres in five units in the upper Tellico watershed. Three of these units are immediately adjacent to Trail 1 which is poor habitat for black bear and ovenbird due to high level of human disturbance. Harvest of these units would neither lessen nor improve this habitat since disturbance would remain. Harvesting and regenerating the two units farther from the system would have a slight benefit to black bear while not measurably affecting ovenbird. Acadian flycatcher would not be affected since activity would not take place in the riparian area.

Cumulative changes to contiguous older forests and riparian areas habitat components (positive or negative) are not measurable, except when considering the proposed prescribed burning. .Again, slight changes to the amount of contiguous older forest are overshadowed in this area by the high level of human disturbance that devalues much of the area as wildlife habitat except for Alternative C, where the level of human disturbance may decrease enough to support a more diverse wildlife community. Open road density exceeds Forest Plan standards under Alternatives A, B, E, and F. It is likely that under any of these Alternatives, wildlife diversity is compromised within the Tellico OHV area, even though there is an abundance of contiguous older forest habitat present. Alternatives C and D both achieve open road densities compatible with increased use of suitable habitat by a more diverse community. Proposed winter closure (Alternatives B through F) perpetuates seasonal use of the area by a more diverse wildlife community.

Therefore, cumulatively speaking for black bear and ovenbird, Alternative C proposes to have the greatest benefit through reduced open road density, followed by Alternative D-modified. Alternatives E, B, A, and F propose less benefit to black bear habitat, respectively.

And, cumulatively speaking for the Acadian flycatcher, all alternatives impact a very small amount of riparian habitat within the Tellico OHV area. Nonetheless, Alternative C potentially affects the least amount of riparian habitat, followed by alternatives C, B, E & F, and A, respectively.

3.4.2a AFFECTED ENVIRONMENT – FOREST CONCERN SPECIES

Forest concern species initially considered in this analysis are those included in the National Forests in North Carolina species list (Attachment 3.4-1). LRMP direction is to manage habitats for all existing native and desired nonnative species in order to maintain viable populations of such species across the planning area (LRMP, Appendix K). All forty-five forest concern terrestrial animal species that might occur on the Nantahala National Forest were considered. Species which are known to occur or are likely to occur were identified from this list using known habitat relationships, element occurrence records maintained by the North Carolina Natural Heritage Program, and field data on the activity areas. This process resulted in five forest concern terrestrial wildlife species for inclusion in this analysis, three mollusks and two mammals (highlighted in Attachment 3.4-1, Table 3.4.2a-1).

The dark glyph is known to occur within the activity area near Tipton Knob and Rocky Knob. The pink glyph is known to occur south of the activity area. The open supercoil known to occur adjacent to the Tellico OHV area and is likely to occur in the moist leaf litter of older deciduous forests. The rock shrew and Allegheny woodrat are not known to occur in the activity area; however, the presence of the boulderfield forest in Alternative F-modified makes these two species likely to occur until site-specific surveys can be conducted.

Table 3.4.2a.1. Forest concern species evaluated for this project (terrestrial wildlife).

Species	Type	Habitat description
Dark glyph (*Glyphyalinia junaluskana*)	Snail	Rich, moist deciduous forest
Pink glyph (*Glyphyalinia pentadelphia*)	Snail	Rich, moist deciduous forest
Open supercoil (*Paravitrea umbilicaris*)	Snail	Rich, moist deciduous forest
Rock shrew (*Sorex dispar*)	Mammal	Rocky areas: hardwood forest
Allegheny woodrat (*Neotoma magister)*	Mammal	Boulderfield forest

3.4.2b ENVIRONMENTAL CONSEQUENCES – FOREST CONCERN SPECIES

Direct and Indirect Effects

Effects of the alternatives on the dark glyph, pink glyph, and open supercoil were estimated according to the change in mature forest. Loss of mature forest was calculated by the amount of new trail construction converted into acres. Decommissioned trail is not expected to develop the required habitat characteristics for decades and therefore is not considered. Table 3.4.2a.2 summarizes this analysis.

Effects of the alternatives on the rock shrew and Allegheny woodrat were estimated according to the change in boulderfield forest. Table 3.4.2b.1 summarizes this analysis.

Table 3.4.2b.1. Amount of terrestrial wildlife forest concern species' habitat disturbed by each alternative. Numbers in parentheses represent the percent of total habitat available within the Tellico OHV area that will be affected.

	Rich, moist deciduous forest (dark glyph, pink glyph, open supercoil)	Boulderfield forest (rock shrew, Allegheny woodrat)
Alt A	52.63 ac (0.66%)	No effect (habitat not present)
Alt B	48.79 ac (0.61%)	No effect (habitat not present)
Alt C	25.12 ac (0.31%)	No effect (habitat not present)
Alt D	37.13 ac (0.46%)	No effect (habitat not present)
Alt E	50.12 ac (0.63%)	No effect (habitat not present)
Alt F	49.89 ac (0.62%)	4 ac (100%)

Cumulative Effects

Other past (i.e. occurring within the last 5 years), present, and reasonably foreseeable future actions with potentially overlapping impacts to wildlife habitat in the upper Tellico area (as defined above) include:

1. The Jenks Branch Project regenerated 38 acres of timber in the MA 4D portions of the Tellico OHV area, supplemented natural regeneration by planting oak seedlings, and established approximately 0.6 acres of grass/forb habitat (totaling 0.48% of the area).

2. The Farmer Branch Project will harvest and regenerate 125 acres in five units in the upper Tellico watershed. Three of these units are immediately adjacent to Trail 1.

No other past, present, or reasonably foreseeable future actions in the area are known that would have overlapping effects on Forest Concern wildlife species with this project. While potential effects do vary by alternative, the numbers represent only a tiny fraction of the habitats available within the Tellico OHV area and across the Forests, and would likely not be measurable on the ground. Alternative F-modified will result in loss of habitat for the Allegheny woodrat and rock shrew.

Determination of Effect

Therefore, while each of the proposed alternatives may impact individuals of the dark glyph, pink glyph, and open supercoil, such effects will not impact species viability across the Forests, nor lead towards federal listing. Table 3.4.2b.1 summarizes the very small amount of habitat potentially affected in relation to the amount available across the Tellico OHV area. These percentages are even smaller when compared to the amount of habitat across the Nantahala and Pisgah National Forests or range of the species. Despite the small numbers, Alternative C proposed to disturb the least amount of snail habitat, followed by Alternatives D, B, F, E, and A, respectively.

Alternatives A through E will not impact the rock shrew or Allegheny woodrat since no boulderfield habitat will be disturbed. Alternative F-modified will eliminate 100% of the suitable habitat within the Tellico OHV area for these two species. This may impact individuals, but is not likely to impact species' viability across the Forests or lead towards federal listing. Boulderfield habitat is not common across the Forest; however, the range of each of these species indicates that potential loss of individuals will not affect species viability (Handley 1991, Merritt 1987).

3.4.3a AFFECTED ENVIRONMENT – PETS

The project area is in the Unicoi Mountains, which support several endemic species, including a ground beetle (*Trechus luculentus unicoi*), a nesticid spider *(Nesticus sheari),* and the Tellico salamander (*Plethodon aureolus*).

Terrestrial wildlife proposed, endangered, and threatened (PET) species initially considered in this analysis are those currently listed by the U.S. Fish and Wildlife Service and are included on the National Forests in North Carolina species list (Attachment 3.4-1). Sensitive species (S) considered in this analysis are those identified by the Regional Forester for which

population viability is a concern (August 2001). These species are also listed in Attachment 3.4-1.

Eight federally-listed terrestrial animal species were evaluated for the species' likelihood of occurrence within the Tellico OHV area (Attachment 3.4-1). Species which are known to occur or are likely to occur were identified from this list using known habitat relationships, element occurrence records maintained by the North Carolina Natural Heritage Program (NCNHP) and the United States Fish and Wildlife Service (USFWS), and field data from the activity areas. This process resulted in one federally-listed species, the Indiana bat (*Myotis sodalis*) being identified as likely to occur based on known records of the species in Cherokee and Graham Counties (although no Indiana bats have been found within the immediate Tellico OHV area). Therefore, the Indiana bat will be included in this effects analysis.

Twenty-six sensitive terrestrial wildlife species were evaluated for the species' likelihood of occurrence within the Tellico OHV area (Attachment 3.4-1). Species which are known to occur or are likely to occur were identified from this list using known habitat relationships, element occurrence records maintained by the North Carolina Natural Heritage Program, the NatureServe database (NatureServe 2008), and field data from the activity areas. This process resulted in nine sensitive species being identified as likely to occur within the Tellico OHV area, which will be included in this effects analysis (Table 3.4.3a.1).

Table 3.4.3a.1: Terrestrial PETS species included in this effects analysis.

Species	Type	USFS Status	Habitat Description
Indiana bat (*Myotis sodalis*)	Mammal	Endangered	Hardwood forests, snags
A ground beetle *(Trechus luculentus Unicoi)*	Insect	Sensitive	Endemic to Unicoi Mountains, Beneath rocks and moss in wet ravines
Rock-loving grasshopper (*Trimerotropis saxatilis*)	Insect	Sensitive	Lichen covered rock outcrops
A nesticid spider *(Nesticus sheari)*	Arachnid	Sensitive	Endemic to Unicoi Mtns: north-facing rocky slopes in rich cove forest
Santeetlah dusky salamander *(Desmognathus santeetlah)*	Amphibian	Sensitive	Stream headwaters and wet seeps
Tellico salamander (*Plethodon aureolus*)	Amphibian	Sensitive	Endemic to hardwood forests in the Unicoi Mountains
S. Appalachian salamander (*Plethodon teyahalee*)	Amphibian	Sensitive	Moist forests at all elevations
Southern rock vole (*Microtus chrotorrhinus carolinensis*)	Mammal	Sensitive	Moist rocky areas in spruce & hardwood forests at high elevations
Eastern small-footed bat (*Myotis leibii*)	Mammal	Sensitive	Roosts in hollow trees in summer
Southern water shrew (*Sorex palustris punctulatus*)	Mammal	Sensitive	Small, high elevation (>3000') streams 12-15' wide

Proposed activity areas were surveyed for the presence of special habitats, such as wetlands, boulderfields, caves or mines that could be adversely affected by project activities. No

special habitats except boulderfields were located. No Terrestrial wildlife PETS species are associated with boulderfields.

Project-specific surveys were not conducted for the Indiana bat. Indiana bat activity within Graham and Cherokee Counties has been and continues to be intensively monitored by the Forest Service, USDA, US Fish and Wildlife Service, and other cooperators. This extensive survey data is relied on for this analysis.

Project-specific surveys for the eight sensitive species were not conducted. Habitat for these species is not limited across the forest, and wildlife habitats within Tellico OHV area is identified as general habitat, not necessarily as having a high potential for occupancy for any sensitive species. Additionally, actual presence or absence of the species would not change the assessment of effects to viability of the population.

The ground beetle, *Trechus luculentus unicoi*, is found under moss covered rocks in wet ravines and near seeps and springs above 3000'. This species is thought to be endemic to the Unicoi Mountains. Effects of the alternatives on this species were estimated according to the loss of this habitat, as reflected by the new culverts installed that would cause a disruption of the habitat in the area of the culvert. Where culverts are removed during the decommissioning process, this habitat would be restored. These results are summarized in Table 3.4.3b.1.

The rock-loving grasshopper utilizes lichen-covered rock outcrops and boulders. Effects of the alternatives on this species were estimated according to the loss of this habitat (boulderfield forest). These results are summarized in Table 3.4.3b.1.

The cave spider, *Nesticus sheari*, utilizes moist rocky areas in rice cove forests on north-facing slopes. The species is thought to be endemic to the Unicoi Mountains. Effects of the alternatives on this species were estimated according to the loss of this habitat, as reflected by the new culverts installed that would cause a disruption of rocky habitats in the area of the culvert. Where culverts are removed during the decommissioning process, this habitat would be restored. These results are summarized in Table 3.4.3b.1.

The Santeetlah dusky salamander is found in stream headwaters and seepage areas in the Great Smoky, Unicoi, Cheoah and Great Balsam Mountains. Effects of the alternatives on this species were estimated according to the loss of this habitat reflected as a measure of new culvert installations. Where culverts are removed during the decommissioning process, this habitat would be restored. These results are summarized in Table 3.4.3b.1.

The Tellico salamander occurs in hardwood forests, and is thought to be endemic to the Unicoi Mountains in Tennessee and North Carolina. The southern Appalachian salamander is found in moist forests in the southwestern mountains at all elevations. Effects of the alternatives on these species were estimated according to the loss of this habitat from trail construction and trails remaining open. Habitat for this species would be restored in alternatives where trails or segments of trails will be decommissioned.

The southern rock vole utilizes moist rocky areas in spruce and high elevation hardwood forests. Effects of the alternatives on this species were estimated according to the loss of this habitat, as reflected by the new culverts installed that would cause a disruption of the habitat

in the area of the culvert. Where culverts are removed during the decommissioning process, this habitat would be restored. These results are summarized in Table 3.4.3b.1.

The southern water shrew is known to occur on small first order streams up to 12-15' wide, with rhododendron cover across Macon, Swain and Clay counties. There are approximately 45 acres of suitable habitat in the upper Tellico watershed. Effects of the alternatives on this species were estimated according to the loss of this habitat, reflected as a measure of the number of fords or culverts crossing perennial streams (bridge crossings would not impact habitat). No new non-bridge crossings are proposed for any alternatives. Impacts would be reduced if a non-bridge crossing is eliminated the trail system. These results are summarized in Table 3.4.3b.1.

The eastern small-footed bat is known to occur in a variety of habitats across the Forest. They can benefit from small openings which they use as feeding areas at night. Effects of the alternatives on this species were estimated to be beneficial where new openings in the canopy are created through road or trail construction. Where trails are decommissioned, this habitat would be lost. These results are summarized in Table 3.4.3b.1.

Values in Table 3.4.3b.1 summarize net habitat affected (acres gained or lost) for the terrestrial wildlife PETS species considered in this analysis. These values were calculated on the parameters described above using the formula below, except for the Eastern small-footed bat, where existing trail area and new trail area represent habitat gained and trail decommissioning represents habitat lost (the inverse of the other PETS species).

Net habitat affected = total habitat available (i.e. existing condition for the appropriate parameter, as described above) - habitat lost from new trail construction + habitat gained from trail decommissioning

3.4.3b ENVIRONMENTAL CONSEQUENCES – PETS

Table 3.4.3b.1: Acres of habitat affected by alternative for terrestrial wildlife PETS species.

Species	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Indiana bat	No Effect	No Effect	No Effect	No Effect	No Effect	No Effect
A ground beetle	No Effect	0.17 acres lost	0.36 acres gained	0.15 acres gained	0.27 acres lost	0.27 acres lost
Rock-loving grasshopper	No Effect	No Effect	No Effect	No Effect	No Effect	4.00 acres lost
A nesticid spider	No Effect	0.17 acres lost	0.36 acres gained	0.15 acres gained	0.27 acres lost	0.27 acres lost
Santeetlah dusky salamander	No Effect	0.17 acres lost	0.36 acres gained	0.15 acres gained	0.27 acres lost	0.27 acres lost
Tellico salamander	52.63 acres lost	48.79 acres lost	25.12 acres lost	37.13 acres lost	50.12 acres lost	49.89 acres lost

Species	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Southern Appalachian salamander	52.63 acres lost	48.79 acres lost	25.12 acres lost	37.13 acres lost	50.12 acres lost	49.89 acres lost
Southern rock vole	No Effect	0.17 acres lost	0.36 acres gained	0.15 acres gained	0.27 acres lost	0.27 acres lost
Southern water shrew	No Effect	0.02 acres gained	0.03 acres gained	0.02 acres gained	No Effect	No Effect
Eastern small-footed bat	52.63 acres gained	48.79 acres gained	25.12 acres gained	37.13 acres gained	50.12 acres gained	49.89 acres gained

Cumulative Effects

Other past (i.e. occurring within the last 5 years), present, and reasonably foreseeable future actions with potentially overlapping impacts to wildlife habitat in the upper Tellico area (as defined above) include:

1. The Jenks Branch Project regenerated 38 acres of timber in the MA 4D portions of the Tellico OHV area, supplemented natural regeneration by planting oak seedlings, and established approximately 0.6 acres of grass/forb habitat (totaling 0.48% of the area).

2. The Farmer Branch Project will harvest and regenerate 125 acres in five units in the upper Tellico watershed. Three of these units are immediately adjacent to Trail 1.

While potential effects do vary by alternative, the numbers represent only a tiny fraction of the habitats available within the Tellico OHV area and across the Forests, and would likely not be measurable on the ground. Generally speaking, for the terrestrial wildlife PETS species considered in this analysis, Alternatives C and D may result in improved habitat conditions. Alternative A would result in no change in habitat condition, and Alternatives B, E, and F may result in declining habitat quality for terrestrial PETS species.

Determination of Effect

Activities proposed under all alternatives may affect the Indiana bat, but are not likely to adversely affect the species because no suitable snags would be cut between April 15 and October 15, and all standards and guides for the protection of this species, as listed in Amendment 10 of the LRMP would be followed. Additionally, all Terms and Conditions contained within the Biological Opinion issued for the Indiana bat by the USFWS (April 5, 2005) would be followed. Consultation is not required for this project.

Table 3.4.3b.2 summarizes the determination of effect of each alternative on the sensitive terrestrial wildlife species considered in this analysis. Generally speaking, implementation of any alternative may impact individuals of the species but will not impact the species viability across the Forests or its range, nor lead to a trends towards listing.

Table 3.4.3b.2: Determination of effect of each alternative on sensitive terrestrial wildlife species.

Species	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
A ground beetle (*Trechus luculentus unicoi*)	No Impact	May impact individuals (negative)	May impact Individuals (positive)	May impact Individuals (positive)	May impact individuals (negative)	May impact individuals (negative)
Rock-loving grasshopper (*Trimerotropis saxatilis)*	No Impact	No Impact	No Impact	No Impact	No Impact	May impact individuals (negative)
A nesticid spider *(Nesticus sheari)*	No Impact	May impact individuals (negative)	May impact Individuals (positive)	May impact Individuals (positive)	May impact individuals (negative)	May impact individuals (negative)
Santeetlah dusky salamander *(Desmognathus santeetlah)*	No Impact	May impact individuals (negative)	May impact Individuals (positive)	May impact Individuals (positive)	May impact individuals (negative)	May impact individuals (negative)
Tellico salamander *(Plethodon aureolus)*	May impact individuals (negative)	May impact individuals (negative)	May impact individuals (negative)	May impact individuals (negative)	May impact individuals (negative)	May impact individuals (negative)
Southern App. salamander *(Plethodon teyahalee)*	May impact individuals (negative)	May impact individuals (negative)	May impact individuals (negative)	May impact individuals (negative)	May impact individuals (negative)	May impact individuals (negative)
Southern rock vole (*Microtus chrotorrhinus carolinensis*)	No Impact	May impact individuals (negative)	May impact Individuals (positive)	May impact Individuals (positive)	May impact individuals (negative)	May impact individuals (negative)
Southern water shrew *(Sorex palustris punctulatus)*	No Impact	May impact Individuals (positive)	May impact Individuals (positive)	May impact Individuals (positive)	No Impact	No Impact
Eastern small-footed bat *(Myotis leibii)*	May impact Individuals (positive)	May impact Individuals (positive)	May impact Individuals (positive)	May impact Individuals (positive)	May impact Individuals (positive)	May impact Individuals (positive)

3.5 Area Visitor Preferences

3.5.1 AFFECTED ENVIRONMENT

Two user groups have been identified as key stakeholders in the Upper Tellico OHV System; OHV users and trout anglers. Surveys of these groups were conducted during May, June and July 2008 by the Human Dimensions Research Lab, Department of Forestry, Wildlife & Fisheries, University of Tennessee. Onsite and offsite OHV user surveys were conducted to capture information from actual visitors, as well as those who did not visit the OHV System during the survey period. Off-site surveys were made available on the Internet through various sources. Therefore, respondents included both those who had visited the upper Tellico area previously, and those who had not visited but had an interest in the OHV System. Most of the trout angler respondents were onsite; responses to the angler survey as posted on the web were minimal. Therefore, the survey does not represent the population of trout anglers who have visited the area in the past or are interested in the area, but who were not present on site during the survey period. The distribution of respondents was as follows:

Table 3.5.1.1 Summary of Survey Respondents.

Group	Number of respondents	% of respondents
OHV users- onsite	192	31.4
OHV users- offsite	124	20.3
Trout anglers (all but 7 were onsite)	296	48.3
Total All Respondents	612	100

A Note on Terminology

The trail system is open to trail motorcycles and all-terrain vehicles (ATV); as well as utility-terrain vehicles (UTV), modified street legal 4WD vehicles, 4WD rail buggies, and highly specialized 4WD rock-crawlers. The latter group of vehicles are generally over 50 inches wide and referred to as "4WD" in this analysis; collectively, all off-highway vehicles are referred to by the acronym "OHV".

Demographics

The area is used primarily by non-North Carolina residents. The majority of respondents are residents of Georgia and Tennessee. Anglers use the area 2-3 times more often than OHV users, and tend to live locally. This is likely due to numerous other trout fishing opportunities in the region, reducing the necessity of traveling long distances for the trout angling experience. OHV users tend to live farther away, are 8 to 10 years younger than anglers, have completed higher levels of education and have higher annual incomes.

Table 3.5.1.2 Summary of Survey Respondent Demographics.

Element	OHV Users: Onsite	OHV Users: Offsite	Trout Anglers Onsite
Residency-Highest %	GA (34.4%)	GA (32.3%)	TN (86.8%)
Residency-2nd Highest %	TN (29.2%)	TN, SC, FL tied (12.9%)	GA (7.1%)
Residency-3rd Highest %	NC (14.1%)	NC (11.3%)	AL (1.7%)
# visits to Tellico region in last 12 months	5.11 trips	3.89 trips	11.11 trips
Age	40.1 years	38.6 years	48.43 years
Gender	Male (89.4%	Male (96.8%)	Male (94.4%)

Element	OHV Users: Onsite	OHV Users: Offsite	Trout Anglers Onsite
	Female (10.6%)	Female (3.2%)	Female (5.6%)
Post-high School Education	71.1%	93.5%	62.5%
Annual Income $50,000-100,000	51.4%	43.5%	42.6%
Annual Income $100,000 +	21.9%	42.6%	14.4%

Reasons for visiting upper Tellico

The user groups have more in common when examining the benefits they derive from visiting the area. Both groups report a desire for pursuing their activity in a natural setting, and using the experience to "get away from it all." These common motivations are shown in bold in the table below. However, OHV use is apparently a more social pursuit, and sharing challenges with others is an important part of the overall experience. The table below shows the percent of users in each category who thought the listed benefit was moderately or extremely important to them.

Table 3.5.1.3 Summary of Reasons to Visit the Tellico Area.

Benefit	OHV Users (%)	Trout Anglers (%)
Have fun	**99.9 (1)**	**91.4 (1)**
Escape from everyday stresses	**91.2 (2)**	**84.3 (3)**
Enjoy natural scenery	**85.8 (3)**	**87.0 (2)**
Experience nature	**80.4 (4)**	**78.3 (5)**
Experience personal freedom	**78.7 (5)**	**72.2 (6)**
Rest mentally	**72.8 (6)**	**80.2 (4)**
Reduce depression or anxiety	61.5	56.2
Get away from crowds	67.3	67.1
Being with others who enjoy the same thing	88.7	51.2
Do something challenging	87.1	46.1
To be alone	15.2	34.6
Test equipment performance	68.6	12.1
Explore new places	75.7	27.7
Talk to new and varied people	70.6	22.4
Test my skills	75.4	45.5
Be with friends	91.3	57.4
Experience excitement	83.1	59.2

Note: Top six reasons are in bold and ranked.

Impacts to Natural Resources

Perceptions concerning negative environmental impacts from OHV use varied by user group. Results reflect the sum of those who thought the impact was a moderate or serious problem. As a group, trout anglers perceived a greater degree of negative impact than OHV users. Within the motorized user group, ATV (ATV/UTV/motorcycle) users expressed a greater degree of awareness than 4WD users that other resources might be impacted by OHV use.

Table 3.5.1.4 Perceived Impacts of OHV Use to Certain Resources.

Perceived OHV impacts to:	OHV Users All (%)	4WD (Buggy/rock Crawlers) only (%)	ATV (ATV/UTV/Motorcycle) Only (%)	Trout Anglers (%)
Water Quality	11.8	11.3	17.5	42.4
Vegetation	8.8	6.2	16.1	Not asked
Soil	14.3	13.7	21.1	Not asked
Wildlife	5.2	3.0	12.5	Not asked

Support for temporary closures and fee increases

Support for various management tools varied among onsite and offsite users. By and large, support for seasonal and storm event closures was not strong; onsite users were more supportive of storm event closures than offsite users, perhaps because they tend to be from the local area. This is possibly due to a greater potential for being able to adapt travel plans on short notice. Support for fee increases at some level was much higher among offsite users. The fees shown in Table 3.5.1.6 were derived from the financial analysis. They were not specifically presented to the survey respondents.

Table 3.5.1.5 Percent User Support for Certain Management Tools

Management Tools	OHV Users- onsite	OHV Users-offsite
Seasonal Closures	22.9	22.9
Storm Event Closures	38.2	28.7
Fee Increases	35.7	72.8

Potential Fee Increases

In chapter 3.11, costs of operating the trail system are calculated with both current fee levels and increased fees. Fee increases are considered in the analysis in acknowledgment that future management of the Trail System would require increased revenue over current levels. Fee increases would be based on a combination of the enhancements built into the trail system and the amount of increased revenue required to maintain the system as proposed in the respective alternative. The table below shows the fee increases analyzed for each alternative. It should be noted that recreation fee increases are proposed, analyzed and reviewed in a specific process outside the scope of this project. Fee increases are presented to the Regional Recreation Advisory Committee, a group of interested individuals outside the Forest Service that meet periodically to review fee proposals to determine appropriateness and consistency across the Southern Region of the Forest Service.

Table 3.5.1.6 Potential Fee Increases

Alternative	Daily User Fee ($)	Annual User Fee ($)
A	10	60
B	20	120
C	0	0
D-modified	0	0
E	40	240
F-modified	40	240

Based on the responses shown in Tables 3.5.1.5 and 3.5.2.1 it appears that users of high challenge areas are more likely to support fee increases.

3.5.2 ENVIRONMENTAL CONSEQUENCES

Four factors were selected to analyze the effects that the six alternatives could have on the social environment. They were selected for their potential to identify significant differences among the alternatives.

- Trail preference
- Preferred trail experience level

- Decision to continue using the area
- Preference for alternative uses

Trail Preference

The table below shows trail preferences by user type. An assumption is made that the preference is based on their current trail experiences; or, if the preferred trail was closed during the survey period, their most recent use of the trails. Among all OHV users, there was a high degree of correlation of preferred trails between onsite and offsite users. However, offsite uses had a higher representation of preference for the most difficult trails. As two of the five preferred trails were closed during the survey period, it is logical to assume that more of the offsite respondents were not using the trail system. The onsite respondents' preferences were for the more difficult trails, rather than the most difficult trails. This is interesting in that the question did not relate to which trails they actually used, but which they preferred. It may indicate that, in spite of the closed trails, there is a segment of users who prefer a more diversified experience while in the trail system.

Table 3.5.2.1 Summary of Trail Preference by User Type.

Enjoy using Trail #	Experience Level	Onsite %	Offsite %	ATV (ATV/UTV/ motorcycle) %	4WD(Buggy/modified / rock crawler) %
1	Easy	18.7	13.9	24.4	14.8
Lower 2	Most	**46.7 (5)**	**70.4 (2)**	19.5	**64.1 (4)**
Upper 2	Most	44.0	**52.2 (5)**	11.1	**56.1 (5)**
3	More	27.1	18.3	33.3	22.2
4	More	**49.4 (3)**	55.7	**48.9 (2)**	**56.1 (5)**
5	More	40.4	46.1	**40.0 (4)**	45.0
6	Most	43.4	41.7	**48.9 (2)**	44.4
7	Most	32.9	48.7	9.8	45.9
8	More	26.5	27.0	28.9	27.0
9	Most	**49.3 (4)**	**69.6 (4)**	22.0	**65.2 (3)**
10	More	16.9	14.8	31.1	12.2
10a	More	21.7	6.1	**53.3 (1)**	5.3
11	Most	**62.7 (2)**	**70.4 (2)**	**40.0 (4)**	**72.0 (2)**
12	Most	**63.3 (1)**	**73.9 (1)**	31.1	**73.5 (1)**

Note: Top five preferred trails are shaded and ranked.

Among ATV users, there was a preference for more difficult trails, with preferences fairly evenly distributed among various experience levels. The 4WD users expressed a strong preference for the most difficult trails.

Preferred Trail Experience Level

Total miles of preferred trail experience were taken from Tables 3.6.2.6 through 3.6.2.11, to determine the number of miles of preferred user experience level provided in each alternative. These are shown in the analysis for each alternative.

Decision to continue using the area

Miles of preferred trail experience helps determine the potential loss of users depending on which alternative is selected. Two measures that impact users were selected: trail closures (loss of preferred experience) for OHV users, and sedimentation for anglers. Trout anglers' decisions as to whether to continue fishing in the Tellico River appear to be little affected by

sedimentation levels. On the other hand, over half of the offsite OHV users who responded to the survey indicated they would ride in the area less often if there are trail closures

Table 3.5.2.2 Summary of Recreation Choice Threshold by User Type.

Visit frequency	OHV Users-on site %	OHV Users-offsite %	Anglers %
Ride less often with trail closures	33.6	53.6	
Ride the same with trail closures	62.0	34.0	
Will fish less often due to sedimentation			9.1
Will fish the same due to sedimentation			82.8

Preference for other uses

In the survey of off-highway vehicle users, 73.8 % of respondents report participating in other activities in addition to OHV recreation while in the area. In a similar survey of trout anglers, 83.9% report participating in activities other than fishing while visiting the Tellico River. Each alternative was analyzed as to whether 80% of the preferred uses (other than the primary reason for visiting) would still be available. A standard of motorized access to the use was applied, consistent with the Forest Plan direction for the area. Specifically, almost all of the trail system is located in Management Areas 1B and 2C. MA 1B direction includes "motorized access for traditional forest uses and recreation, including off-highway vehicles." MA 2C emphasizes providing a quality visual experience, motorized recreation opportunities favoring driving for pleasure, and providing public vehicular access on forest roads. Therefore, motorized access was considered to be the appropriate level of access for the alternative uses.

Preference between the two user groups for other uses was remarkably similar. The percent for the most preferred "other recreation activities" are showing in bold in the table below.

Table 3.5.2.3 Summary of Preferred Other Activities by User Type.

Other Recreation Activities	OHV Users %	Trout Anglers %
Camping	**54.3 (1)**	**56.2 (1)**
Photography	**41.9 (2)**	26.7
Sightseeing	**39.3 (3)**	**35.3 (3)**
Picnicking	**30.4 (4)**	**41.1 (2)**
Hiking/Backpacking	**22.7 (5)**	**27.7 (5)**
Swimming	18.5	**32.5 (4)**
Trout fishing	20.1	
Animal/bird watching	14.1	21.2
Hunting	2.9	23.6
OHV driving		10.3
Mountain biking	6.7	5.1
Horseback riding	1.9	3.8

Note: Top alternative activities are in bold and ranked.

Alternative A:

Direct and Indirect Effects

OHV users would have access to all trails available in 2007. OHV users would have 10.6 miles of the most difficult trails; ATV users would have 22.2 miles of the more difficult

trails. Use levels by all three user groups would remain similar to 2007. Access for preferred other uses would remain the same as 2007 levels.

Note: Use levels from 2007 are considered the baseline. In 2007 fees were increased, but no trails were closed. 2006 levels would not be as relevant because of lower fees, while 2008 use levels have been reduced in part by temporary closure of certain popular trails.

Table 3.5.2.4 Summary of Effects of Alternative A

Factor	4WD Users	ATV Users	Anglers
Trail preference- have access to 80% of preferred trails	Yes	Yes	N/A
Miles of preferred trail experience level*	10.6	22.2	N/A
Will ride or fish less often	No	No	No
Have motorized access to 80% of preferred other uses	Yes	Yes	Yes

* Cross-referenced with Table 3.6.2.6

Alternative B:

Direct and Indirect Effects

4WD users would see a 5.7 mile reduction in most difficult trails. ATV users would see a reduction of 5.0 miles of more difficult trails. 4WD users would ride less often, whereas use by ATVs and anglers would likely remain at similar levels. Some ATV users would be concerned about lack of access to the trail system from Allen Gap. On the other hand, some ATV users would be able to make better use of Trail 11 with the construction of challenge area bypasses. Access to other uses such as those in Table 3.5.2.3 would be similar to 2007 levels. Some users would be negatively affected by seasonal and storm event closures (see Table 3.10.1.5). Restrictions on camping would reduce but not eliminate access for preferred other uses.

Table 3.5.2.5 Summary of Effects of Alternative B

Factor	4WD users	ATV users	Anglers
Trail preference- have access to 80% of preferred trails	No	Yes	N/A
Miles of preferred trail experience level *	4.9	17.2	N/A
Will ride or fish less often	Yes	No	No
Have motorized access to 80% of preferred other uses	Yes	Yes	Yes

* Cross-referenced with Table 3.6.2.7

Alternative C:

Direct and Indirect Effects

All of the more and most difficult trails would be eliminated. All trail users would be negatively affected. Users would have access to preferred other uses, but at a reduced scale.

Other uses could be accessed via Trail 1 and portions of the forest roads currently designated as Trails 2, 4, 5, and 6. Motorized access to angling in tributaries of the Tellico River, such as Peckerwood, Mistletoe and Bob Creeks, would be eliminated. There is insufficient data at present to determine if other uses would begin to replace motorized trail use.

Table 3.5.2.6 Summary of Effects of Alternative C

Factor	4WD users	ATV users	Anglers
Trail preference- have access to 80% of preferred trails	No	No	N/A
Miles of preferred trail experience level *	0	0	N/A
Will ride or fish less often	Yes	Yes	No
Have motorized access to 80% of preferred other uses	Yes	Yes	Yes

* Cross-referenced with Table 3.6.2.8

Alternative D-modified:

Direct and Indirect Effects

All of the trails would be eliminated. All motorized trail users would be negatively affected. Users would have high-clearance highway legal road access to preferred other uses. Other uses could be accessed via Trail 1 and portions of the forest roads currently designated as Trails 2, 4, 5, 6, 7 and 8. Motorized access to angling in tributaries of the Tellico River, such as Peckerwood, Mistletoe and Bob Creeks, would be available.

Table 3.5.2.7 Summary of Effects of Alternative D-modified

Factor	4WD users	ATV users	Anglers
Trail preference- have access to 80% of preferred trails	No	No	N/A
Miles of preferred trail experience level*	0	0	N/A
Will ride or fish less often	Yes	Yes	No
Have motorized access to 80% of preferred other uses	Yes	Yes	Yes

* Cross-referenced with Table 3.6.2.9

Alternative E:

Direct and Indirect Effects

4WD users would see a 4.4 mile reduction of most difficult trails. ATV users would see a reduction of 0.7 miles of more difficult trails. OHV users may ride less often due the loss of Lower Trail 2 and Trail 12. However, construction of a new challenge area on Trail 11, retaining access to the Slickrock section of Trail 9, and providing 4WD access to Trail 10 may prompt previous users to return, or recruit new users. ATV use may remain at similar levels, however, some users may not like increased 4WD use of Trail 10. There would be

little effect on the use by anglers. Access to other uses would be similar to 2007 levels. Users would be positively affected by the lack of storm event closures and elimination of additional camping restrictions.

Table 3.5.2.8 Summary of Effects of Alternative E

Factor	4WD users	ATV users	Anglers
Trail preference- have access to 80% of preferred trails	No	Yes	N/A
Miles of preferred trail experience level*	6.2	21.5	N/A
Will ride or fish less often	No	No	No
Have motorized access to 80% of preferred other uses	Yes	Yes	Yes

* Cross-referenced with Table 3.6.2.10

Alternative F-modified:

Direct and Indirect Effects

4WD users would see a 1.2 mile reduction of most difficult trails, generated by the Trail 12 reroute around "Schoolbus". Popular challenge areas on Trail 2 would remain open, with the addition of bypasses. 4WD use is likely to remain similar to current use, in spite of the loss of one challenge area Construction of a new challenge area on Trail 11, retaining access to the Slickrock section of Trail 9, and providing 4WD access to Trail 10 may prompt previous users to return, or recruit new users. ATV use may remain at similar levels, however some users may not like increased 4WD use of Trail 10. They would be positively affected by the construction of the 7.3 mile Trail 13, even though it would be constructed for an easy experience level. There would be little effect on the use by anglers. Access to other uses would be similar to 2007 levels, or enhanced by the construction of Trail 13 in a new area. Users would be positively affected by the lack of storm event closures and elimination of additional camping restrictions.

Table 3.5.2.9 Summary of Effects of Alternative F-modified

Factor	4WD users	ATV users	Anglers
Trail preference- have access to 80% of preferred trails	Yes	Yes	N/A
Miles of preferred trail experience level*	8.1	21.5	N/A
Will ride or fish less often	No	No	No
Have motorized access to 80% of preferred other uses	Yes	Yes	Yes

*See Table 3.6.2.11

Comparison of alternatives

Comparing alternatives for a range of users provides mixed results, even within user groups. For example, Alternative E eliminates some favored challenge areas for 4WDs, but creates new opportunities elsewhere. Alternative F-modified requires ATV users to share Trail 10 with 4WD users, but creates a new trail (Trail 13) dedicated to their use. The assessments below are based on a synthesis of the overall impact to the 4WD, ATV and angling experiences.

Table 3.5.2.10 Summary of Effects on User Types

Effect of alternative on:	Alt A	Alt B	Alt C	Alt D-modified	Alt E	Alt F-modified
4WD users	No change	Negative	Negative	Negative	Positive	Positive
ATV users	No change	Mixed	Negative	Negative	Mixed- more shared use	Positive
Anglers	No change	No change	Mixed- less access	Positive- Improved access	No change	No change

Cumulative Effects – All Alternatives

Various actions have occurred or are planned in the Trail System vicinity:

- Rough Crossing Bridge: This bridge spans the Tellico River on Trail 5, and marks a transition in experience level on segments of Trail 5 from easy to more difficult. The bridge was installed in 2005 to reduce road-related sedimentation in the river.
- Fain Ford Bridge: This planned bridge would span the Tellico River on Trail 4. A decision was signed to construct it and it is in the design stage. Funding for construction has not been confirmed. A decision to proceed with the project is pending the outcome of the current Trail System analysis.
- Illegal routes: A number of illegal trails were identified both in routine maintenance and during the 2007-2008 condition surveys. All identified routes have been closed following a June 2008 contract maintenance project. Some of these routes had facilitated travel around most-difficult trail segments. Others provided access to the trail system from adjacent private land.
- User fee increase: An increase from $5 to $10 per day was instituted in May 2007. No additional fee increases have been proposed.
- Tellico River corridor camping: Camping is prohibited by Supervisors Order along Trail 1 in North Carolina. The Cherokee National Forest provides developed campsites along the Tellico River immediately north of the Trail System in Tennessee. Significant capital improvements were completed in 2005 to provide managed camping areas while protecting water quality in the Middle Tellico River.

Trail 1 paving and improvement: Paving of 3340 feet of Trail 1 is currently being implemented, from the State Line to the Tipton Creek Bridge. This section of road is immediately adjacent to the Tellico River; paving will reduce sheet erosion and sedimentation from the road and manage runoff more effectively.

In addition, examination of similar opportunities within a one day drive influences the overall effect of the various alternatives:

- Other OHV Opportunities: Table 3.6.2.4 (Chapter 3.6) shows other OHV, 4WD, ATV and motorcycle opportunities within an 8 hour drive of the OHV System, located on federal, state and county lands. OHVs have access to 721 miles of more to most difficult trails within this radius; 4WDs have access to 519 miles of more to most difficult trails

within this radius, and ATVs have access to 971 miles of easy to most difficult trails. Of the 54 other trail systems inventoried, only 8 have more than 25 miles of total trail experience; smaller trail systems are much more typical. As mentioned in Chapter 3.6, "General consensus among OHV System planners and managers is that a minimum of 25 miles is necessary to provide a full day of trail riding opportunities." Few existing trail systems provide that degree of experience, regardless of difficulty level. Average size of the 54 trail systems is 19.5 miles. The six mile Anderson Creek OHV Trail System was closed in July 2008. It was located on the Chattahoochee-Oconee National Forest between Blue Ridge and Dahlonega GA, which is approximately 2.5 hours driving time from the Upper Tellico OHV Trail System.

Alternative A

The Rough Crossing and Fain Ford Bridges would continue to provide access to trails preferred by all users. Illegal routes would continue to be created around the most difficult trail segments, as there would not be any viable alternatives provided by the managed trail system itself. Additional review would be required to determine the feasibility of continuing to allow ATV traffic on the paved section of Trail 1. Continued camping restrictions on Trails 1 and 5 would be mitigated partially by the camping provided on the Cherokee National Forest.

Alternatives B-E

Additional paving and upgrading of Trail 1 southward to Harshaw Gap would impact ATV user access to the trail system from the south, as well as ATV access from the Tipton Creek Community. However, it would improve access to Tipton Creek Community by passenger vehicles from the north, and potentially promote use of Davis Creek Road/Tipton Creek Road as a scenic byway connecting North Carolina and Tennessee. Other preferred uses (see Table 3.5.2.3) may increase with improved access to the area. Travel speeds on Trail 1 from Harshaw Gap north to the state line are likely to increase, requiring implementation and maintenance of appropriate engineering and safety design features.

Alternative B

OHV users would become more dependent on other trail systems in the region for more to most difficult trail experiences. Developed camping on the Cherokee National Forest would become more important as camping restrictions are expanded in the Trail System, or users would become more dependent on commercial overnight facilities in the area. A fee increase implemented so recently after the last one could create hardship among some users, or cause them to choose other sites for OHV recreation.

Alternative C

OHV users would become completely dependent on other trail systems in the region for more to most difficult trail experiences. Developed camping on the Cherokee National Forest would become more important as vehicular access to camping opportunities in North Carolina are limited, or users would become more dependent on commercial overnight facilities in the area. The Rough Crossing Bridge would continue to provide access to picnicking and fishing on a portion of Trail 5, but the Fain Ford Bridge would not be built.

Alternative D-modified

The effects are similar to Alternative C, with the addition of some access in the current Trail 8 corridor.

Alternative E

More OHV use would be retained in the trail system, instead of shifting to other trail systems in the region. Creation of illegal routes would be less likely as the trail system would provide alternative routes around the most difficult segments. A significant increase in user fees so soon after the last increase might prompt some users to visit less often or not at all, but would also draw additional users who prefer the most difficult trail experience. Not adding more camping restrictions would disperse camping around the area, reducing the dependence on the developed camping in the Cherokee National Forest.

Alternative F-modified

Cumulative effects would be similar to Alternative E. ATV use would likely increase due to the addition of new opportunities on Trail 13 and improved access to the trail system.

3.6 Recreation Opportunities

Note: All mileages cited in section 3.6 are 2D GIS miles, which differ slightly from measured 3D mileages used in engineering, hydrology, and fisheries analysis, and as described in Chapters 1 and 2.

3.6.1 AFFECTED ENVIRONMENT

Trail History and User Experience:

The Upper Tellico tract was acquired by the US Forest Service in the early 1980's; the OHV trail system was established a few years later. Miles of abandoned logging roads existed in the area prior to FS acquisition and had been used by 4WD enthusiasts, hunters, and fishermen for years. Many of today's local "off-roaders" speak of being the third generation of Tellico users. However, Upper Tellico's popularity goes far beyond those local users and has become nationally recognized as one of the country's most challenging off-road trail systems. Users drive or trailer off-road vehicles from the Rocky Mountain region, the West Coast, and even Canada. Upper Tellico is commonly compared to the Rubicon Trail in California and Moab in Utah.

The trail system is open to trail motorcycles and all-terrain vehicles (ATV); as well as utility-terrain vehicles (UTV), modified street legal 4WD vehicles, 4WD rail buggies, and highly specialized 4WD rock-crawlers. The latter group of vehicles are generally over 50 inches wide and referred to as "4WD" in this analysis; collectively, all off-highway vehicles are referred to by the acronym "OHV".

Though Upper Tellico has historically attracted 4WD vehicle users, motorcycle and ATV riders frequent the area as well. There are even some trails designated as ATV-only. These trails are narrower, are rated Easy to More Difficult, and generally have a more natural appearance. The ATV user group generally prefers this type of trail, with low to moderate challenges, obstacles less than 2 feet high, and a narrower overall width. However, Upper Tellico does have one challenge area on an ATV-only trail; but it is bypassed by most users on unauthorized user-created trails.

Conversely, challenge areas are a major attraction to the 4WD user group. Some of the more popular challenge features are "The Rock Garden", "Slickrock", "Helicopter Pad", and "Guardrail". In these areas 4WD enthusiasts experience trails scattered with 5-foot diameter boulders, a series of 6-foot bedrock ledges, or 45 degree rock cliffs reaching 30 feet in height. These challenge areas are only attempted by the most experienced drivers. With heavy 4WD use and subsequent erosion, challenge areas have become more difficult over time. This has limited the access to less experienced users and less capable equipment. Being too difficult for ATVs to negotiate, there are many unauthorized user-created trails bypassing these obstacles. Bypass trails are often in unsustainable locations and create additional erosion problems.

There are three categories of trail difficulty that relate to user experience. The categories are Easy, More Difficult, and Most Difficult. Trails are rated with a standard system in use throughout the recreation industry. Ratings are assigned under ideal conditions and are based

on difficulty compared to other routes in the area. Conditions are always subject to change due to weather and other acts of nature.

(**Easy**) These routes are appropriate for novice through advanced users. They generally follow obvious, well-marked trails and roads. Grades are gentle, and fewer obstacles will be encountered.

(**More Difficult**) These routes are appropriate for intermediate through advanced users. Terrain may be steeper and trails narrower. Frequency, size, and difficulty in negotiating obstacles may be greater.

(**Most Difficult**) These routes are recommended for advanced to expert users only. Terrain is steep, obstacles may be very difficult to negotiate, and routes are not always well marked. Users should have considerable skill in the chosen activity, as well as knowledge of navigation and survival before attempting these trails.

To some users Most Difficult rated trails are an attraction, to others an Easy trail is more appealing. Upper Tellico OHV Trail System has a broad range of difficulty levels for all types of motorized trail experience. The following table identifies miles of trail by difficulty level and number of challenge areas:

Table 3.6.1.1 Existing Upper Tellico OHV Trail Experience Opportunities

Trail Number	Allowed Use	Difficulty Level	GIS Miles	Number of Challenge Areas
1	4WD, Motorcycle, ATV	Easy	5.3	0
2 (lower segment)	4WD, Motorcycle	Most	1.0	1
2 (upper segment)	4WD, Motorcycle, ATV	Most	2.2	1
3	4WD, Motorcycle, ATV	More	3.9	0
4	4WD, Motorcycle, ATV	More	4.8	0
5 (lower segment)	4WD, Motorcycle, ATV	Easy	1.1	0
5 (upper segment)	4WD, Motorcycle, ATV	More	0.5	0
6	4WD, Motorcycle, ATV	Most	2.2	0
7	4WD, Motorcycle, ATV	Most	0.6	1
8	4WD, Motorcycle, ATV	More	5.8	0
9	4WD, Motorcycle	Most	0.7	1
10	ATV	More	4.5	1
10A	ATV	More	2.8	0
11	4WD, Motorcycle, ATV	Most	2.7	3
12	4WD, Motorcycle, ATV	Most	1.2	2

Existing motorized use allowed on each system trail is indicated on the Upper Tellico OHV System map published and sold by the Nantahala National Forest. Allowed motorized uses are also shown on the Motor Vehicle Use Map (MVUM), which is a free publication available for all National Forest units. The MVUM publications identify roads, trails, and areas designated for motor vehicle use under 36 CFR 212.51 for the purpose of enforcing the prohibition at 36 CFR 261.13, and is a product of the Forest Service travel management regulation. However, both of these map products contain errors due to incomplete or outdated GIS data or changes in trail system management. Trail data contained is this EA

represents the most accurate information based on recent GPS inventories and current trail system management.

Vehicle types identified in this document describe allowed motorized trail use in common terms, such as 4WD, ATV and motorcycle. These terminologies relate to those used on the Upper Tellico OHV System map, but differ from those on the MVUM publication. The following table provides a crosswalk between vehicle types referenced in this analysis and allowed uses indicated on the Tusquitee Ranger District Motor Vehicle Use Map.

Table 3.6.1.2. Upper Tellico Trail System Vehicle Type Terminology

MVUM Allowed Use	Vehicle Type Referenced in EA	General Description
Open to All Vehicles	4WD, UTV, ATV, Motorcycle	Highway-Legal or Non-Highway-Legal Vehicle, Greater than or less than 50 inches in width
Special Vehicle Designation	ATV Only	All Terrain Vehicle, less than 50 inches in width

Dispersed Recreation and Trails Management Direction:

Although there are specific regulations or restrictions in some areas, dispersed recreation such as camping, fishing, and hunting is allowed on most National Forest lands. Open Forest Development Roads and motorized trails provide vehicular access for these activities.

In addition to motorized use on Forest Development Roads, system trails accommodate a range of use types that are specifically designated for various motorized and non-motorized uses. All National Forest trails are open to hiking, and unless otherwise posted, all open and gated Forest Development roads are open to bicycle and equestrian use.

The Travel Analysis for the upper Tellico watershed indicates that visitors using the area include trout fishermen, campers, local residents and people driving for pleasure, and hunting. Deer hunting is not common; however, bear hunting remains popular. Roads and trails important to bear hunters from mid-October through late November include NFSTs 420-1, 420-2, 420-3, 420-4, 420-6 and 420-10.

The Nantahala Land and Resource Management Plan (LRMP) includes management direction to provide a variety of dispersed recreation opportunities across the Forest. Dispersed recreation and trails management standards specify Recreation Opportunity Spectrum (ROS) settings, types of suitable recreation activities, and desired trail density to insure adequate trail opportunities in appropriate locations. Recreation Opportunity Spectrum classifications applicable to this project are Roaded Natural 1 (RN1) and Roaded Natural 2 (RN2), and are defined below:

- RN1 – Area is characterized by a predominantly natural-appearing environment with evidence of the sights and sounds of people. Such evidences usually harmonize with the natural environment. Interaction between users is moderate. Evidence of other users is prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and facility design. Motorized recreation opportunities predominate.

- RN2 - Area is characterized by a predominantly natural-appearing environment with moderate evidence of the sights and sounds of people. Such evidences usually harmonize with the natural environment. Interaction between users may be low, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Opportunities for both motorized and non-motorized forms of recreation are possible, but non-motorized opportunities predominate.

Dispersed recreation and trail management direction is defined for each Management Area (MA). The analysis area includes general forest areas in MA 1B, 2C, 4C, 4D; developed recreation sites in MA 12; and riparian zones in MA 18, which is embedded within other management areas. Applicable recreation management direction for each MA is summarized below:

MA 1B

- Provide motorized recreation opportunities favoring driving for pleasure. Provide some non-motorized opportunities including viewing wildlife, hunting, and access for fishing. Manage for RN1 conditions, including a high level of public vehicular access on Forest Development roads.
- Provide Off-Highway Vehicle (OHV) opportunities on designated routes. Use traffic service level D roads to enhance or expand these opportunities if such use does not adversely impact other resources. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit.
- Provide trails that emphasize hunting and fishing access, and provide some hiking opportunities.

MA 2C

- Provide motorized recreation opportunities favoring driving for pleasure. Provide some non-motorized recreation opportunities including day-use hiking, viewing wildlife, and access for fishing. Manage for RN1 conditions, including public vehicular access on forest development roads.
- Provide OHV opportunities on designated routes. Use traffic service level D roads to enhance or expand these opportunities if such use does not adversely impact other resources. Provide opportunities in response to identified needs to an approximate density of 2 miles per square mile in any management area unit.
- Provide some opportunities for horse and bicycle travel on closed roads.

MA4C & 4D

- Provide non-motorized recreation opportunities including hunting, access for fishing, viewing wildlife, horseback riding, and hiking. Manage for RN2 conditions, including a low level of vehicular access on forest development roads.
- Provide hiking opportunities and trails for viewing wildlife, hunting, and access for fishing. Use a desired density level of 2 miles of trail per square mile.

MA12 (Developed Recreation Sites)

- Manage developed sites to support dispersed recreation opportunities, and provide trail opportunities as appropriate.

MA 18 (Riparian Zones)

- Emphasize non-motorized recreation opportunities. Manage for RN1 or RN2 conditions depending on type of recreation opportunity in adjacent management areas.

Trail density standards are specified in the LRMP to indicate a desired amount and type of trail opportunity in each Management Area. The identified miles per square mile are estimates of an appropriate density for the use type and ROS setting and are not intended as an absolute maximum or minimum. The following table summarizes LRMP trail density standards:

Table 3.6.1.3 Summary of LRMP Trail Density Standards

ROS Setting	Management Area	Managed Use Type	Miles / Square Mile
RN1	1B	OHV	2
RN1	2C	OHV	2
RN2	4C	Hiking	2
RN2	4D	Hiking	2

Note: Since MA 4C and 4D are managed primarily for non-motorized trail opportunities, LRMP density standards for these management areas are for hiking trails rather than motorized trail opportunities.

3.6.2 CONSEQUENCES

Consequences of the various alternatives to recreation opportunities are evaluated based on the following:

- **Trail Density** – Compliance with LRMP standards for motorized trail miles per square mile of each contiguous management area within the project analysis area.
- **Motorized Forest Access and Dispersed Camping Opportunities** – Miles of open or seasonally open system roads on Nantahala and Cherokee National Forest's, Tusquitee and Tellico Ranger Districts which lie within areas managed for a RN ROS setting; and identification of dispersed camping opportunities in the surrounding area.
- **Storm-Event and Seasonal Closures** – Estimated number of annual closure days based on rainfall data from nearby weather stations, and duration of seasonal closure.
- **Other OHV Opportunities** – Miles of other OHV trails within a one-day drive of Murphy, NC; categorized by allowed use, difficulty level and/or challenge opportunities.
- **Use Fees** – Comparison with fees for other OHV systems, and public opinion of fee amounts as determined by user surveys.
- **Trail Experience** - Miles of Upper Tellico OHV trails categorized by difficulty level and number of challenge areas.

Trail Density

The following table summarizes proposed miles of motorized trail per square mile of MA for each Alternative, and the amount of deviation from LRMP standards.

Table 3.6.2.1 Summary of Proposed Trail Density by Alternative

Proposal	Management Area (MA)	Proposed Use Type	Trail Miles per Square Mile of MA	Deviation from LRMP Standard (in miles)
Alternative A	1B	OHV	3.4	+1.4 mi. OHV
	2C	OHV	4.8	+2.8 mi. OHV
	4C	OHV*	0	-2.0 mi. Hike
	4D	OHV*	0.3	-2.0 mi. Hike; + 0.3 mi. OHV
Alternative B	1B	OHV	2.0	Standard Met
	2C	OHV	3.5	+1.5 mi. OHV
	4C	OHV*	0	-2.0 mi. Hike
	4D	OHV*	0	-2.0 mi. Hike
Alternative C	1B	N/A	0	-2.0 mi. OHV
	2C	N/A	0	-2.0 mi. OHV
	4C	N/A	0	-2.0 mi. Hike
	4D	N/A	0	-2.0 mi. Hike
Alternative D Modified	1B	N/A	0	-2.0 mi. OHV
	2C	N/A	0	-2.0 mi. OHV
	4C	N/A	0	-2.0 mi. Hike
	4D	N/A	0	-2.0 mi. Hike
Alternative E	1B	OHV	2.0	Standard Met
	2C	OHV	4.7	+2.7 mi. OHV
	4C	OHV*	0	-2.0 mi. Hike
	4D	OHV*	0	-2.0 mi. Hike
Alternative F Modified	1B	OHV	3.8	+1.8 mi. OHV
	2C	OHV	4.5	+2.5 mi. OHV
	4C	OHV*	0.5	-2.0 mi. Hike; + 0.5 mi. OHV
	4D	OHV*	0.4	-2.0 mi. Hike; + 0.4 mi. OHV

*MA 4 is managed primarily for non-motorized trail uses, LRMP densities are for hiking trails.

Motorized Forest Access and Dispersed Camping Opportunities

In Alternatives where OHV trail miles are reduced or eliminated, there will be a loss of motorized trail access to National Forest lands. However, Alternatives C and D-modified reconstruct some trails as seasonally open roads to retain motorized access in the Upper Tellico area; though access would be by street-legal vehicles only. Additionally, the Nantahala and Cherokee National Forests offer many miles of open or seasonally open system roads. On the Tusquitee Ranger District (Nantahala NF), there are 165 miles of open road in a RN1 and RN2 settings. The adjacent Tellico Ranger District (Cherokee NF) offers another 132 miles of open road.

These system roads (or Forest Development Roads) are maintained, aggregate-surfaced roads suitable for high-clearance vehicles; and in many cases are passable by passenger vehicles. They do not offer the challenge of OHV trails and are only open to highway-legal vehicles; but they provide access to thousands of acres of National Forest lands in the Upper Tellico vicinity. Motorized access to National Forest lands provides opportunities for family-oriented recreation activities such as hunting and fishing; and is often the only means of access for users with impaired mobility. Under all alternatives these opportunities will continue to be

available along 297 miles of open Forest Development Roads on the Tusquitee and Tellico Ranger Districts.

With its current management Upper Tellico OHV System is open to trailside camping along all trails except lower Trail 5 and Trail 1 (Davis Creek Road); this would continue under Alternative A. Alternative F-modified increases OHV trail miles open to dispersed camping. Alternatives B, C, D and E reduce trail miles and/or close the area to camping; and would reduce or eliminate motorized access for dispersed camping within the OHV System. The following table summarizes miles of OHV trail open to camping in each Alternative:

Table 3.6.2.2 Summary of OHV Trail Miles Open to Dispersed Camping

Proposal	Camping Restrictions	Miles of OHV Trail Open to Camping
Alternative A	No camping along TR1 (Davis Ck Rd) & Lower TR5	32.8
Alternative B	No camping along any OHV trails or system roads	0
Alternative C	OHV Trail System Closed (partially retained as roads)	0
Alternative D-modified	OHV Trail System Closed (partially retained as roads)	0
Alternative E	No camping along Davis Ck Rd & Lower TR5	28.6
Alternative F Modified	No camping along Davis Ck Rd & Lower TR5	38.3

Dispersed camping opportunities are not limited to the OHV System. Many other camping opportunities exist along open Forest Development Roads in Nantahala and Cherokee National Forests. Suitable campsites near roads (or trails) are limited by terrain, proximity to streams, vegetation, etc.; and in a few cases dispersed camping on open system roads is restricted to designated sites. Alternatives where no OHV trailside camping is allowed do not necessarily eliminate dispersed camping opportunities in the vicinity.

Storm-Event and Seasonal Closures

The following table summarizes estimated annual days of OHV System closure for each Alternative. Storm-event closure estimates are based on rainfall data from a nearby weather station.

Table 3.6.2.3 Summary of Estimated Annual Storm-Event & Seasonal Closure Days

Proposal	Estimated Annual Days of Storm-Event Closure	Annual Days of Seasonal Closure	Total Estimated Annual Closure Days
Alternative A	0	0	0
Alternative B	24*	90	118
Alternative C	0	Yearlong Closure	365
Alternative D-modified	0	90	90
Alternative E	0	90	90
Alternative F-modified	0	90	90

*Based on 12 storm events of ≥ 1” rain, 2 days closure per event.

Other OHV Opportunities

In Alternatives where OHV trail miles are reduced, where challenge areas are eliminated, and where the system is closed completely, overall use will be displaced. Presumably the amount

of displaced use would be proportional to the reduction in trail miles. Alternatives with fewer or no challenge areas would reduce the number of 4WD users, while elimination of ATV-only trails would affect use from that group.

To evaluate impacts associated with a potential reduction or loss of OHV trail miles in some Alternatives, it's critical to identify other OHV opportunities in the region. If sufficient OHV opportunities are available within a reasonable driving distance, then impacts to the OHV community would be limited. If few opportunities exist, then reduction or loss of Upper Tellico OHV trail miles would have a greater impact.

An internet search was conducted to identify other OHV systems within an 8-hour drive of Murphy, NC. The following table summarizes OHV opportunities on Federal, State and County trails. Most of these trail/roads are within the Southern Appalachian and foothills region and offer terrain similar to Upper Tellico.

Daily trail-use fees range from $5 to $30, and on-site or nearby camping is usually available. These trail systems provide a range of difficulty levels from Easy to Most Difficult, allow various vehicle types, and offer challenge areas for the more experienced users.

The internet search revealed several privately owned OHV parks, but they are not included in the summary because of special membership requirements or lack of trail-specific data.

Note:
- All mileages are approximate
- < 2-Hour Drive = 0-100 miles from Murphy, NC
- 2 to 4-Hour Drive = 100-200 miles from Murphy, NC
- 4 to 8-Hour Drive = 200-400 miles from Murphy, NC
- The term "OHV Miles" includes trails open to all off-highway vehicle types. The breakdown of 4WD, ATV and Motorcycle subcategories indicates the number of "OHV Miles" open to each specific use. Within the subcategories, some duplication of mileage occurs because many trails allow use by two or more vehicle types.

Table 3.6.2.4 Summary of Other Federal, State & County OHV Opportunities

Use Type – Driving Distance – Difficulty Level	Available Trail Miles
Total OHV Miles < 8-Hour Drive	1053
OHV Miles < 2-Hour Drive (Easy to More Difficult)	60
OHV Miles 2 to 4-Hour Drive (Easy to More Difficult)	55
OHV Miles 4 to 8-Hour Drive (Easy to More Difficult)	217
OHV Miles < 2-hour Drive (More to Most Difficult)	190
OHV Miles 2 to 4-hour Drive (More to Most Difficult)	159
OHV Miles 4 to 8-hour Drive (More to Most Difficult)	372
Total 4WD Miles < 8-Hour Drive	584
4WD Miles < 2-Hour Drive (Easy to More Difficult)	16
4WD Miles 2 to 4-Hour Drive (Easy to More Difficult)	17
4WD Miles 4 to 8-Hour Drive (Easy to More Difficult)	32

Use Type – Driving Distance – Difficulty Level	Available Trail Miles
4WD Miles < 2-hour Drive (More to Most Difficult)	130
4WD Miles 2 to 4-hour Drive (More to Most Difficult)	67
4WD Miles 4 to 8-hour Drive (More to Most Difficult)	322
Total ATV Miles < 8-Hour Drive	971
ATV Miles < 2-Hour Drive (Easy to More Difficult)	36
ATV Miles 2 to 4-Hour Drive (Easy to More Difficult)	31
ATV Miles 4 to 8-Hour Drive (Easy to More Difficult)	190
ATV Miles < 2-hour Drive (More to Most Difficult)	190
ATV Miles 2 to 4-hour Drive (More to Most Difficult)	152
ATV Miles 4 to 8-hour Drive (More to Most Difficult)	372
Total Motorcycle Miles < 8-Hour Drive	993
Motorcycle Miles < 2-Hour Drive (Easy to More Difficult)	44
Motorcycle Miles 2 to 4-Hour Drive (Easy to More Difficult)	38
Motorcycle Miles 4 to 8-Hour Drive (Easy to More Difficult)	190
Motorcycle Miles < 2-hour Drive (More to Most Difficult)	190
Motorcycle Miles 2 to 4-hour Drive (More to Most Difficult)	159
Motorcycle Miles 4 to 8-hour Drive (More to Most Difficult)	372

As shown in the preceding tables, there are approximately 1053 miles of OHV trail opportunities within an 8-hour drive of Murphy, NC. Under Alternative C, a loss of approximately 39 miles of Upper Tellico OHV trail represents 4% of total available OHV trail miles within a one-day drive. Alternatives B, D-modified, E and F-modified represent proportionally smaller percentages. Detailed internet search results, including trail system location, available miles, and driving distance from Murphy are shown in Appendix B.

Trail Experience

In OHV trail systems like Upper Tellico, trail difficulty levels and availability of challenge areas can be considered an indicator of potential user experience. Overall length of an OHV system also affects user experience. General consensus among OHV trail system planners and managers is that a minimum of 25 miles is necessary to provide a full day of trail riding opportunities. Systems with less than 25 miles may have additional impacts from overuse, users may tend to create trails or "play" areas, and the system may lose its attraction to non-local users.

Although many other elements such as scenery, wildlife encounters, and sense of remoteness contribute to the OHV experience, difficulty, challenge, and length of system are the primary factors. Miles of each trail experience type are shown by Alternative in the following Direct and Indirect Effects sections.

Alternative A:

Direct and Indirect Effects

The following table summarizes miles of proposed trail by allowed use type, difficulty level, and the number of available challenge areas:

Table 3.6.2.5 Summary of Alternative A Trail Experience by Use Type

Allowed Use	Difficulty Level	GIS Trail Miles	Number of Challenge Areas
4WD, Motorcycle, ATV	Easy	6.4	6
	More	15.0	
	Most	8.9	
4WD, Motorcycle	Easy	0	3
	More	0	
	Most	1.7	
ATV	Easy	0	1
	More	7.2	
	Most	0	
TOTAL		39.2	10

Alternative B:

Direct and Indirect Effects

Under this Alternative, the overall trail system length is slightly less than the minimum desired length of 25 miles. The following table summarizes miles of proposed trail by allowed use type, difficulty level, and the number of available challenge areas:

Table 3.6.2.6 Summary of Alternative B Trail Experience by Use Type

Allowed Use	Difficulty Level	GIS Trail Miles	Number of Challenge Areas
4WD, Motorcycle, ATV	Easy	2.0	3
	More	13.3	
	Most	4.9	
4WD, Motorcycle	Easy	0	0
	More	0	
	Most	0	
ATV	Easy	0	0
	More	3.9	
	Most	0	
TOTAL		24.1	3

Alternative C:

Direct and Indirect Effects

Under this Alternative the trail system would be closed, but portions of trails 4, 5 and 6 would be reconstructed as seasonally open roads for street-legal vehicles. The following table summarizes miles of proposed trail by allowed use type, difficulty level, and the number of available challenge areas:

Table 3.6.2.7 Summary of Alternative C Trail Experience by Use Type

Allowed Use	Difficulty Level	GIS Trail Miles	Number of Challenge Areas
4WD, Motorcycle, ATV	Easy	0	0
	More	0	
	Most	0	
4WD, Motorcycle	Easy	0	0
	More	0	
	Most	0	
ATV	Easy	0	0
	More	0	
	Most	0	
TOTAL		0	0

Alternative D-modified:

Direct and Indirect Effects

Under this Alternative the trail system would be closed, but all or part of trails 4, 5, 6, 7 and 8 would be reconstructed as seasonally open roads for street-legal vehicles. The following table summarizes miles of proposed trail by allowed use type, difficulty level, and the number of available challenge areas:

Table 3.6.2.8 Summary of Alternative D-modified Trail Experience by Use Type

Allowed Use	Difficulty Level	GIS Trail Miles	Number of Challenge Areas
4WD, Motorcycle, ATV	Easy	0	0
	More	0	
	Most	0	
4WD, Motorcycle	Easy	0	0
	More	0	
	Most	0	
ATV	Easy	0	0
	More	0	
	Most	0	
TOTAL		0	0

Alternative E:

Direct and Indirect Effects

The following table summarizes miles of proposed trail by allowed use type, difficulty level, and the number of available challenge areas:

Table 3.6.2.9 Summary of Alternative E Trail Experience by Use Type

Allowed Use	Difficulty Level	GIS Trail Miles	Number of Challenge Areas
4WD, Motorcycle, ATV	Easy	2.0	4
	More	18.8	
	Most	4.9	
4WD, Motorcycle	Easy	0	1
	More	0	
	Most	1.3	

Allowed Use	Difficulty Level	GIS Trail Miles	Number of Challenge Areas
ATV ATV	Easy	0	0
	More	2.7	
	Most	0	
TOTAL		29.7	5

Alternative F-modified:

Direct and Indirect Effects

The following table summarizes miles of proposed trail by allowed use type, difficulty level, and the number of available challenge areas:

Table 3.6.2.10 Summary of Alternative F-modified Trail Experience by Use Type

Allowed Use	Difficulty Level	GIS Miles	Number of Challenge Areas
4WD, Motorcycle, ATV	Easy	9.0	5
	More	17.9	
	Most	4.1	
4WD, Motorcycle	Easy	5.3	3
	More	3.5	
	Most	2.0	
ATV	Easy	0	0
	More	2.7	
	Most	0	
TOTAL		44.5	8

Alternatives B through F-modified, Davis Creek Road Paving:

Effects Common to all Action Alternatives

In these Alternatives an approximately 1 mile section of Davis Creek Road (Trail 1) would be paved from Tipton Creek bridge south past the "switchbacks". This would have no effect on trail experience under Alternatives B through D-modified, since OHV use on Trail 1 would be eliminated (allowing only street-legal vehicles on Davis Creek Road). In Alternative F-modified, 4WD and motorcycle use would be allowed on Trail 1; therefore, partial paving of Davis Creek Road would change the character and the OHV user experience over that segment of road/trail. The "Easy" difficulty level would not necessarily change, but users would be traveling on an asphalt surface rather than the existing aggregate.

Alternatives A through F-modified:

Cumulative Effects

All past, current, and foreseeable future actions within the analysis area were considered for cumulative effects to recreation resources. These include paving a 3340 ft. segment of Davis Creek Road north of Tipton Creek Bridge to the State line, and constructing a bridge across the Tellico River at Fain Ford on Trail 4.

The paving project has no additional cumulative effects to recreation resources in Alternatives B through E, because Trail 1 would be eliminated from the system. In Alternatives A and F-modified, OHV use would continue on Trail 1; therefore, partial paving of Davis Creek Road would change the character and experience because OHV users would be traveling on asphalt rather than the existing aggregate surface.

Constructing a bridge at Fain Ford would eliminate the experience of fording the Tellico River; this would be true for Alternatives A, B, D-mod, E, or F-mod. No bridge would be constructed under Alternative C.

Summary of Trail Experience by Alternative

The following table shows a side-by-side comparison of trail miles and challenge opportunities for each Alternative.

Table 3.6.2.11 Size of the trail system and types of opportunities under various alternatives

		Alt. A	Alt. B	Alt. C	Alt. D-mod	Alt. E	Alt. F-mod
GIS Miles of Trail*		39.2	24.1	0	0	29.7	44.5
Miles ATV only Trail		7.2	3.9	0	0	2.7	2.7
Miles by Difficulty Level of Trail (4WD & Motorcycle)	Most	10.6	4.9	0	0	6.2	6.1
	More	15.0	13.3	0	0	18.8	21.4
	Easy	6.4	2.0	0	0	2.0	14.3
Number of Challenge Areas		10	3	0	0	5	8

*GIS miles in this table are 2-dimensional computer vary somewhat from the 3-dimentional measured miles.

3.7 Scenery

3.7.1 AFFECTED ENVIRONMENT

Scenery consists of the combination of landforms, geologic features, water bodies, and vegetation as seen across the landscape. Although considered a "common landscape" within the Southern Appalachian character type, the Upper Tellico area has a diverse mix of hardwood and coniferous forests, rock outcrops, and waterways; including the Tellico River. Existing modifications to the landscape can be seen on public lands in the form of clearings, roads, trails, bridges, developed recreation areas, and timber harvests. In addition to the motorized trails, open and gated roads, many abandoned logging roads exist from when the tract was private timber land. Most of the old logging roads have healed, and are now covered with vegetation. Of the designated motorized trails, many are eroded with deep entrenchment and exposed bedrock. Extensive vegetation damage has occurred around some challenge areas and numerous user-created bypass trails exist. All of these human-caused impacts affect scenic quality.

Upper Tellico OHV Trail System is contained within six Management Areas (MA) identified in the LRMP. These are MA 1B, 2C, 4C, 4D, 12, and 18. Each MA is assigned a Visual Quality Objective (VQO) based on methodology described in the USDA Forest Service Visual Management System Handbook (VMS). Definitions of VMS terminology can be found in the LRMP Appendix "G".

Visual Quality Objectives are determined by various combinations of three components: Variety Class, Sensitivity Level, and Distance Zone.

Variety Class identifies areas based on their value as scenic landscapes. The three classifications are:

- Variety Class A – These are distinctive landscapes where the composition of landforms, water bodies, rock outcrops, and vegetation has unusual or outstanding scenic qualities.
- Variety Class B – These landscapes are common within the landscape character type. They contain a variety of features, forms, and patterns; but are not unusual or outstanding scenic landscapes.
- Variety Class C – These areas have minimal variety of features, and include all areas not considered Variety Class A or B.

The Upper Tellico area is classified as Variety Class B.

Sensitivity Level is a measure of viewer concern for scenic quality. Classifications are:

- Sensitivity Level 1 (SL1) - Highest level of viewer concern. This occurs on primary travel routes or use areas where at least 25% of users have a major concern for scenic quality; or secondary routes/areas with at least 75%.
- Sensitivity Level 2 (SL2) - Average level of viewer concern. This occurs on primary routes/areas where 1%-25% of users have a major concern for scenic quality; or secondary routes/areas were 25%-75% have a major concern.
- Sensitivity Level 3 (SL3) - Lowest level of viewer concern. This occurs on secondary routes/areas where less than 25% of users have a major concern for scenic quality.

Distance Zones are classified by the distance at which activities are viewed. Classifications are:

- Foreground (FG) - From viewer to a maximum of 1/2 mile.
- Middleground (MG) - From FG to a maximum of 5 miles
- Background (BG) - From MG to the horizon.

Within each MA the assigned VQO varies depending on Distance Zone and Sensitivity Level for a specific viewpoint. Visual Quality Objectives for project MA's are:

- Retention (R) – Management activities are not visually evident; objective must be met within one growing season.
- Partial Retention (PR) – Management activities remain visually subordinate to the characteristic landscape; objective must be met within two growing seasons.
- Modification (M) – Management activities may visually dominate the characteristic landscape; objective must be met within three growing seasons.

The following table shows the assigned VQO for each of the project Management Areas based on Distance Zone and Sensitivity Level:

Table 3.7.1.1 Summary of VQO Assignments by Management Area.

MA	FG SL1	FG SL2	FG SL3	MG SL1	MG SL2	MG SL3	BG SL1	BG SL2	BG SL3
1B	M	M	M	M	M	M	M	M	M
2C	R	PR	PR	PR	PR	PR	PR	PR	PR
4C	R	R	PR	R	PR	PR	R	R	PR
4D	PR	M	M	PR	M	M	M	M	M
12	Meet a range of VQO's from R-M depending on site characteristics								
18	R if adjacent MA is R; PR if adjacent MA is PR or M								

All motorized trails in Upper Tellico OHV area would be considered Sensitivity Level 3; except Davis Creek Road and FR402 which would be Sensitivity Level 2. The Tellico River and its tributaries would be classified as SL 2 and SL 3, respectively. Even though the Tellico River is eligible as a Wild and Scenic River, the outstanding resource values worthy of designation are recreational, not scenic; therefore dictating a SL2 classification (see Ch 3.7, Wild and Scenic River Eligibility).

3.7.2 ENVIRONMENTAL CONSEQUENCES

Scenery Analysis:

Environmental consequences to scenery are evaluated based on a proposed activity's ability to meet assigned Visual Quality Objectives from identified viewpoints. Some viewpoints analyzed are at specific locations others are from corridors. All open roads, existing trails, proposed trail locations, developed recreation areas, fishable streams, and the Tellico River were considered for viewpoints. The following chart shows viewpoint locations analyzed for all Alternatives and their associated Management Areas, Distance Zones, Sensitivity Levels, and assigned VQO's.

Table 3.7.2.1 Summary of Assigned VQO's for Each Viewpoint Location

Viewpoint Location	MA	DZ	SL	VQO
Tellico River	18 (2C)	FG	2	PR
Fishable Streams	18 (1B)	FG	3	PR
"	18 (2C)	FG	3	PR
"	18 (4C)	FG	3	PR
Davis Creek Road (Trail 1)	1B	FG	2	M
"	2C	FG	2	PR
"	4D	FG	2	M
FR402 (Trail 2)	1B	FG	2	M
Trail 2 (not on FR402)	1B	FG	3	M
"	4D	FG	3	M
Trail 3	1B	FG	3	M
"	2C	FG	3	PR
Trail 4	1B	FG	3	M
"	2C	FG	3	PR
Trail 5 & Relocation	2C	FG	3	PR
Trail 6 & Trail 5 Connector	2C	FG	3	PR
Trail 7 & Relocation	2C	FG	3	PR
Trail 8	2C	FG	3	PR
Trail 9 & Relocation	2C	FG	3	PR
Trail 10	1B	FG	3	M
"	2C	FG	3	PR
Trail 11	1B	FG	3	M
Trail 12	1B	FG	3	M
Trail 13 (new location)	1B	FG	3	M
"	4C	FG	3	PR
"	4D	FG	3	M
Allen Gap Trailhead	12	FG	3	R, PR or M
Stateline Trailhead	12	FG	3	R, PR or M
Trail 4 Trailhead (new location)	1B	FG	3	M

Alternative A:

Direct and Indirect Effects

Erosion resulting from trail entrenchment and inadequate maintenance has created scenery impacts in many locations. Trails and associated drainage features in MA 2C are required to meet PR VQO; badly eroded segments of Trail 4, 5, 7, 8, 9 and 10 do not currently meet this standard. Trails in MA 1B are so severely damaged that even M VQO is not being met on segments of Trail 2, 10, 11 and 12. Continuation of current management and maintenance routines would allow further erosion, resulting in additional scenery degradation. In many locations, scenery management standards would not be met with this Alternative.

Alternative B:

Direct and Indirect Effects

In this Alternative, newly constructed trails, reconstructed trails, and associated drainage features would be visible from many locations in MA 1B and 2C; as would several miles of trail proposed for closure and rehabilitation in MA 1B, 2C, and 4D. Construction of trail relocations and reconstruction of existing routes conforming to the appropriate FS OHV trail design standards, and rehabilitation of damaged trail segments and some challenge areas, would improve overall scenic conditions. The following mitigation could help proposed activities meet assigned VQO's and would further reduce scenery impacts as compared to the existing condition.

Mitigation Measures:

- To the extent possible, stabilize and re-vegetate failed slopes adjacent to challenge areas.
- Reconstruct, or relocate and rehabilitate, existing challenge area bypass trails.
- Create barriers to prevent user-created bypass trails around challenge areas.
- Where possible, create hardened observation areas adjacent to challenge areas to prevent uncontrolled soil and vegetation damage in the surrounding landscape.

Alternative C:

Direct and Indirect Effects

With closure and rehabilitation of the entire trail system, all assigned VQO's would be met.

Alternative D-modified:

Direct and Indirect Effects

With closure and rehabilitation of the entire trail system, and reconstruction of all or part of trails 4, 5, 6, 7 and 8 to Forest Development Road standards, scenery would be improved as compared to existing condition and all assigned VQO's could be met.

Alternative E:

Direct and Indirect Effects

Same as Alternative B, with the following additions:

- Upgrading the southern end of Trail 4 to road standards would improve overall appearance of the corridor.
- The proposed trailhead parking area at Trail 4 and 11 intersection utilizes a site that would require minimal cut/fill, and is located in an area only visible from system trails. Both of these serve to minimize scenery impacts.
- Retaining the "Slickrock" challenge area may perpetuate existing scenery impacts on this site; therefore mitigation measures cited for challenge areas in Alternative B would apply.

With mitigation, implementation of this Alternative could meet assigned VQO's.

Alternative F-modified:

Direct and Indirect Effects

Same as Alternative E, with the following addition:

- New construction of Trail 13 would be done to OHV trail standards, which would have a similar appearance to a single-lane road. The narrower width would minimize scenery impacts along its length and at intersections with Davis Creek Road and Trail 4, but meeting PR VQO in the immediate FG may be difficult in the MA 4C section. Management Area 4C has an emphasis on scenery and non-motorized recreation (See section 3.6, Recreation Opportunities). Limited 4WD use is allowed, but is not the primary management objective.

Alternatives B through F-modified, Davis Creek Road Paving:

Direct and Indirect Effects Common to all Action Alternatives

In these Alternatives an approximately 1 mile section of Davis Creek Road (Trail 1) would be paved from Tipton Creek bridge south past the "switchbacks". The character and appearance of that segment of Davis Creek Road would change from that of an aggregate surfaced road to asphalt, but assigned Visual Quality Objectives would still be met.

Alternatives A through F-modified:

Cumulative Effects

All past, current, and foreseeable future actions within the analysis area were considered for cumulative effects to scenery resources. In the following section, these effects are discussed for each activity and Alternative.

Construction of a bridge at Fain Ford would introduce additional man-made elements to the Tellico River corridor. The bridge would be seen in conjunction with other proposed activities in Alternatives B, D-modified, E and F-modified, specifically improvements to Trail 4 on its approaches to the river. Under these Alternatives and Alternative A, bridge construction would eliminate OHV damage to river banks and scenery impacts would be reduced. Under Alternative C, no bridge would be built.

Paving of a 3340 ft. section at the north end of Davis Creek Road will be seen in conjunction with other proposed management activities along the corridor. Under Alternative A, the character and appearance of that segment of Davis Creek Road (Trail 1) has changed from that of an aggregate surfaced road to asphalt. For Alternatives B through F-modified cumulative effects would be less noticeable because these Alternatives include paving an adjacent 4860 ft. section of road. These two sections of road would create a continuous 1.6 miles of pavement, making the two sections indistinguishable in terms of change to scenic condition. Even with the cumulative change in appearance and character assigned Visual Quality Objectives would be met.

Alternative A trail proposal: As users ride through the OHV trail system there are/would be repeated views of erosion, soil compaction, and vegetation damage. Cumulative impacts to scenery under this Alternative would not meet assigned VQO's.

Alternative C trail proposal: Trails would be closed and rehabilitated. Trail viewpoints would no longer exist. Scenery viewed from Tellico River and Davis Creek Road would be improved. All assigned VQO's would be met.

Alternative B, D-modified, E, or F-modified trail proposal: Newly constructed trails, reconstruction, conversion to roads, and rehabilitation efforts would be visible continuously as users drive the trail system or roads. All of these activities would serve to improve scenic quality and have a positive overall cumulative effect. Assigned VQO's would be met, even where multiple construction/reconstruction/rehabilitation activities would be seen.

3.8 Wild and Scenic River Suitability

3.8.1 AFFECTED ENVIRONMENT

In 1994 the Cherokee and Nantahala National Forests prepared the *Draft Environmental Impact Statement and Wild and Scenic River Study Report on the Hiwassee and Tellico Rivers* (DEIS) to determine suitability for their inclusion in the National Wild and Scenic Rivers System. The study identified 22.8 miles of the Tellico River as suitable for a Recreational River designation; from its headwaters in North Carolina to McDaniel Bridge near Tellico Plains, Tennessee. The North Carolina segment of the Tellico River is 5.8 miles long.

Eligibility for inclusion in the National Wild and Scenic Rivers System is based on the following Criteria. The river must be free-flowing and posses one or more of the following outstandingly remarkable resource values: scenic, recreational, geological, fish and wildlife, historical and cultural, or other values including ecological. The study identified recreation, fish and wildlife, historical and cultural, and botanical resources as having distinctive characteristics along the 5.8 mile Tellico River segment within North Carolina.

There are three classifications of rivers or river segments in the National Wild and Scenic Rivers System; Wild, Scenic, and Recreational. Classification is based on the condition of the river and adjacent lands at the time of the study. The following are some of the criteria used in determining classification:

- Wild River - The river should be free from impoundments and the shoreline should be essentially primitive with little or no evidence of human activity. There should be little or no evidence of past timber harvest and the river should be generally inaccessible except by trail. There should be no roads or other provision for vehicular access within the river corridor. Water quality meets criteria of federally approved state standards.

- Scenic River - The river should be free from impoundments and the shoreline should be largely primitive with no substantial evidence of human activity. Evidence of past or current timber harvest is acceptable if the forest appears natural. The river may be accessible by roads which occasionally reach or bridge the river. Poor water quality does not preclude classification provided a water quality improvement plan exists or is being developed.

- Recreational River – The river may have some development with substantial evidence of human activity. This development may include residential and commercial structures, a range of agricultural uses, and forest management with evidence of past and ongoing timber harvest. The river may be readily accessible by roads and the existence of parallel roads and bridge crossings within the river corridor is acceptable. Poor water quality does not preclude classification provided a water quality improvement plan exists or is being developed.

Appendix “A” of the DEIS contains the Wild and Scenic River Study Report which documents the findings of suitability for a Recreational River classification of the 5.8 mile Tellico River segment in North Carolina. In reference to this segment the study states,

"Current land uses and management on National Forest and private lands are compatible with potential river classifications".

The Nantahala Land and Resource Management Plan Amendment 5 (LRMP) provides general direction and standards for eligible Wild and Scenic River (WSR) management on pages III-11 & III-14 through III-19; portions of which state the following:

- Provide interim protection for eligible rivers which are recommended for further study by precluding management activities whose effects could foreclose the potential classification. Continue interim protection through the study period and until the rivers are designated or released from consideration. (p. III-11 & 14, WSR Management General Direction #2)
- Use the NEPA process to assess probable effects of proposed management activities within the ¼ mile corridor. Insure proposed activities do not reduce potential classification of the river segments. (p. III-14, #4 & 4a)
- Manage the Tellico River corridor on Forest lands to retain the values which qualify it for the potential classification of Recreation. (p.III-18, #12)
- Limit motorized vehicles to open roads and trails. (p.III-19, #12c)
- Allow construction of structures and facilities for intensive recreation use and construction of new roads provided the identified outstandingly remarkable values are protected. (p. III-19, #12d & 12f)

In the existing 39.3 mile Upper Tellico OHV Trail System there are 15.3 miles of motorized trail and open road within the ¼ mile Tellico River corridor in North Carolina. Those trails and roads cross the River 5 times with bridges and once with a ford. It is important to note that the trail system was in existence during the 1994 WSR study in essentially the same configuration as the current system. Two exceptions to that are the construction of the "New Bridge" on Trail 5 to replace "Rough Crossing" ford, and the addition of ATV-only Trail 10A; 2.5 miles of which are in the river corridor.

3.8.2 ENVIRONMENTAL CONSEQUENCES

Environmental consequences to Wild and Scenic River eligibility are evaluated based on the following:

- Compliance with LRMP management direction and standards for eligible Wild and Scenic Rivers; including provisions for use of NEPA process to assess effects and interim protection of outstandingly remarkable values which qualify the Tellico River for WSR Recreational classification.

Alternative A:

Direct and Indirect Effects

With recurrent heavy OHV use on existing trail locations and a continuation of past levels of maintenance, water quality may deteriorate. Since this alternative does not propose development of a water quality improvement plan as cited in the National Wild and Scenic Rivers System Recreational classification criteria, it could be argued that this component of the criteria would not be met. If so, outstandingly remarkable values would not be maintained and compliance with LRMP direction would not be possible.

Alternatives B through F-modified:

Direct and Indirect Effects

Paved or aggregated surfaced roads, motorized trails, bridges, structures and recreation facilities within the eligible WSR corridor do not preclude the Tellico River from retaining its classification as a Recreational River segment under guidelines of the National Wild and Scenic Rivers System.

Activities proposed in Alternatives B through F-modified comply with LRMP WSR management direction and standards, and would maintain outstandingly remarkable recreation values identified in the WSR Study.

Alternatives A through F-modified:

Cumulative Effects

All past, current, and foreseeable future actions within the analysis area were considered for cumulative effects to the Tellico River's Wild and Scenic River eligibility. Other actions include paving a 3340 ft. segment of Davis Creek Road at its Northern end, and construction of a bridge on Trail 4 where it crosses the Tellico River at Fain Ford. Even if implemented in conjunction with Alternatives A through F-modified, neither the paving nor bridge would affect Tellico River WSR eligibility.

3.9 Heritage Resources

3.9.1 AFFECTED ENVIRONMENT

The name "Tellico" derives from the Cherokee word "Talikwa" (Mooney 1891) which has been interpreted to mean "plains" (Bassett 1999) or possibly wide river bottoms. This is a most plausible explanation for determining the name origin of Tellico Plains, Tennessee. Tellico Plains occupies the former site of the Cherokee town of Great Tellico, which was one of the more important towns of the Overhill Cherokee during the 18th century. Two important roads met at Great Tellico, the Trading Path and the Seneca Trail Warrior Path (Duncan 2003:242). Several very important treaties affecting the future of settlement and land ownership were signed at Tellico. The heritage resources analysis area addressed in this discussion consists of the presently existing and authorized Upper Tellico River Off-Highway Vehicle (OHV) routes, potential new routes, re-routes, parking areas and their contiguous acres between Allen Gap, Rocky Top, the Graham County line, the Tennessee State line and Jenks Knob.

The headwaters of the northwest flowing Tellico River originate within the Upper Tellico OHV Area. The southwest flowing Beaverdam and Davis Creek headwaters of the Hiwassee River originate within the OHV area and pass through the historic Cherokee towns of Grandview, Hanging Dog, Unaka and Ogreeta, in Cherokee County, North Carolina. The 1884 USGS Murphy quadrangle map includes roads and trails that are closely followed by the present day routes of Trails #1 and #2. In addition the historic map shows a road along the Stateline Ridge. No structures or other cultural improvements other than names of watercourses and topographic features are noted within the OHV analysis area on this map.

Information accumulated from heritage resources / historic properties recorded to date demonstrates a long and diverse series of human occupation and land use that spans at least the last 12,000 years on the Nantahala National Forest. There more than 700 formally recorded archeological sites in Cherokee County, North Carolina. These sites include prehistoric (before AD 1500) and historic (after AD 1500) sites. Tribal groups known to use the analysis area prehistorically and historically include tribes of the Cherokee and Creek and possibly other tribes of the Muskogeon dialect. Contact with European cultures altered the human occupation of the region beginning with the influx of European diseases and cultural assimilation and finally culminating in the removal of the Cherokee in 1838 along the Trail of Tears. Subsequent Euro-American settlement of the area focused on farming, livestock grazing, and, to a lesser degree, mining, finally culminating in unregulated commercial logging of the analysis area in the period extending from approximately 1900 to 1930. Remnants of all these activities and events, both historic and prehistoric, can be found throughout the analysis area. Site types range from temporary prehistoric hunting and gathering sites such as campsites, hunting sites, and stone quarries and sites of semi-sedentary or sedentary settlement, to historic sites such as farmsteads, mining sites, and lumbering camps. Connecting many of these sites and environments are a network of prehistoric and historic Indian trails, trade and military routes, railroad beds, and wagon roads and turnpikes (after Bass 2002). In the late 19th and early 20th centuries, Tellico Plains became the base of operations for logging operations of the Tellico River basin, conducted by the Babcock Lumber Company (http://en.wikipedia.org).

The Upper Tellico OHV Area is a portion of 9,200 acres Tract N-632 acquired from the Nature Conservancy in August of 1981. Prior to Conservancy ownership the Tract was owned by the Dabo Development Company following Champion and Bemis timber companies' ownership. At the time of Forest Service (FS) acquisition there were approximately 80 miles of logging and skid roads, in addition to railroad beds (FS Land Files).

Previous Surveys and Known Heritage Resources

Thirteen heritage resources have been located within the Upper Tellico OHV area. Eight of these are managed as NRHP eligible sites, to be preserved, protected or mitigated prior to any impact. Ten additional sites have been reported or are expected based upon high probability landforms within the OHV area. See Table 3.8.1b. Prehistoric archeological sites 31CE110 and 31CE111 were recorded along Trail 1, Davis Creek Road, in 1979 by Forest Service archeologists prior to road reconstruction. The survey for proposed bridge replacement along Trails 6 and 7 in 1992 recorded site 31CE312, a well-preserved section of historic narrow-gauge logging railroad trusses. In 1993 archeological survey for proposed Trails 1, 4 and 5 maintenance located prehistoric site 31CE347. In 2008 sample inventory and monitoring for the present project showed that this site and 2 additional prehistoric sites along Trails 4 and 11 have been impacted. An additional site was located along Trail 5. In 1993, survey for the nearby Farmers Branch Timber Sale located prehistoric archeological site 31CE330 in proximity to Trail 2. The 1998 Stateline Pay Station archeological survey located no heritage resources in the affected portions of Trails 1 and 6. The Archeological Survey for Proposed Trail Maintenance in 1999 located 31CE651, a historic logging site and yarder along Trail 8 and prehistoric archeological site 31CE650 along Trail #2. Prehistoric archeological site 31CE654 was recorded along Trail 8 during the 2000 Tellico Survey for Proposed Dispersed Campsite Improvements. Also conducted in 2000, the Heritage Resources Survey for the Proposed Jenks Branch Timber Sale, west of Trail 2, located no sites. The 2005 Heritage Resources Survey for the Proposed Farmer Branch Timber Sale, west of Trail 1, located no heritage resources. Recent 2008 surveys for reroutes and connector trails located no additional sites. Proposed new Trail 13 survey also has been completed and 2 sites were located. In addition, 5 sites are in proximity, all of which are easily accessible if users drive off the proposed trail. Trail 10A has not had a survey conducted along its route and portions of Trails 4, 6 and 8 are un-surveyed. Un-surveyed is 3.079 acres over .257 mile of trail. It is expected that there are 6 additional unrecorded sites along these routes.

Heritage Resources Surveys

Heritage resources field surveys presently conducted are dependent upon probability, the likelihood of a site being present in the expected area of potential effect (APE). Because of the historic impacts of OHVs outside trail prisms, re-routing around obstacles, camping along trails, and trail maintenance activities that further impact the area, an OHV corridor 100 feet in width is considered the APE. The corridor is 50 feet either side of the trail centerline and includes all contiguous areas with a 20% or less slope. Probability is based upon the following factors including landform, slope, distance to water and stream rank, and resources available for use and/or extraction. Probability ratings are developed in consultation with the North Carolina State Historic Preservation Officer (SHPO) and Eastern Band of Cherokee Indians Tribal Historic Preservation Officer (THPO). Some early surveys did not

fully address secondary or indirect impacts and only took into consideration the actual trail tread which often consisted of an old road bed or designated user-created trail. Many of these routes were not as deep or wide when first surveyed as they are today. Adjacent high and moderate probability areas were often not surveyed to determine potential impacts from future maintenance, braiding of routes to avoid areas, and unauthorized user created trails. The 2008 inventory and monitoring has documented that previously unrecorded sites have been impacted and exposed along trails crossing high and moderate probability areas adjacent to some previously surveyed trails.

Table 3.9.1a. Slope Factors for Determining Site Probability and Heritage Resources Survey Needs and Intensity

High Probability	Moderate Probability	Low Probability
0 – 5% slope	5+ - 20% slope and <30% slope within 100 feet of water	>20% slope and >30% slope more than 100 feet from water

Table 3.9.1b. High and Moderate Probability Ratings For Trails: Miles of Trail Crossing Areas of 20% or < Slope and Survey Results

Trail	High (0 - 5% slope) & Moderate (5+ - 20% slope) Probability Mileage	Percent Surveyed	Site(s) Located to Date
1 Tipton Creek	0.640	100%	2
2 Tipton Knob	0.830	100%	1
3 Bearpen	0.356	100%	0
4 Fain Ford	0.706	**90%**	3
5 Tellico River	0.580	100%	1
6 State line Loop	0.240	**95%**	0
6 to 5 Connector	0.052	100%	0
7 Peckerwood	0.026	100%	1
7 & 5 Reroute	0.103	100%	0
8 Bob Creek	1.299	**90%**	0
9 Mistletoe Connector	0.124	100%	0
9 Reroute	0.044	100%	0
10 Round Mountain	0.509	100%	0
10A Upper Tellico River	0.385	**0%**	0
10 Reroute	0.006	100%	0
11 Chestnut Mountain	1.134	100%	1
12 Hawk Knob	0.593	100%	0
13 new trail	0.485	100%	4

3.9.2 ENVIRONMENTAL CONSEQUENCES

Effects to heritage resources can result from all activities that disturb or put use pressure on the land. These impacts destroy context by moving and mixing artifacts. Artifacts are often broken and no longer identifiable. Previously preserved materials and sites can be destroyed by changes in soil depth and moisture content along with exposure to the elements and unauthorized collection.

All activities increase the opportunities for discovery of previously unknown heritage resources. Road and trail construction can cause direct impacts to heritage resources. Increased access to an area also increases the likelihood of vandalism at archeological sites.

Recreation developments, construction, and use can directly affect cultural resources. Trail construction for OHVs can impact archeological sites as can associated parking lots and facilities.

Environmental consequences to heritage resources are determined based on the current resource condition and potential impacts to the resource from exposure, use, and physically disturbing activities. Driving across, digging through and excavation are considered direct effects, adverse impacts to heritage resources. Construction of parking lots and campgrounds as well as all other related facilities are direct effects. Decommissioning of trails may be a direct effect to heritage resources. Soil movement, soil compaction, flooding and erosion resulting from these activities are direct adverse effects. The removal of vegetation or change in species age or type may be an adverse effect on the setting of a historic site. Increased access or access at certain times could be adverse impacts to Traditional Cultural Properties (TCPs). Recreational use, OHV riding and camping are direct effects.

Indirect effects may occur when artifacts unintentionally exposed are subjected to unauthorized collection, a violation of the Archaeological Resources Protection Act of 1979 (ARPA). Increased access to areas is also an indirect effect, making it easier to locate and loot sites. Erosion and sedimentation of sites may be an indirect effect from activities in other parts of the project's watershed.

The cumulative impact of an alternative is the incremental effect of the direct and indirect effects of the alternative in the context of the overlapping effects from past, other present, and reasonably foreseeable future actions. Increased access to and continued exposure of artifacts over time and their unauthorized collection can be a cumulative adverse effect.

The intent of Section 106 of the National Historic Preservation Act of 1966, as amended 1988 and 1999 (NHPA) is to protect National Register of Historic Places (NRHP) eligible sites, properties, from adverse effects.

Alternative A:

Direct and Indirect Effects

Current trail use, off-trail use, maintenance, erosion, and unauthorized artifact collection affects heritage resources. Alternative A affects 89.1 acres of high and moderate probability landforms known and likely to contain heritage resources over 7.42 miles of the trail routes. Nine known sites, 5 of which are considered NRHP eligible and requiring mitigation are being impacted.

Cumulative Effects

The currently planned Farmer Branch Timber sale and recent paving of 4,000 feet of Davis Creek Road increased access therefore potential exposure of heritage resources. Continued use of the 7.42 miles of trail on high or moderate probability landforms would add additional likely exposure and potential illegal collection of artifacts.

Alternative B:

Direct and Indirect Effects

Trail use, off-trail use, maintenance, erosion, reroutes (Trails 5, 6 & #7), trail decommissioning and unauthorized artifact collection affects heritage resources. Decommissioning can be designed and implemented to avoid adverse impacts and preserve heritage resources. Alternative B affects 66.6 acres of high and moderate probability landforms known and likely to contain heritage resources over 5.55 miles of the trail routes. Nine known sites, 5 of which are considered NRHP eligible and requiring mitigation are being impacted. Paving 4,860 feet and reconditioning /reconstructing the remainder of Trail 1 and eliminating non-highway-legal OHVs may result in an increase by non-street legal OHVs of user-created trails to access the area, impacting sites in proximity to designated trails.

Cumulative Effects

The currently planned Farmer Branch Timber sale and recent paving of 4,000 feet of Trail 1 increased access therefore potential exposure of heritage resources. Continued use of the 5.55 miles of trail on high or moderate probability landforms would add additional likely exposure and potential illegal collection of artifacts.

Alternative C:

Direct and Indirect Effects

Paving 4,860 feet and reconditioning /reconstructing the remainder of Trail 1 and eliminating all OHV use would decrease effects to heritage resources. Decommissioning all other trails may affect 65.4 acres of high and moderate probability landforms known and likely to contain heritage resources over 5.48 miles of the trail routes that would be converted to system road. Decommissioning can be designed and implemented to avoid adverse impacts and preserve heritage resources. Decommissioning by disturbing only previously surveyed non-site areas would help preserve significant sites. Five NRHP known eligible sites may be impacted. Covering and reseeding would help preserve sites.

Cumulative Effects

The currently planned Farmer Branch Timber sale and recent paving of 4,000 feet of Davis Creek Road increased access therefore potential exposure of heritage resources. Continued use of the 5.48 miles of trail (converted to system road) on high or moderate probability landforms would add additional likely exposure and potential illegal collection of artifacts.

Alternative D-modified:

Direct and Indirect Effects

Paving 4,860 feet and reconditioning /reconstructing the remainder of Trail 1 and eliminating all OHV use will decrease effects to heritage resources. Road use, maintenance, erosion, reroutes, trail decommissioning and unauthorized artifact collection affects heritage resources. Heavy maintenance increases the chances of impacting significant heritage resources. Decommissioning can be designed to avoid adverse impacts and preserve sites. Alternative D-modified may affect 90.4 acres of high and moderate probability landforms known and likely to contain heritage resources over 7.46 miles of the roads. Five NRHP known eligible sites may be impacted.

Cumulative Effects

The currently planned Farmer Branch Timber sale and recent paving of 4,000 feet of Davis Creek Road increased access therefore potential exposure of heritage resources. Continued use of the 5.53 miles of trail on high or moderate probability landforms would add additional likely exposure and potential illegal collection of artifacts.

Alternative E:

Direct and Indirect Effects

Paving 4,860 feet and reconditioning / reconstructing the remainder of Trail #1 may decrease the amount of trail use but may result in an increase by non-street legal OHVs of user-created trails to access the area, impacting sites in proximity to designated trails. Trail use, off-trail use, maintenance, erosion, reroutes, reconstruction, parking lot construction, and unauthorized artifact collection affect heritage resources. Heavy maintenance increases the chances of impacting significant heritage resources. Alternative E affects 69.8 acres of high and moderate probability landforms known and likely to contain heritage resources over 5.81 miles of the trail routes. Five NRHP known eligible sites will be impacted

Cumulative Effects

The currently planned Farmer Branch Timber sale and recent paving of 4,000 feet of Davis Creek Road increased access therefore potential exposure of heritage resources. Continued use of the 5.81 miles of trail on high or moderate probability landforms would add additional likely exposure and potential illegal collection of artifacts.

Alternative F-modified:

Direct and Indirect Effects

Paving 4,860 feet and reconditioning / reconstructing the remainder of Trail #1 may decrease the amount of trail use but may result in an increase by non-street legal OHVs of user-created trails to access the area, impacting sites in proximity to designated trails. Trail use, off-trail use, maintenance, erosion, reroutes, reconstruction, parking lot construction, challenge area construction and unauthorized artifact collection affect heritage resources. Heavy maintenance increases the chances of impacting significant heritage resources. Alternative F-modified affects 92 acres of high and moderate probability landforms known and likely to contain heritage resources over 7.59 miles of the trail routes. Nine NRHP known eligible sites would be impacted.

Cumulative Effects

The currently planned Farmer Branch Timber sale and recent paving of 4,000 feet of Davis Creek Road increased access therefore potential exposure of heritage resources. Continued use of the 7.59 miles of trail on high or moderate probability landforms would add additional likely exposure and potential illegal collection of artifacts.

The measure used to weigh the effects of alternatives is the amount of acreage or linear distance to be impacted, disturbed, or subjected to other use compared with the probability or likelihood of site presence (High, Moderate or Low Probability).

Table 3.9.2a Comparison of Trail System Risk by Alternative

Alternative	Miles of High & Moderate Site Probability	Acres of High & Moderate Site Probability	Number of *Known* NRHP Eligible Sites Affected	Overall Calculated Risk
A	7.42	89.1	5	Moderate
B	5.50	66.6	5	Moderate
C	5.45	65.4	5	Moderate
D-modified	7.46	90.4	5	High
E	5.81	69.8	5	Moderate
F-modified	7.59	92.0	9	High

3.10 Human Health and Safety

3.10.1 AFFECTED ENVIRONMENT

Human health and safety is analyzed for two very different environments; conditions associated with Trail 1, and conditions associated with the remainder of the OHV System (Trails 2-12).

Trail 1 is a double lane mixed-use road open to all traffic year round. It extends from Allen Gap parking area to the NC-TN state line. It has dual designation as both forest road and forest trail, allowing both highway-legal and non-highway-legal vehicles on it. It is rated for travel at 20 mph; however, there are numerous locations where slower speeds are necessary. It is maintained regularly; in February 2008 a maintenance contract addressed critical needs on the portion of Trail 1 that accesses private property, as well as sections of Davis Creek Road (the extension of Trail 1 south from Allen Gap toward the Hanging Dog community). Further work was done in June 2008 to grade, add surface material and improve drainage along Trail 1 north of Allen Gap within the trail system. In some sections of the road, the travelway is narrow, curved, and steep with very limited sight distance and sharp switchbacks.

Trails 2-12 range from level, well graveled one lane two-wheel drive roads to deeply entrenched boulder fields which require specialized four-wheel drive equipment to traverse. In some cases it is only possible to travel in one direction on the trail. Deeply entrenched sections may be incised as much as 15-20 feet below ground level, with unstable banks and large trees with unstable root systems perched overhead.

Accidents and injuries in the OHV System are rarely if ever reported directly to the Forest Service. Low-speed vehicle rollovers are common, as regularly self-documented on several Internet video websites. It is likely that there are numerous minor injuries associated with these rollovers that are not reported. Anecdotal information indicates that there may be a higher proportion of accidents and injuries associated with ATVs than with OHVs; however, there is no clear documentation to support this.

Station 21 (Hanging Dog Fire Department, Cherokee County) reports the following medical calls to the Tellico area, caused by motor vehicle accidents (Personal Communication, DeWeese 5/11/09): 2006 – 5 calls, 2007 – 1 call, 2008 -- 2 calls, 2009 – 0 calls

Cherokee County EMS reports eight incidents in the area over the last four years (Personal Communication, Lovingood, 4/19/09).

Monroe County Tennessee EMS report a historical average of one incident per month related to the OHV System. More defined statistics are not available. Victims are almost always transported out to Trail 1 or downriver to Green Cove for evacuation and treatment. Injuries are generally to the operator, often being crush injuries to head, ribs, or lacerations when a body part is outside the vehicle or it contacts controls within the vehicle when it tips or rolls. Very few injuries are sustained by bystanders, passengers or children. Monroe County reports minimal highway-legal vehicle vs. ATV accidents on Trail 1.

A review of Cherokee County Emergency Medical Services records did not show a clear trend in accidents and injuries (Cherokee Emergency Services, 2008). The table below shows an estimate of reported incidents in the OHV System area EMS calls originating in either the Tellico area or an unspecified address on Davis Creek Road, and are listed as wrecks, traffic incidents, missing persons or trauma.

Table 3.10.1.1 Summary of Tellico-area Emergency Calls

Year	Cherokee County EMS	Hanging Dog VFD"	Monroe County EMS
2003	2		8-12
2004	4		8-12
2005	1		8-12
2006			8-12
2007	5		8-12
2008		8 (2005-8)	8-12
Avg/Year	2	2	8-12

During maintenance contract implementation in June 2008, certain segments of the trail system were found to be unsafe to work in. Safety concerns are described in a letter from the contractor. It states "the trail (Trail 12) is very dangerous due to the fact it is steep and about 10 feet in a gulley with large trees that have exposed stumps and root systems overhanging the trail with large bedrock in most of the trail. The large size and amount of rock would make it necessary for dirt pads to be used to stabilize the equipment with dirt from existing bank and that runs a great risk of bringing down the trees onto the trail, operators and equipment. The steepness of the terrain will not allow room to dig water breaks to the outside of the trail or silt basins without trail widening. Water breaks in the existing trail would require tree and vegetation removal to remove borrow dirt for construction. "

Additional trail segments not referenced in the letter were also deemed by the contractor to be unsafe, and therefore were not included in the maintenance work done in June 2008 (James Barry Jones, email correspondence, 2008). These include:

Table 3.10.1.2: Trail miles not maintained by contractor due to safety concerns

Trail	Distance not maintained (miles)
2	0.38
7	0.07
8	0.68
9	0.09
11	0.67
12	1.2
Total	3.29

Trail 2: 0.38 miles
Upper 2 Challenge Area - Due to the slope and irregularities of the trail tread the excavator could not be maneuvered through this section of trail safely. Overhanging trees and the depth of entrenchment would not allow the excavator to dig without widening the trail width substantially. Access could not be gained from either side trail due to the steepness of the terrain.

Trail 7: 0.07 miles
The Ledge Challenge Area – Due to the vertical distance of the ledge the excavator could not maneuver through this section of trail, station 18+00 to station 21+65.

Trail 8: 0.68 miles
Bridges - Due to the limited weight limits for each of the bridges access could not be gained between the 1st bridge at station 23+60 to last bridge at station 59+70. Bridge simply will not support maintenance equipment weight loadings safely.

Trail 9: 0.09 mile
Slick Rock Challenge Area - Due to the slope and bed rock material of the slick rock area maintenance equipment could not traverse through the challenge area station 27+15 to station 31+90.

Trail 11: 0.67 mile
Challenge Area – Due to the travel way slope and amount of protruding bedrock the guard rail challenge area could not be traversed with maintenance equipment near station 52+00. Also the challenge area at the intersection of trail 12 could not be traversed. These stopping points along the trail system leave a section of trail 11 between the challenge areas that could not be maintained. The total length of this section is 3540 feet.

Trail 12: 1.2 mile
Challenge Areas- Due to the school bus challenge area and the challenge areas on Trail 11 no part of trail 12 could be maintained.

3.10.2 ENVIRONMENTAL CONSEQUENCES

Alternative A:

Direct and Indirect Effects

The human health and safety environment would either not change, or would deteriorate over time. Minor incidents would continue, with an occasional more serious accident. The highest potential for serious accident or injury is on Trail 1, where there is mixed use of ATV's, non street legal 4WD's, OHVs and standard street legal vehicles of all types.

Maintenance and use of segments identified in Table 3.10.1.2 would continue to present a safety hazard to contractors, employees, partners and the public.

Alternative B:

Direct and Indirect Effects

The proportion of most difficult trails as compared to more difficult and easy trails would decrease. The likelihood of conflict between vehicle types would be reduced on Trail 1, as ATV's and other non-highway-legal vehicles would be removed. Trailering of OHVs/ATVs

vehicles north to the Trail 6 trailhead parking area would increase, potentially increasing conflicts on sharp curves if speed limits and caution signage are not obeyed.

With paving and upgrading, travel speeds on Trail 1 are likely to increase, regardless of the posted speed limit. Motorcycle use is likely to increase, adding diversity in speed and maneuverability among vehicles on the road. Road design for correct banking and surfacing, guardrail installation and caution signage would be critical. Law enforcement patrolling would need to be increased. Access and response times for emergency services would be improved.

Maintenance of challenge areas on Trail 11, as identified in Table 3.10.1.2 would continue to present a safety hazard to contractors, employees, and partners.

Alternative C

Direct and Indirect Effects

All ATV and other non-highway- legal vehicles would be removed from the trail system. The majority of use would be on Trails 4, 5 and 6. These trails would be rated as easy and less conducive to accidents and injuries.

The effect of paving Trail 1 would be the same as for Alternative B. This alternative eliminates the maintenance safety hazards associated with the trail segments shown in Table 3.10.1.2.

Alternative D-modified

Direct and Indirect Effects

The effects would be generally the same as for Alternative C.

Alternative E

Direct and Indirect Effects

Eliminating non-highway- legal vehicles on Trail 1 while adding parking capacity on Trail 4 would reduce trailering of ATVs and other vehicles to the Trail 6 parking area. The potential for accidents on Trail 1 involving mixed-use vehicles would be reduced. The frequency of low speed rollovers and associated injuries on the most difficult trail sections would be similar to Alternative A.

The effect of paving Trail 1 would be the same as for Alternative B.

Maintenance of challenge areas on Trail 11, as identified in Table 3.10.1.2 would continue to present a safety hazard to contractors, employees, and partners. Other non-maintainable areas referenced in Table 3.10.1.2 would be stabilized and present less of a safety hazard to contractors, employees, and partners.

Alternative F-modified

Direct and Indirect Effects

The effects would be similar to those of Alternative E. However, maintenance of challenge areas on Trails 2, 9 and 11, as identified in Table 3.10.1.2 would continue to present a safety hazard to contractors, employees, and partners.

All Alternatives

Cumulative Effects

Past, present, and reasonably foreseeable future actions that should be analyzed in the context of human health and safety include:

- Trail 1 paving: 3340 feet of Trail 1 is currently being implemented, from the State Line to the Tipton Creek Bridge. This section of road is immediately adjacent to the Tellico River; paving will reduce erosion and sedimentation into the Tellico River, and manage runoff more effectively.
- Farmer Branch Timber Sale: This sale is located within the project area, and consists of 106 acres across six sale units. One unit is immediately adjacent to the Allen Gap parking area, one is accessed by Forest Road 403 which leads off of the Allen Gap parking area, and three units are immediately adjacent to Trail 1. The sale commenced in Fall 2008, and will extend through Fall 2011. The timber sale contract includes maintenance of sale-related impacts to Forest Road 403, Allen Gap parking area and Trail 1.

Alternatives B, C, D-modified, E, F-modified

Timing of the Trail 1 paving should be coordinated with timber sale activities, to ensure that loading and hauling of forest products does not damage new road surface, reduce the benefits of the paving or create safety issues. Mixed use (Alt. F-modified) on the portion of Trail 1 to be paved in 2009 may temporarily affect safety if posted travel advisories are not complied with

Table 3.10.2.1 Summary of Trail System Safety by Alternative.

Alternative	Safety- Trail and Road Users	Safety- Maintenance and Management
A	Less safe as system deteriorates- expect challenge area injuries	Less safe as system deteriorates
B	Safer than A – requires traffic control compliance	Increase- eliminates most non-maintainable segments
C	Safer than A– requires traffic control compliance	Increase- eliminates all non-maintainable segments and upgrades all remaining routes to high clearance, highway legal access
D-modified	Safer than A– requires traffic control compliance	Increase- eliminates all non-maintainable segments and upgrades all remaining routes to high clearance, highway legal access
E	Safer than A– requires traffic control compliance- expect challenge area injuries	Increase- non-maintainable areas would be stabilized. Injuries are likely to continue in challenge areas.
F-modified	Safer than Alt A – requires traffic control compliance-expect challenge area injuries	Increase- non-maintainable areas would be stabilized. Injuries are likely to continue in challenge areas. Challenge areas will continue to present safety hazards, but bypasses will give less experienced users options for less difficult routes

3.11 Economics

3.11.1 AFFECTED ENVIRONMENT (Current Economic Conditions)

This section discusses the benefits of the trail system to the local economy and is based on site- specific sources of information. A study of local businesses and forest visitors was conducted by the University of Tennessee in the summer of 2008 (English, Menard and Jensen 2008).

Businesses

The survey of businesses resulted in 78 responses from Cherokee County NC, and 8 responses collectively from Clay County NC, Fannin County GA, Monroe County TN and Polk County TN (Fly 2008). The majority of respondents represented real estate sales (34.4%), rental cabins (26.2%), retail (18.9%), construction (10.0%), automotive repair/service (7.8%). Reported percentages of sales to OHV and ATV users varied, with no statistically supportable trends. Sales to "rock crawlers-rail buggies" ranged from zero (53% of respondents) to 10% (9.4% of respondents). Sales to "dirt bike/ATV owners" ranged from zero (45.3% of respondents) to 20% (10.9% of respondents).

Impact of Fuel Costs

In the current economic environment, attitudes related to fuel prices and the impact they may have on future use and revenue are relevant. Of businesses surveyed, 81% reported a decline in sales from April-June 2008 as compared to the same period in 2006 and 2007. Businesses attributed the decline primarily to the general economy, gasoline prices and trail closures. The three campground owners or operators who responded listed the trail closures as the most important contributing factor to the sales decline; the other businesses listed the general economy and gasoline process as more important.

Users in the survey discussed in Chapter 3.5 reported different perspectives on the impact that fuel prices had on their recreation decisions. Onsite OHV/ATV users, by virtue of being in the area during the survey period, were demonstrating that they would continue to use the area at least to some degree. However, there was only a small difference between their responses and those of the offsite users. Fuel prices seem to have the most effect on the trout anglers. This is consistent with the annual income data summarized in Table 3.5.1.2. OHV/ATV users are less influenced by increases in fuel prices than anglers, who report lower mean annual incomes. Offsite users are somewhat more affected than onsite users.

Table 3.11.1.1 Summary of Influence of Fuel Prices.

Effect of fuel prices	OHV/ATV users Onsite	OHV/ATV users Offsite	Trout anglers
Ride/fish less often	17.9	23.1	31.7
Ride/fish about the same	80.5	73.6	65.9
Ride/fish more often	1.6	3.3	2.4
Influence choice of location	15.3	27.5	16.5

During the survey period, gasoline prices for the area were averaging $3.90-$4.00 per gallon (New York Times, June 9, 2008). Price increases well into the $4.00-$5.00 range and beyond are likely to have a more significant impact on visitor choices than were reflected in the survey, especially for non-local users.

Comparison of Economic Impacts

OHV users generate roughly four times the economic impact to the region as trout anglers. Within the OHV user group, the "rock crawler" group generates four to five times the economic impact of ATV users. These proportions hold true whether examining the annual value of goods and services (industrial output) or employee compensation, income, and various taxes (value added). Overall, "rock crawlers" generated roughly 68% of the direct expenditures among the users surveyed. The economic impact analysis indicates that OHV's contribute over $3 million annually in direct impacts to the three-county area, generating about $320,000 in indirect business taxes. Trout anglers contribute around $ 735,000 annually, generating about $81,000 in indirect business taxes.

To put this in perspective, it is important to examine the total economic picture for the three county area studied. Tourism in the three county study area contributes 8.6% of the total economy. According to English, et al, this includes scenic and sightseeing transportation and support activities; motion picture/video industries; independent artists, writers, and performers; promotion of performing arts/sports; museums, historical sites, and parks; fitness and recreational sports centers; other amusement, gambling, and recreational industries; hotels/motels; campgrounds; and restaurants. Within the tourism-related sector of the economy, OHV use and trout angling represent a relatively small segment of the economy.

Table 3.11.1.2 Summary of Economic Contributions.

County	Total Economy (in million $)	Contribution from Tourism (in million $)	Contribution from Tourism (%)	Contribution from OHV (million $/ %)	Contribution from Trout Anglers (million $/ %)
Cherokee County NC	1,269.5	43.7	3.4		
Graham County NC	348.3	23.0	6.6		
Monroe County TN	2,656.0	302.8	11.4		
Three county study area	4,273.8	369.5	8.6	4.8 0.1	1.1 0.03

Following is a breakdown of the economic impact by user type. Locally the impact may be significant, particularly related to job creation. One mitigating factor is that the number of jobs reflects portions of jobs which may also support other segments of the economy. The figure shown does not represent an entire full-time job, but that portion of a job which is associated with OHV use. The economic benefit study assumed a multiplier of 0.37; that is, for every job created by expenditures based on OHV use, another 0.37 job is created in other industries in the region. From a regional perspective, the impact is relatively small.

Table 3.11.1.3 Summary of Annual Economic Impacts by User Type

Economic Indicators	Total Impacts
Total Industrial Output ($)	
Trout Angler	1,137,561
All OHV	4,790,698
Total Value Added ($)	
Trout Angler	661,822
All OHV	2,736,093

Economic Indicators	Total Impacts
Employment (# jobs)	
Trout Angler	18
All OHV	54

Terms used in Table 3.11.1.3, are defined as follows:

Total Impact (ie. positive impact, benefit or contribution) figures shown include:

Direct Impacts: attributable specifically to new expenditures in the region, such as a visitor from outside the region renting a cabin

Indirect Impacts: businesses expenditures on raw materials, supplies and other operating expenditures, such as a local restaurant purchasing food supplies to serve visitors

Induced Impacts: new income that is spent and re-spent within the local economy, such as local store employees who serve visitors, spending their salary within the community

Economic Indicator Unit of Measure

Total Industrial Output: annual dollar value of goods and services produced by OHV- and angler-related tourism.

Total Value Added: estimated employee compensation, proprietary income, other income, and indirect business taxes (consists of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses)

Employment: estimated number of total wage and salary jobs (both full and part time as well as self-employed) created through direct, indirect or induced expenditure- this represents portions of the number of jobs shown.

The economic analysis examined the overall economic impact of each use surveyed. The use-specific impact value was determined by dividing the total impact value shown in Table 3.11.1.3 by the number of anglers or OHV vehicles. As shown in the table below, rock crawlers generate the most economic impact of the three types of use.

Table 3.11.1.4 Summary of Total Economic Impact by Vehicle or User

User Type	Estimated economic impact
Rock-Crawler - per vehicle	$ 413
ATV- per vehicle	$ 308
Total OHV-weighted average	$389
Trout Angler	$ 143

Vehicle Type

Rock-Crawler only: Dune buggies, rail buggies, modified street-legal 4-wheel drive vehicles/trucks, and rock-crawler vehicles

ATV only: Off-highway motorcycles, ATVs, and utility terrain vehicles (Mule, Rhino, Kubota, etc.)

<u>Proportion of Forest-wide Recreation Users Served</u>

According to the US Forest Service National Visitor Use Monitoring (NVUM) report 2006 revision, the National Forests in North Carolina has approximately 8,564,000 site visits annually. In fiscal year 2008, 7,488 vehicle passes were sold for Upper Tellico OHV Area. With an estimated 85% fee compliance and a multiplication factor of 1.5 users per vehicle, Upper Tellico OHV Area receives approximately 13,214 site visits annually. As compared to the overall

National Forests in North Carolina visitation, this represents just 0.0015% of National Forest recreation use in the state.

Other Uses

The two primary user groups of the Upper Tellico OHV Trail System and surrounding area were the focus of this economic analysis. There are many other uses of the area. Some of them are discussed in Chapter 3.5, and include camping, picnicking, photography, hiking, hunting and others. To some extent these uses are embedded in the responses from OHV users and trout anglers, as they conduct many of these activities while pursuing their primary interest. Additional economic benefits are derived from vegetation management activities in the area, with the most recent example being the Farmer Branch Timber Sale. A discussion of the economic impacts of that project is presented in the environmental assessment (Farmer Branch Project, 2006, page 51).

3.11.2 ENVIRONMENTAL CONSEQUENCES

The economic impact analysis is based on a "snapshot in time" during the 2008 survey period. Comparison of alternatives considers probable trends in economic impact based on future management (same, more, less than 2008). User survey results discussed in more detail in Chapter 5 (Tables 3.5.2.2 and 3.5.2.4-9) support these conclusions.

Economic data was collected in 2008, a year that has been atypical compared to impacts/benefits common in 2007 and before. Contributing factors include trail closures, public concern over future trail system management, and general economic conditions. However, Alternative A is based on 2007 trail management, which does not include trail closures. Therefore, Alternative A may generate increased economic benefits relative to 2008.

Capital improvement expenses range from $468,750 for Alternative A to $6,220,521 for Alternative F-modified. Capital improvement expenses (depending on the alternative) include upgrading Trail 1, constructing trails, upgrading roads to meet standards, and improving parking areas. Capital improvement expenses also include (depending on the alternative) closing and decommissioning roads and trails, and stabilizing the decommissioned routes to eliminate future sedimentation. Capital improvement expenses would provide a one-time benefit to the region in contracting, salary, materials and supplies, and other expenditures.

Average annual maintenance expenses (net cost to government) range from $ 113,782 for Alternative A to $ 1,500,880 for Alternative F-modified. Operations, maintenance and program management expenses include on-the-ground maintenance, patrolling, monitoring of the trail system and other resources, and oversight. These expenditures would be distributed over time. With external (non-appropriated) revenue sources funding the expenses, the impact to other segments of the recreation, trails and roads programs on the Nantahala National Forest would be minimal. However, without significant long term commitment of external revenue sources, there would be a commensurately higher impact on other segments of those programs. Competition for limited grant funds would divert funding from other OHV trails in North Carolina.

Impacts of each alternative

In evaluating the economic impact (or benefit) of each alternative, the estimated "Utilized Rider Days" from the Financial Analysis Model discussed in more detail in Appendix C is used as the basis for predicting the level of use for each alternative. Using the per-vehicle impact above, Table 3.11.1.5 shows the impact by alternative.

Note: $389 per vehicle is used as a weighted average of the impact of both rock crawlers (413 x 0.77) plus ATV's (308 x .23), for Alternatives A, B, E and F. However, there is no data available to predict quantitatively the number or proportion of future rock crawlers vs. ATV users based on alternative. Increased use by rock crawlers would generate increased impact over what is shown below.

Economic impact of angler use by alternative is not examined here. Survey results indicated that angler use would not vary dramatically based on future management of the area (see Table 3.5.2.2). Therefore, it is not of use in comparing alternatives.

Table 3.11.2.1 Summary of Impact/Benefit from OHV Use by Alternative

User Type	Alt A	Alt B	Alt C	Alt D-mod	Alt E	Alt F-mod
a. Utilized Rider Days	11,117	7,698	0	0	15,159	15,159
b. Avg # of riders per vehicle	1.75	1.5	0	0	1.75	1.75
c. # Vehicle-days (a /b)	6,353	5,132	0	0	8,662	8,662
d. Impact per vehicle ($)	389	389	0	0	389	389
e. Total impact (c x d)	2,471,317	1,996,348	0	0	3,369,518	3,369,518

Alternatives A-F-modified

External economic factors such as higher fuel prices may influence the effects of all alternatives. According to Table 3.11.1.1, 23.1% of the OHV and ATV users surveyed off site responded that they would use the area less often with increased fuel prices, though no threshold was identified. This factor likely influences Alternatives A, E, and F-modified more, where the trail system would be more attractive to users traveling from outside the region, but the difference in effect would be difficult to quantify.

Alternative A:

Economic benefits to the region would likely increase compared to 2008 levels, but remain comparable to historic levels. Direct revenue from fees and other sources would be $161,307, which would be available for spending and re-spending in the region.

Alternative B:

Economic benefits to the region would likely decrease compared to 2008 levels. Initial implementation would cost $3,250,485 (from Appendix C). This implementation expense would provide a short-term influx of funds generated by contracting, purchase of materials and similar actions. In the long run, revenue is likely to decrease due a smaller user base. Direct revenue from fees and other sources would be $74,247, which would be available for spending and re-spending in the region.

Alternative C:

Economic benefits to the region would likely decrease compared to 2008 levels. Initial implementation would cost $2,333,660 (from Appendix C). This implementation expense would provide a short-term influx of funds generated by contracting, purchase of materials and similar actions. In the long run, revenue is likely to decrease due a smaller user base. OHV-based revenue would be eliminated, but may be compensated for to some extent by an increase in other uses, as discussed above.

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Alternative D-modified:

Economic benefits to the region would likely decrease compared to 2008 levels. Fewer users from outside the area are likely in the foreseeable future. Initial implementation would cost $3,129,120 (from Appendix C). This implementation expense would provide a short-term influx of funds generated by contracting, purchase of materials and similar actions. OHV-based revenue would be eliminated, but may be compensated for to some extent by an increase in other uses, as discussed above.

Alternative E:

Economic benefits to the region would likely increase over 2008 levels. Initial implementation would cost $4,654,583 (from Appendix C). This implementation expense would provide a short-term influx of funds generated by contracting, purchase of materials and similar actions. In the long run, revenue would continue to increase due to an expanded user base. Direct revenue from fees and other sources would be $209,816, which would be available for spending and re-spending in the region.

Alternative F-modified:

Economic benefits to the region would likely increase over 2008 levels. Initial implementation would cost $6,220,521 (from Appendix C). This implementation expense would provide a short-term influx of funds generated by contracting, purchase of materials and similar actions. In the long run, revenue would continue to increase due to an expanded user base. Direct revenue from fees and other sources would be $209,816, which would be available for spending and re-spending in the region.

3.12 Climate Change

3.12.1 EFFECTS OF CLIMATE CHANGE ON THE PROJECT

The effect of concern in regard to this project is the amount of precipitation that might occur with climate change. The scale of this analysis is the upper Tellico watershed, since the impact of precipitation can be calculated at the watershed scale. The two major climate change models vary in their projections of future precipitation but both suggest decreases in precipitation in the Southeast through 2030, with one predicting a slight decrease through 2030 followed by a 20% increase, and one predicting more long term drought conditions (IPCC 2007)

If precipitation decreases and the water table drops some springs would likely dry up or have less flow, some intermittent streams might become ephemeral, and accelerated erosion from the trails would be reduced. For those alternatives that leave the OHV system open, less frequent maintenance would be required than what is currently estimated.

3.12.2 EFFECTS OF THE PROJECT ON CLIMATE CHANGE

The effect of concern in regard to this project is the emissions from fossil fuel combustion released into the atmosphere from motorized vehicles. The scale of analysis is global since the impact of emissions on climate change is calculated at the global scale. No direct, indirect or cumulative effects would occur since any vehicles displaced or added to traffic in the area would be added or displaced from some other area and no net change globally in the number of motor vehicles releasing emissions of fossil fuel would occur for this project from any alternative.

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APPENDIX A

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 1 – Tipton Creek	
The switchbacks (survey stations 6,400 ft. through 8,000 ft.) cannot be maintained adequately as an aggregate surfaced road. Repeated reconstruction has failed to resolve the issues associated with the steep grade. The switchbacks make it very difficult for ordinary vehicles to traverse the road and nearly impossible for vehicles with trailers. Sections are in close proximity to Tipton Creek. With high traffic volumes and unauthorized high speeds, along with wheels spinning to gain traction through the switchbacks, Trail 1 is a high sediment source. Hardening the road surface such as with pavement would alleviate much of this problem. The drawback, however, is that ATVs are not compatible with paved surfaces. So an alternate way for ATVs to access the system from State Line parking area would be required.	Harden the northernmost portion of the road surface with pavement or other appropriate surface material to eliminate sedimentation potential and reduce maintenance needs. Reconstruct the remainder south to Allen Gap. Add trail system access for ATVs at the northern entrance near the NC-TN state line (if part of Trail 1 is paved ATV's could not use the paved part to access the system). Remove Trail 1 from the OHV System but retain as a year-round open through-road from North Carolina into Tennessee for highway-legal vehicles.

Trail 1

The switchbacks on Trail 1

Paving a portion of Trail 1 would stabilize the steep switchbacks and lessen the road's potential as source of sediment to Tipton Creek.

Sediment-laden runoff from Trail 1 entering Tipton Creek

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 2 – Tipton Knob	
The section from its northern intersection with Trail 1 for about 3/5ths of a mile is all draining into the adjacent Jenks Branch. It would require extraordinary engineering design at high cost to fix this, since it involves the area known as the Rock Garden, a wide stretch of entrenched bouldery rubble with steep eroding banks. The banks would be exceptionally hard to stabilize long-term and the cost of maintenance of such extreme installations is unknown. The remainder of the trail is in poor condition and has some deeply entrenched areas but is less of a potential sediment source due to its location on a ridgeline. While it would be expensive to repair and maintain for continued OHV traffic, this segment accesses private property so it would need to remain available for the use of the private landowners.	Remove from OHV System. Close and rehabilitate the segment north of intersection with FS-402 (known as the Rock Garden). Add remainder of Trail 2 (from intersection of FS-402 south to Harshaw Gap) to forest road system. Gate at Harshaw Gap and Jenks Gap (this section would be available only for administrative use and landowner access to private inholdings.) The section from Jenks Gap to FS-402 would be open to highway-legal vehicles and would be maintained for high-clearance vehicles from FS-402 to FS-24.

Trail 2

The “Rock Garden” on Trail 2 has deep entrenchment with eroding side walls and is a source of sediment to Jenks Branch.

The middle part of Trail 2 connects FS 402 and FS 24.

Rough part of lower Trail 2

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 3 – Bearpen	
Though part of this trail runs parallel to a Tellico River tributary, the condition of the trail would allow routine engineering and heavy maintenance to alleviate the sedimentation potential. Scouting of possible reroute locations found them more problematic than the trail's present location. Part of the sedimentation potential is actually the result of sediment coming from Trail 12. Reducing or eliminating soil loss from Trail 12 would address this.	Retain as part of the OHV System. Perform heavy maintenance including installation of additional drainage structures.

Trail 3

The trail tread of Trail 3 is of a grade and slope more gentle than some in Tellico.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 4 – Fain Ford	
A section of Trail 4 runs parallel to Peckerwood Creek, and condition surveys located numerous instances where sediment could be seen entering the creek. Within this section, another location exhibits fill-slope failure* and has landslide potential. Even fixed, this segment has limited potential for long term success. The remainder of Trail 4 is fixable with normal engineering and heavy maintenance. *The outside edge of the road breaks away due to factors such as slope, inherent soil characteristics, and the inability of water to properly drain.	Retain as part of the OHV System from southern access point to intersection with Trail 8 at Fain Ford. Close and rehabilitate section north of this intersection with Trail 8, to the intersection with Trails 6 and 7. [The previous decision to construct a bridge across the Tellico River at Fain Ford would go forward. See Decision Memo for Fain Ford Bridge Project on Upper Tellico OHV Area signed June 9, 2005, available from the Tusquitee District Office, Murphy, NC.]

Trail 4

Part of Trail 4 had numerous spots leaking sediment, close proximity to water, and a partial slope failure. The remainder was considered “fixable.”

A bridge at Fain Ford would make crossing easier and better protect the resource.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 5 – Tellico River	
Two areas of high-sediment-potential exist near the intersection with Trail 4, as sediment is accumulating from a "trail stacking " situation where Trail 12 is dumping sediment on a path through the woods to Trail 4. Then the sediment runs along with additional Trail 4 sediment down to Trail 5 and into the Tellico River. There is also a series of springs in this area adding to the runoff.	Retain as part of the OHV System with a reroute to a new intersection with Trail 4. This reroute of approximately 3,500 feet would use an existing old road template. Close and rehabilitate a section that currently intersects with Trail 4. [Also see Trail 12 proposal]

Trail 5

Conditions on Trail 5 vary from flat and “road-like” to steeper and rockier.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 6 – State Line Loop	
One short section is a major sediment source for this trail. Installation of oversized culverts on this section along with heavy maintenance of the whole trail would alleviate much of the sedimentation potential.	Retain as part of the OHV System. Install several oversize culverts at a bad section of trail (between surveyed stations 3,458 ft. through 6,888 ft.). A new connector would be constructed off Trail 6 from State Line parking area to Trail 5 to facilitate access to the trail system by non-street-legal vehicles. This new access would take this traffic off Trail 1.

Trail 6

Improved drainage features could make Trail 6 a more maintainable road.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 7 – Peckerwood Connector	
Not only sediment but other contaminants associated with motor vehicles are making their way into Peckerwood Creek from the "challenge" area on Trail 7. Stabilizing this trail segment would require extraordinary engineering design and be very expensive. Follow-up maintenance requirements would be considerable.	Retain as part of the OHV System from intersection with Trail 6 to a point in the vicinity of Peckerwood Creek. Construct a reroute of approximately 1,500 feet from this point to Trail 8 to bypass the "high challenge" area. The proposed reroute follows an existing old road bed for 900 feet, leaving 600 feet of new construction. Close and rehabilitate the trail east of the reroute, including the "high challenge" area.

Trail 7

Parts of Trail 7 are in good condition (above). This bad section of Trail 7 (below) is eroding down to bedrock, is entrenched with eroding side walls, and is a source of sediment into Peckerwood Creek. The “ledge” (below) is extremely difficult for vehicles to negoiate.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 8 – Bob Creek	
The first 1.5 miles runs parallel to the Tellico River and it is evident that the adjacent tributaries do at times overtop the trail and even turn the trail itself into a stream of sorts. In addition, three bridges are rotted out, an old wooden culvert needs replacing, and a new bridge is needed at one point on the trail. For the most part these problems could be fixed with the installation of about a dozen oversize culverts, four or five new bridges, and a shift in the road surface upward. Fixing Trail 8 would entail more cost than most of the other trail work but it is a major loop in the system. The fixes are within the scope of normal engineering and heavy maintenance. The short section of Trail 8 that runs south from the Trail 7 intersection contains an area worn down to bedrock that can funnel water down to Trail 4 and then straight into the Tellico River. Attempts to find a suitable reroute location were unsuccessful.	Retain in part and close in part. Keep the trail open from its intersection with Trail 4 at Fain Ford eastward, making a counterclockwise loop to its intersection with the Trail 7 reroute. Close the short section south of its intersection with the Trail 7 reroute. Trail 8 would require heavy maintenance, some reconstruction and possible minor rerouting. Due to proximity to the Tellico River this would include minor road shifts away from the stream course and to minimize the entrenchment. Some hardening of the roadway with rip-rap (quarried rock of a specific size) would also occur. Construct four to five bridges and install numerous large culverts along with other standard drainage features. Restore Mistletoe Creek into its original channel.

Trail 8

Decayed stringers on Trail 8 caused the bridges to be condemned.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 9 – Mistletoe Connector	
Steep grades, areas of deep entrenchment mixed with numerous springs coming out of the bedrock area and close proximity to unnamed tributaries that feed into the Tellico River make Trail 9 among the most difficult and expensive to repair and maintain.	Remove from the OHV System. Close and rehabilitate.

Trail 9

Steep grades, deep entrenchments with eroding walls, and close proximity to live water make Trail 9 a source of sediment to nearby streams.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 10 (ATV Only) – Round Mountain	
Condition surveys identified three especially problematic areas on this ATV-only trail. The first, at the northern end of Trail 10, is a steep, deeply entrenched section of about 800 feet that is dumping onto Trail 8 and rapidly filling a sediment trap there. The second is a section of about 500 feet where the stream is actually running in the trail. The third is at the "challenge area" where extensive soil movement has occurred immediately adjacent to the creek. Possible trail relocations were scouted but were not suitable. The main trail has deteriorated to a condition where users have created bypasses on poor locations. From an engineering perspective any fixes would be difficult to maintain in part due to the high-impact ATV traffic.	Retain from intersection with Trail 10A west to intersection with Trail 3 (the southernmost section). Remove the remainder from the ATV system; close and rehabilitate.

Trail 10

Steep grades with erosive soils mixed with abundant water make Trail 10 difficult to maintain.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 10A (ATV Only) Round Mountain Spur	
While this trail parallels the Tellico River for the majority of its length, good grades and lack of entrenchment make it a good candidate to retain with routine engineering fixes to the drainage features and some initial heavy maintenance.	Retain open to ATVs with reevaluation at the end of two years. Reevaluation would result in continuation of open status or closure depending on effectiveness of drainage features in stemming sediment flow into the Tellico River.

Trail 10A

Trail 10A has good grades, but it is close to water.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 11 – Chestnut Mountain	
While there are some steep, rocky areas and some entrenchment and exposed bedrock, the trail is far from water and condition surveys did not track sediment reaching water. However there are three "challenge areas" that not many users can traverse, thus limiting the capability of the trail to be used by ATVs and others looking for a ride of moderate difficulty. Bypasses around the challenge areas could make the trail more useable if suitable locations are found.	Retain as part of the OHV System contingent on successful construction of challenge area bypasses. If bypasses are not successful, close trail and rehabilitate. Retain the challenge areas but also provide bypasses. [These bypasses are not shown on the map.]

Trail 11

After a rain, water runs down this gulley on Trail 11, but the trail is farther from water than other trails.

The Guardrail on Trail 11 is too challenging for many OHVers.

CONDITION SURVEY FINDINGS	PROPOSED ACTION
Trail 12 – Hawk Knob	
Trail 12 begins with a long section of deep entrenchment followed by exposed bedrock. The trail is visibly broadcasting sediment-laden runoff through the woods down to Trail 3, across this trail and through the woods down to Trail 4 and then Trail 5, ending up in the Tellico River. The steep mud chute, unstable side-walls with undermined trees and root-wads, narrow entrenched sections, and high terraced bedrock ledges make Trail 12 a poor candidate for normal engineering fixes. Terrain features limit possible reroutes.	Remove from the OHV System. Close and rehabilitate.

Trail 12

At left is a length of deep entrenchment at the beginning of Trail 12.

Sediment from Trail 12 overlaying vegetation above Trail 4.

Gully formed from Trail 12 runoff.

Appendix B

Details of Other OHV Opportunities

The following table lists the complete results of an internet search of public OHV systems within an 8-hour drive of Murphy, NC. This data is summarized in Table 3.5.2.4.

Note:

- All mileages are approximate
- Data accuracy dependant on internet source as of 8/26/08

Table Appendix B.1. List of Federal, State & County OHV Opportunities

Trail System Name	Location	Miles from Murphy	4WD Trail Miles	ATV Trail Miles	Motorcycle Trail Miles	Total Miles	Most Difficult or Challenge
Badin Lake	Uwharrie NF, NC	294	16	16	16	16	Yes
Brown Mt	Pisgah NF, NC	182	6	27	34	34	Yes
Wayehutta	Nantahala NF, NC	64	0	21	21	21	Yes
Houston Valley	Chattahoochee-Oconee NF, GA	85	0	23	23	23	No
Rocky Flats	“	69	3	3	3	3	Yes
Windy Gap	“	71	0	4	4	4	Yes
Tibbs	“	71	0	4	4	4	No
Milma Creek	“	71	0	4	4	4	No
Rock Creek	“	63	0	5	5	5	No
Tatum Lead	“	63	6	6	6	6	Yes
Davenport Mountain	“	21	0	6	6	6	Yes
Whissenhunt	“	55	0	11	11	11	Yes
Beasley Knob	“	21	11	11	11	11	Yes
Oakey/Moates	“	50	0	9	9	9	Yes
Locust Stake	“	75	0	9	9	9	Yes
Town Creek	“	139	0	8	15	15	No
Buffalo Mt	Cherokee NF, TN	161	0	13	13	13	Yes
Horse Creek	“	153	5	0	0	5	No
Dick Creek Rd	“	155	3	0	0	3	No
Rich Mt Rd	“	150	9	0	0	9	No
Unicoi Trail	“	26	0	0	3	3	No
Smith Mt Tr	“	28	0	0	5	5	No
Turkey Ck Mt Road	“	53	3	0	0	3	No
Tavern Br Rd	“	55	7	0	0	7	No
Beaverdam Bald Road	“	2	6	0	0	6	No
Prentice Cooper	TN State Forests	92	110	110	110	110	Yes

Trail System Name	Location	Miles from Murphy	4WD Trail Miles	ATV Trail Miles	Motorcycle Trail Miles	Total Miles	Most Difficult or Challenge
Pickett	“	176	32	32	32	32	Yes
Royal Blue WMA	TN Wildlife Resources	149	29	46	46	46	Yes
White Sulphur	Daniel Boone NF, KY	304	0	20	20	20	No
S-Tree	“	209	0	10	10	10	No
Turkey Foot	“	209	0	9	9	9	No
Big Dog	“	209	0	3	3	3	No
Pine Creek	“	209	0	2	2	2	Yes
Renfro	“	209	0	4	4	4	No
Gulf Ridge	“	209	0	2	2	2	No
Goodwater	“	209	0	3	3	3	No
Sellers Ridge	“	166	0	2	2	2	No
Yellow Cliff	“	166	0	2	2	2	No
Rock Ridge	“	166	0	5	5	5	No
Straight Ck	“	166	0	2	2	2	No
Redbird Crest	“	206	5	65	65	65	No
Turkey Bay	Land Between the Lakes NRA, KY	320	106	106	106	106	Yes
Black Mt.	Harlan County Parks, KY	221	200	200	200	200	Yes
South Pedlar	George Washington-Jefferson NF, VA	379	0	19	19	19	Yes
Patterson Mt	“	341	0	16	16	16	No
Stony Run	“	357	12	0	0	12	No
Peavine Mt	“	367	15	0	0	15	No
Flint Ck	Bankhead NF, AL	236	0	15	15	15	Yes
Kentuck	Talladega NF, AL	196	0	23	23	23	Yes
Wambaw	Francis Marion - Sumter NF, SC	387	0	40	40	40	No
Enoree	“	207	0	14	14	14	Yes
Cedar Springs	“	137	0	12	12	12	No
Parsons Mt	“	137	0	11	11	11	Yes
Manchester	SC State Forest	311	0	18	18	18	No
TOTALS			**584**	**971**	**993**	**1053**	

Appendix C

Financial Analysis

FSM 2353.03 provides direction on implementing the Travel Management Rule referenced on page 5 of this document. In particular, it directs the agency to "emphasize long-term cost effectiveness and need when developing or rehabilitating trails", and "provide a trail system that is environmentally, socially and financially sustainable." Additionally, the objectives in FSM 7702 include providing "sustainable access in a fiscally responsible manner to NFS lands." A Financial Analysis Model used in this analysis helps inform the determination as to what degree each alternative is cost effective, financially sustainable, and fiscally responsible.

An important note concerning prior agency-sponsored Financial Analysis:

An earlier version of this Financial Analysis Model was used in 2007 to assess potential OHV System capital and maintenance costs. The Forest Service contracted with Trails Unlimited, an agency enterprise team, to assess the condition of the OHV System, provide recommendation on capital improvements and future management, and provide cost projections (Upper Tellico OHV Area- Management and Cost/Revenue Estimates, Lockwood, 9/13/07). Field review was conducted on January 12-13, 2007. Trails Unlimited concluded that with a combination of routine maintenance, relocation of 1.2 miles, and heavy reconstruction of 5.7 miles, the entire trail system could be retained. TU estimated that the cost of these actions was as follows:

Relocation	$103,145
Heavy Reconstruction	$ 83,730
Annual Maintenance	$199,020

According to TU, annual maintenance would be reduced by 50-70% (to $59,706-$99,510) once heavy maintenance, reconstruction and relocation were completed.

Clearly, these results are a departure from costs estimated in this analysis. TU did not include the cost of "five large projects…for the extreme rock crawling routes", bridge installation, maintenance protocols that would address water quality, resource monitoring, and certain other key items. It was also generated from a two-day field review conducted by three individuals in January 2007. The current analysis takes all associated costs into account, is based primarily on a need to improve water quality, and is the result of comprehensive condition surveys conducted in two separate seasons (October 2007 and March 2008), requiring approximately 300 person-days of field time. The TU was a useful starting point for assessing the potential scope of the work to be done, but cannot be viewed as a comprehensive plan for the OHV System.

Expense estimates for the six alternatives in this environmental analysis were developed using a trail system financial analysis prototype developed under contract with PriceWaterhouse Coopers and its subcontractor, CHM-Government Services for the

Forest Service Southern Region in 2006. The model was modified by Southern Region Office staff to specifically address the financial analysis needs of the Upper Tellico OHV System Environmental Assessment. The model is a partially automated, multi-sheet Microsoft Excel workbook summarizing expense data for multiple alternatives across a 10 year period. The base data for the model was provided by Forest staff. Base data includes expenses for implementation, maintenance for a ten-year period, and long term resource monitoring to ensure the selected alternative is successful in addressing the purpose and need for the project.

Partner and cooperating agency contributions and grants are reflected in the Revenue section of Tables 3.11.1.6 and 3.11.1.7 in Chapter 3.11. "Other sources" includes funding provided by grants such as the Recreation Trails Program (RTP) made possible by non-federal in-kind matching contributions. This source of revenue is not shown for Alternatives B, C and D, as the Interdisciplinary Team predicted that there would be fewer in-kind contributions available from partner groups under those alternatives. "Non-monetary contributions" include in-kind and other contributions from partners, other agencies, universities and other organizations.

Estimated non-monetary contributions vary among alternatives. Alternative A reflects average contributions from 2003-2007, with the high and low years eliminated. Alternative B includes some user group contributions, plus fisheries monitoring support provided by North Carolina Wildlife Resources Commission (NCWRC) personnel. Alternatives C and D eliminate user group contributions, but retain the NCWRC contributions. Alternatives E and F assume an increase in user group contributions, with the same fisheries monitoring support.

Table Appendix C.1 Estimated Contributions

Alternative	Non-monetary contributions ($)
A	44,094
B	58,254
C	57,741
D-modified	57,741
E	85,582
F-modified	85,582

The following assumptions were made in developing the model:

Capital Improvement/Decommissioning
All capital improvements are completed prior to Year One except for trailhead improvement in Years Five and Ten.

Operations expenses include law enforcement, trail patrols, monitoring of water, fisheries and heritage resources, and fee collection expenses.

Maintenance expenses include recurring maintenance of bridges, trail surface and other trail features such as silt traps, culverts, signage and other trail features.
Maintenance and operating expenses would generally be higher in the first five years after implementation, then decrease.
Expenses include a 2.9% annual inflation factor (Bureau of Labor Statistics ten year average)

Program Management expenses include program oversight, communications, recreation and special use event administration and partnership management. In this discussion, operations, maintenance and program management expenses are shown as an annual average over a 10 year period. Average annual expenses are used to compare alternatives, as a more accurate depiction of the agency's commitment of resources over time. The "Alt Summary" tab of the Financial Analysis Model located on the project record, shows in detail by alternative how expenses would vary over time, following the first-year implementation costs. For example, in Alternative C net operations and maintenance expense to the government would be $324,853 in Year One, and taper down to $162,920 in Year Ten as the need for monitoring and other work declines.

Capital expenses include improving trails and parking areas, as well as trail decommissioning, stabilization, and restoration, depending on the alternative.

Revenue
Revenue figures include daily and annual fees paid by users. They also include grants (such as RTP grants) made possible through partnerships with non-profit groups, as well as the value of non-monetary contributions made by partners. Such non- monetary contributions may include donated personnel and equipment time and mileage that are not reimbursed by a matching grant program. This includes contributions by partners such as TVA and other agencies and groups that help with environmental monitoring, which explains why this “revenue” appearing even in Alternative C where the trail system is closed.

- Volunteer Hours: Alternative A is based on Southern Four Wheel Drive Association estimated hours for the last five years, minus the highest and lowest years (average of middle 3 years) at a GS5-6 cost-to-government rate. Alternatives E & F show an increase of 15% due to increased miles/features.
- Grants would be used only for Alternatives A, E, and F-modified due to availability of matching contributions. Alternatives B and D-modified may less likely to recruit in-kind contributions suitable for matching grants.
- Fees increase 25% in Years Five and Ten.
- Daily/Annual Pass Percentage – a slightly higher proportion of daily passes is calculated for Alternatives B, E, and F-modified . It is assumed that less users will buy the annual pass due to the increased expense if fees are increased, and based on the district’s experience in 2007 when the pass price increased from $30 to $60.
- Percentage of riders who are Fee Compliant - Higher compliance is calculated for Alternatives E & F-modified due to more law enforcement & visitor contacts.

Average Number of Riders

Average number of riders per tow vehicle – There would be a greater number of UTVs in Alternatives B than Alternatives A, E, and F-modified due to trail design and opportunities. Therefore, a factor of 1.5 persons per vehicle is used instead of the 1.75 used in Alternatives A, E, and F-modified .

Days Open

In Alternatives B the system would be open 255 days: 3 winter months plus 20 wet weather closure days. In Alternatives D-modified, E and F-modified the trail system or roads would be open 275 days: 3 winter months without 20 additional wet weather closure days

Table Appendix C.2 Summary of Annual Revenue and Expenses by Alternative-With no fee increase (All values in $$)

Variable	Alt A	Alt B	Alt C	Alt D - modified	Alt E	Alt F - modified
Cost: Operation, Maintenance and Program Management Expense	319,184	1,094,347	276,525	645,352	1,202,969	2,114,971
Revenue: Fees, grants	161,307	74,247	0	0	209,816	209,816
Volunteer/In -kind contributions	44,094	58,254	57,741	57,741	85,582	85,582
Net Annual Expense *	113,782	961,847	218,784	587,611	907,571	1,500,880
One-time Capital Improvement/ Closure Expense	468,750	3,250,485	2,333,660	3,129,120	4,654,583	6,220,521

- Net Annual Expense: The amount of appropriated or additional funds from other sources required to maintain the trail system under the specified alternative.

It may be helpful to review those portions of the capital improvement expenses that are attributable to paving and reconstruction of Trail 1, as that action is common across Alternatives B-F-modified.

Table Appendix C.3 Breakout of Trail 1 Improvement Expenses (all values in $$)

Variable	Alt A	Alt B	Alt C	Alt D-modified	Alt E	Alt F - modified
One-time Capital Improvement/ Closure Expense	468,750	3,250,485	2,333,660	3,129,120	4,654,583	6,220,521
Trail 1/Tipton Creek Road Improvement	0	820,000	820,000	820,000	820,000	820,000
Net Capital Improvement Expense without Trail 1/Tipton Creek Road Improvements	468,750	2,400,485	1,513,660	2,279120	2,309120	5,400,521

User survey respondents indicated at least some support for increasing fees to help manage the System. Table 3.5.1.5 shows that 35.7 % of on-site OHV users supported fee increases; 72.8% of off-site OHV user supported increases. Therefore, the alternatives were also analyzed based on projected fee receipts given the fees shown below.

Table Appendix C.3 Summary of Annual Revenue and Expenses by Alternative-With variable fees (All values in $$)

Variable	Alt A	Alt B	Alt C	Alt D-modified	Alt E	Alt F -modified
Daily Fee/ Annual Pass	**10/60**	**20/120**	**0**	**0**	**40/240**	**40/240**
Cost: Operation, Maintenance and Program Management Expense	319,184	1,094347	276,525	645,352	1,202,969	2,114,971
Revenue: Fees, grants	161,307	144,360	0	0	655,787	655,787
Volunteer/In -kind contributions	44,094	58,254	57,741	57,741	85,582	85,582
Net Annual Expense *	113,782	891,733	218,784	587,611	461,600	1,054,908
One-time Capital Improvement/ Closure Expense	468,750	3,250,485	2,333,660	3,129,120	4,654,583	6,220,521

- Net Annual Expense: The amount of appropriated or additional funds from other sources required to maintain the trail system under the specified alternative.

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Fees vary across alternatives

7/8/2009

Assumptions listed at bottom of Sheet (beginning at Row 164)

Data Revision

Alternative Builder - (Year 1 of implementation)

	Alt A	Alt B	Alt C	Alt D Modified	Alt E	Alt F Modified
	OHV Trail System	OHV Trail System	Road System (Hwy Vehicle)	Road System (Hwy Vehicle)	OHV Trail System	OHV Trail System
ANNUAL OPERATIONS & MAINTENANCE						
Miles of Trail Open	38.28	23.75	0.00	18.43	30.66	44.29
REVENUE						
Fees						
Parking Capacity (all trailheads)	70	70	-	-	100	100
Average # of Riders per Tow Vehicle	1.75	1.50	0.00	0.00	1.75	1.75
Daily Rider Capacity	123	105	-	-	175	175
Rider Turn-Over each Day	10%	25%	0%	0%	5%	5%
Days Open	275	255	120	275	275	275
Total Rider Days Available	37,056	33,469	-	-	50,531	50,531
% Days of Full Capacity	30%	23%	0%	0%	30%	30%
Utilized Rider Days	11,117	7,698	-	-	15,159	15,159
% Riders Who Pay Fees (Compliant)	85%	85%	0%	0%	90%	90%
# of Fee Compliant Rider Days	9,449	6,543	-	-	13,643	13,643
% Compliant Riders who Pay Daily Fee	93%	95%	0%	0%	95%	95%
# of Riders who Pay Daily Fee	8,788	6,216	-	-	12,961	12,961
Daily Fee Price	$ 10.00	$ 20.00	$ -	$ -	$ 40.00	$ 40.00
Daily Fee Revenue	$ 87,879	$ 124,320	$ -	$ -	$ 518,451	$ 518,451
Fees increase 5 years (current+increase in decimal)	1.25	1.25	0	0	1.25	1.25
% Compliant Riders who Buy Annual Pass	7%	5%	0%	100%	5%	5%
Aver # of Annual Pass Rider Days per year	10	10	0	0	10	10
# of Annual Pass Buyers	66	33	0	0	68	68
Annual Pass Price	$ 60.00	$ 120.00	$ -	$ -	$ 240.00	$ 240.00
Annual Pass Fee Revenue	$ 3,969	$ 3,926	$ -	$ -	$ 16,372	$ 16,372
Fees increase 5 yrs (current+increase in decimal)	1.25	1.25	0	0	1.25	1.25
Total Fee Revenue	$ 91,848	$ 128,246	$ -	$ -	$ 534,823	$ 534,823
Less 5% of Fees to Region Fund	$ 4,592	$ 6,412	$ -	$ -	$ 26,741	$ 26,741
Fee Revenue Available to Forest	**$ 87,255**	**$ 121,833**	**$ -**	**$ -**	**$ 508,082**	**$ 508,082**
Other Revenue Sources						
Grants	$ 55,000	$ -	$ -	$ -	$ 55,000	$ 55,000
Philanthropy/Other	$ -	$ -	$ -	$ -	$ -	$ -
Total Estimated Other Revenues	**$ 55,000**	**$ -**	**$ -**	**$ -**	**$ 55,000**	**$ 55,000**
TOTAL REVENUE (before appropriations)	**$ 142,255**	**$ 121,833**	**$ -**	**$ -**	**$ 563,082**	**$ 563,082**
EXPENSE						
Operations						
Law Enforcement	$ 20,380	$ 21,970	$ 38,460	$ 38,460	$ 30,465	$ 41,185
Visitor Contract/ Trail Patrol	$ 24,100	$ 20,860	$ -	$ 4,360	$ 38,280	$ 44,710
Environmental Monitoring						$ -
Water Resources	$ 67,346	$ 76,525	$ 76,525	$ 76,525	$ 76,525	$ 76,525
Fisheries Resources	$ 78,340	$ 166,205	$ 148,642	$ 148,642	$ 127,796	$ 127,796
Heritage Resources	$ 3,624	$ 11,377	$ 10,385	$ 11,377	$ 12,309	$ 19,389
Total Environmental Monitoring	$ 149,310	$ 254,106	$ 235,553	$ 236,544	$ 216,629	$ 223,710
Fee Collection/Compliance	$ 12,372	$ 10,608	$ -	$ -	$ 15,444	$ 17,626
Total Trails Operating Expense	**$ 206,162**	**$ 307,544**	**$ 274,013**	**$ 279,364**	**$ 300,818**	**$ 327,231**
Maintenance						
Total Trailhead Maintenance Expense	$ 8,219	$ 10,819	$ -	$ -	$ 16,823	$ 17,148
Trail and/or Road Maintenance (Annual)						
1 Tipton Creek	$ 24,122	$ 20,748	$ 29,900	$ 17,680	$ 17,680	$ 29,330
2 Tipton Knob	$ 3,931	$ -	$ -	$ -	$ -	$ 93,884
3 Bear Pen	$ 6,712	$ 103,970	$ -	$ 1,950	$ 110,453	$ 108,457
4 Fain Ford	$ 7,797	$ 98,527	$ 21,580	$ 98,527	$ 106,488	$ 124,222
5 Tellico River	$ 2,544	$ 49,088	$ 16,120	$ 49,088	$ 52,061	$ 51,146
6 State Line Loop	$ 2,693	$ 58,931	$ 30,550	$ 58,931	$ 59,261	$ 45,031
6-5 Connector	$ -	$ 58,931	$ -	$ -	$ 62,597	$ 38,545
7 Peckerwood Connect	$ 2,629	$ 21,193	$ -	$ 21,193	$ 22,118	$ 21,834
8 Bob Creek	$ 20,698	$ 134,266	$ -	$ 134,266	$ 142,987	$ 140,303
9 Mistletoe Connect.	$ 825	$ -	$ -	$ -	$ 2,841	$ 44,171
10 Round Mountain	$ 9,335	$ 34,483	$ -	$ 3,900	$ 42,130	$ 487,137
10A Round Mountain Spur	$ 5,383	$ 71,993	$ -	$ 1,950	$ 76,618	$ 75,080
11 Chestnut Mount.	$ 5,189	$ 71,993	$ -	$ 1,950	$ 76,453	$ 75,194
12 Hawk Knob	$ 1,504	$ -	$ -	$ -	$ -	$ 62,795
Trail 13	$ -	$ -	$ -	$ -	$ -	$ 136,128
Total Trail Maintenance Expense	$ 93,363	$ 724,122	$ 98,150	$ 389,435	$ 771,687	$ 1,533,257
Total Cyclic Maintenance (Heavy)	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Maintenance Expenses	**$ 101,582**	**$ 734,941**	**$ 98,150**	**$ 389,435**	**$ 788,510**	**$ 1,550,405**
Program Management						
Program Oversight	$ 12,650	$ 14,250	$ 1,600	$ 1,600	$ 17,450	$ 18,575
Communications & Visitor Information	$ 6,940	$ 8,254	$ 1,690	$ 1,690	$ 10,380	$ 12,070
Grant Writing/Management	$ 3,164	$ 650	$ -	$ -	$ 4,190	$ 5,028
Rec Events/Special Use Permits	$ 2,446	$ 1,968	$ -	$ -	$ 3,402	$ 10,744
Volunteer & Partnership Management	$ 11,293	$ 4,253	$ -	$ -	$ 17,511	$ 20,634
Subtotal Program Management Expenses	**$ 36,493**	**$ 29,375**	**$ 3,290**	**$ 3,290**	**$ 52,933**	**$ 67,051**
TOTAL EXPENSES (Before Vol/Inkind Offset)	**$ 344,237**	**$ 1,071,860**	**$ 375,453**	**$ 672,089**	**$ 1,142,261**	**$ 1,944,686**
Surplus or (Deficit) Before In-Kind Donations - Net of Revenues	**$ (201,982)**	**$ (950,027)**	**$ (375,453)**	**$ (672,089)**	**$ (579,180)**	**$ (1,381,605)**
Volunteers-In-Kind-Other Non Monetary Cost Offsets						
Volunteers Offset Value	$ 35,718	$ -	$ -	$ -	$ 38,949	$ 318,229
Other In Kind Donations/Partnerships	$ 2,923	$ 51,050	$ 50,600	$ 50,600	$ 36,050	$ 36,050
Subtotal Costs Offset by Volunteers or In- Kind Donations	**$ 38,641**	**$ 51,050**	**$ 50,600**	**$ 50,600**	**$ 74,998**	**$ 354,279**
TOTAL O&M EXPENSES (after Vol/InKind Offset)	**$ 305,596**	**$ 1,020,811**	**$ 324,853**	**$ 621,489**	**$ 1,067,263**	**$ 1,590,408**
Surplus or (Deficit) - Net of Revenues (excludes Appropriations; includes Vol/Inkind Offset)	**$ (163,341)**	**$ (898,977)**	**$ (324,853)**	**$ (621,489)**	**$ (504,182)**	**$ (1,027,326)**
Total Appropriations Required for Operations - Year 1 (Cost to Government)	**$ 163,341**	**$ 898,977**	**$ 324,853**	**$ 621,489**	**$ 504,182**	**$ 1,027,326**
% Cost Recovery (% of O&M Costs Paid with User Fees, Grants and Philanthropy)	**35%**	**12%**	**0%**	**0%**	**50%**	**33%**
Fee Requirements If:						
100% Cost Recovery						
Daily Fee (rounded)	$29	$168	n/a	n/a	$80	$121
Annual Fee (rounded)	$172	$1,005	n/a	n/a	$478	$725
75% Cost Recovery						

Daily Fee (rounded)	$22	$126	n/a	n/a	$60	$91
Annual Fee (rounded)	$129	$754	n/a	n/a	$359	$544
50% Cost Recovery						
Daily Fee (rounded)	$14	$84	n/a	n/a	$40	$60
Annual Fee (rounded)	$86	$503	n/a	n/a	$239	$363

CAPITAL IMPROVEMENT TOTAL	**See Alt Summary for Capital Schedule**					
Trailhead Improvements						
State Line L Parking Lot (upgrade)	$ -	$ 134,550	$ -	$ -	$ 303,113	$ 303,113
Chestnut Mountain Trailhead (new)	$ -	$ -	$ -	$ -	$ 193,063	$ 193,063
Heritage Survey	$ -	$ -	$ -	$ -	$ 18,198	$ 18,198
Subtotal Trailhead Expense	**$ -**	**$ 134,550**	**$ -**	**$ -**	**$ 514,373**	**$ 514,373**
Trail and/or Road Rehab/Improvement						
Trail 1-Tipton Creek	$ -	$ 1,025,000	$ 1,025,000	$ 1,025,000	$ 1,025,000	$ 1,025,000
Trail 2-Tipton Knob	$ -	$ 88,213	$ 88,213	$ 88,213	$ 88,213	$ 183,750
Trail 3-Bearpen	$ -	$ 65,875	$ -	$ -	$ 92,875	$ 105,000
Trail 4-Fain Ford	$ 468,750	$ 552,425	$ 30,750	$ 552,425	$ 819,363	$ 819,363
Trail 5-Tellico River	$ -	$ 90,620	$ 90,620	$ 90,620	$ 140,870	$ 140,870
Trail 6-State Line Loop	$ -	$ 48,200	$ 60,250	$ 96,200	$ 96,200	$ 96,200
Trail 5-6-Connector	$ -	$ 52,575	$ -	$ -	$ 52,575	$ -
Trail 7-Peckerwood Connector	$ -	$ 129,903	$ -	$ 129,903	$ 139,903	$ 139,903
Trail 8-Bob Creek	$ -	$ 454,435	$ -	$ 454,435	$ 713,935	$ 713,935
Trail 9-Mistletoe Connector	$ -	$ -	$ -	$ -	$ 150,800	$ 185,800
Trail 10-Round Mountain	$ -	$ 17,750	$ -	$ -	$ 142,625	$ 45,625
Trail 10A-Round Mountain Spur	$ -	$ 70,925	$ -	$ -	$ 104,613	$ 104,613
Trail 11-Chestnut Mountain	$ -	$ 76,865	$ -	$ -	$ 163,490	$ 163,490
Trail 12-Hawk Knob	$ -	$ -	$ -	$ -	$ -	$ 35,000
Trail 13	$ -	$ -	$ -	$ -	$ -	$ 1,513,275
Heritage Survey	$ -	$ -	$ -	$ -	$ -	$ 41,000
Subtotal Trail Expense	**$ 468,750**	**$ 2,672,785**	**$ 1,294,833**	**$ 2,436,795**	**$ 3,730,460**	**$ 5,312,823**
CAPITAL IMPROVEMENT TOTAL	**$ 468,750**	**$ 2,807,335**	**$ 1,294,833**	**$ 2,436,795**	**$ 4,244,833**	**$ 5,827,196**
TRAIL/ROAD/TRAILHEAD CLOSURE-DECOMISSIONING						
Trail 1-Tipton Creek	$ -	$ -	$ -	$ -	$ -	$ -
Trail 2-Tipton Knob	$ -	$ 39,800	$ 39,800	$ 39,800	$ 39,800	$ -
Trail 3-Bearpen	$ -	$ -	$ 89,300	$ 90,000	$ -	$ -
Trail 4-Fain Ford	$ -	$ 49,025	$ 132,400	$ 49,025	$ 49,025	$ 49,025
Trail 5-Tellico River	$ -	$ 32,313	$ 136,515	$ 32,313	$ 32,313	$ 32,313
Trail 6-State Line Loop	$ -	$ -	$ 50,150	$ -	$ -	$ -
Trail 5-6-Connector	$ -	$ -	$ -	$ -	$ -	$ -
Trail 7-Peckerwood Connector	$ -	$ 31,713	$ 43,213	$ 31,713	$ 31,713	$ 31,713
Trail 8-Bob Creek	$ -	$ 52,025	$ 150,000	$ 52,025	$ 52,025	$ 52,025
Trail 9-Mistletoe Connector	$ -	$ 48,825	$ 48,825	$ 48,825	$ 36,125	$ -
Trail 10-Round Mountain	$ -	$ 76,500	$ 91,000	$ 91,000	$ -	$ 76,875
Trail 10A-Round Mountain Spur	$ -	$ -	$ 62,950	$ 62,950	$ -	$ -
Trail 11-Chestnut Mountain	$ -	$ -	$ 67,288	$ 67,288	$ -	$ -
Trail 12-Hawk Knob	$ -	$ 112,950	$ 112,950	$ 112,950	$ 168,750	$ 151,375
Trail 13	$ -	$ -	$ -	$ -	$ -	$ -
Trailhead-State Line Parking Lot	$ -	$ -	$ 14,438	$ 14,438	$ -	$ -
Heritage Survey	$ -	$ -	$ -	$ -	$ -	$ -
CLOSURE-DECOMMISSION TOTAL	**$ -**	**$ 443,150**	**$ 1,038,828**	**$ 692,325**	**$ 409,750**	**$ 393,325**
CAPITAL TOTAL	**$ 468,750**	**$ 3,250,485**	**$ 2,333,660**	**$ 3,129,120**	**$ 4,654,583**	**$ 6,220,521**
TOTAL CAPITAL & OPERATIONS/ MAINTENANCE COST TO GOVERNMENT	**$ 632,091**	**$ 4,149,462**	**$ 2,658,513**	**$ 3,750,609**	**$ 5,158,765**	**$ 7,247,846**

ASSUMPTIONS (also see comments in cells for explanations)

REVENUE/EXPENSE OFFSET:

The basis for Alt A fee income is actual '07 income; other Alt A factors and Alts B, D, E, F are calculated from this basis (see detail below)						
Parking spaces are not defined- estimated number of tow vehicles that lot can accommodate - no trailheads in Alts C,D; 2 trailheads in Alts A,B,; 3 trailheads in Alts E, F	70	70	0	0	100	100
Average # of Riders per Tow Vehicle - Greater # of UTVs in Alt B than alts A,E,F due to trail design	1.75	1.5	0	0	1.75	1.75
Rider Turn-Over each Day - less turnover for trails with more miles and features	10%	25%	0%	0%	5%	5%
Days Trail and/or Road Open (Alts C & D open to highway legal vehicles only) 120 - roads open to Hwy vechicles only Sept - Dec 275 - 3 winter months closure; trail/road open April-Dec 255 - 3 winter months plus 20 wet weather days closure	275	255	120	275	275	275
Days at Full Capacity						
30% = 275 open days (9 mos) with 8 weekend days = 72 days + 6 holidays = 78 days = 22% of 275 days + 5.5 additional days (or 11 dys at 50% or 22 days at 25%, etc) (30% of 275 days) 23% = 255 open days (8.4 mos) with 8 weekend days = 67.2 days + 5 holidays = 72.2 days at 100% or 57.76 days at 80% due to feature removal/changes (23% of 255 days)	30%	23%	0%	0%	30%	30%
% of Riders who are Fee Compliant - Higher compliance for Alts E & F because of more law enforcement & visitor contact staff	85%	85%	0%	0%	90%	90%
DailyPass Percentage of use- slightly higher in Alts B,E,F because of changes to trail system	93%	95%	0%	0%	95%	95%
Daily Fee (constant across alternatives with a fee)	$10.00	$20.00	$0.00	$0.00	$40.00	$40.00
Annual Pass Percentage of use	7%	5%	0%	0%	5%	5%
Annual Pass Average Number of Days per Year - three 3-day weekends- would not change across alternatives with a fee	10	10	0	0	10	10
Annual Pass Fee multiple of Daily Fee	6	6	6	6	6	6
Number of visits are constant for all 10 years						
Fees increase 25% in years 5 and 10	1.25	1.25	0	0	1.25	1.25
Grants would be available only for Alts A, E, F because of trail availability/design/length	$55,000	$0	$0	$0	$55,000	$55,000
Philantropic & inkind contributions	$0	$0	$0	$0	$0	$0
Volunteer Hours: Alt A based on Southern 4-wheel Assoc est hours for last 5 years minus the highest and lowest years (aver of middle 3 years) at a GS5-6 CTG rate. No hours estimated for Alts B, C,& D because of trail length/design or closure. Alts E & F plus 15% due to increased miles/features.	1,414	0	0	0	1,523	1,523

O&M EXPENSES:

Some operations expenses decrease after the first 3-5 years (see Op & ProgMgt sheet for details)
Expenses include a 2.9 percent annual inflation factor (Bureau of Labor Statistics 10 year average)

CAPITAL EXPENSES:

All capital improvements are completed in prior to Yr 1 except for trailhead in yrs 5 and 10

NC NANTAHALA NATIONAL FOREST - Tellico OHV EA Trail Financial Analysis

(Fees are the same for all Alternatives) **7/8/2009**

Assumptions listed at bottom of Sheet (beginning at Row 164) Data Revision

Alternative Builder - (Year 1 of implementation)

	Alt A	Alt B	Alt C	Alt D Modified	Alt E	Alt F Modified
	OHV Trail System	OHV Trail System	Road System (Hwy Vehicle)	Road System (Hwy Vehicle)	OHV Trail System	OHV Trail System
ANNUAL OPERATIONS & MAINTENANCE						
Miles of Trail Open	38.28	23.75	0.00	18.43	30.66	44.29
REVENUE						
Fees						
Parking Capacity (all trailheads)	70	70	-	-	100	100
Average # of Riders per Tow Vehicle	1.75	1.50	0.00	0.00	1.75	1.75
Daily Rider Capacity	123	105	-	-	175	175
Rider Turn-Over each Day	10%	25%	0%	0%	5%	5%
Days Open	275	255	120	275	275	275
Total Rider Days Available	37,056	33,469	-	-	50,531	50,531
% Days of Full Capacity	30%	23%	0%	0%	30%	30%
Utilized Rider Days	11,117	7,698	-	-	15,159	15,159
% Riders Who Pay Fees (Compliant)	85%	85%	0%	0%	90%	90%
# of Fee Compliant Rider Days	9,449	6,543	-	-	13,643	13,643
% Compliant Riders who Pay Daily Fee	93%	95%	0%	0%	95%	95%
# of Riders who Pay Daily Fee	8,788	6,216	-	-	12,961	12,961
Daily Fee Price	$ 10.00	$ 10.00	$ -	$ -	$ 10.00	$ 10.00
Daily Fee Revenue	$ 87,879	$ 62,160	$ -	$ -	$ 129,613	$ 129,613
Fees increase 5 years (current+increase in decimal)	1.25	1.25	0	0	1.25	1.25
% Compliant Riders who Buy Annual Pass	7%	5%	0%	100%	5%	5%
Aver # of Annual Pass Rider Days per year	10	10	0	0	10	10
# of Annual Pass Buyers	66	33	0	0	68	68
Annual Pass Price	$ 60.00	$ 60.00	$ -	$ -	$ 60.00	$ 60.00
Annual Pass Fee Revenue	$ 3,969	$ 1,963	$ -	$ -	$ 4,093	$ 4,093
Fees increase 5 yrs (current+increase in decimal)	1.25	1.25	0	0	1.25	1.25
Total Fee Revenue	$ 91,848	$ 64,123	$ -	$ -	$ 133,706	$ 133,706
Less 5% of Fees to Region Fund	$ 4,592	$ 3,206	$ -	$ -	$ 6,685	$ 6,685
Fee Revenue Available to Forest	**$ 87,255**	**$ 60,917**	**$ -**	**$ -**	**$ 127,020**	**$ 127,020**
Other Revenue Sources						
Grants	$ 55,000	$ -	$ -	$ -	$ 55,000	$ 55,000
Philanthropy/Other	$ -	$ -	$ -	$ -	$ -	$ -
Total Estimated Other Revenues	**$ 55,000**	**$ -**	**$ -**	**$ -**	**$ 55,000**	**$ 55,000**
TOTAL REVENUE (before appropriations)	**$ 142,255**	**$ 60,917**	**$ -**	**$ -**	**$ 182,020**	**$ 182,020**
EXPENSE						
Operations						
Law Enforcement	$ 20,380	$ 21,970	$ 38,460	$ 38,460	$ 30,465	$ 41,185
Visitor Contract/ Trail Patrol	$ 24,100	$ 20,860	$ -	$ 4,360	$ 38,280	$ 44,710
Environmental Monitoring						$ -
Water Resources	$ 67,346	$ 76,525	$ 76,525	$ 76,525	$ 76,525	$ 76,525
Fisheries Resources	$ 78,340	$ 166,205	$ 148,642	$ 148,642	$ 127,796	$ 127,796
Heritage Resources	$ 3,624	$ 11,377	$ 10,385	$ 11,377	$ 12,309	$ 19,389
Total Environmental Monitoring	$ 149,310	$ 254,106	$ 235,553	$ 236,544	$ 216,629	$ 223,710
Fee Collection/Compliance	$ 12,372	$ 10,608	$ -	$ -	$ 15,444	$ 17,626
Total Trails Operating Expense	**$ 206,162**	**$ 307,544**	**$ 274,013**	**$ 279,364**	**$ 300,818**	**$ 327,231**
Maintenance						
Total Trailhead Maintenance Expense	$ 8,219	$ 10,819	$ -	$ -	$ 16,823	$ 17,148
Trail and/or Road Maintenance (Annual)						
1 Tipton Creek	$ 24,122	$ 20,748	$ 29,900	$ 17,680	$ 17,680	$ 29,330
2 Tipton Knob	$ 3,931	$ -	$ -	$ -	$ -	$ 93,884
3 Bear Pen	$ 6,712	$ 103,970	$ -	$ 1,950	$ 110,453	$ 108,457
4 Fain Ford	$ 7,797	$ 98,527	$ 21,580	$ 98,527	$ 106,488	$ 124,222
5 Tellico River	$ 2,544	$ 49,088	$ 16,120	$ 49,088	$ 52,061	$ 51,146
6 State Line Loop	$ 2,693	$ 58,931	$ 30,550	$ 58,931	$ 59,261	$ 45,031
6-5 Connector	$ -	$ 58,931	$ -	$ -	$ 62,597	$ 38,545
7 Peckerwood Connect	$ 2,629	$ 21,193	$ -	$ 21,193	$ 22,118	$ 21,834
8 Bob Creek	$ 20,698	$ 134,266	$ -	$ 134,266	$ 142,987	$ 140,303
9 Mistletoe Connect.	$ 825	$ -	$ -	$ -	$ 2,841	$ 44,171
10 Round Mountain	$ 9,335	$ 34,483	$ -	$ 3,900	$ 42,130	$ 487,137
10A Round Mountain Spur	$ 5,383	$ 71,993	$ -	$ 1,950	$ 76,618	$ 75,080
11 Chestnut Mount.	$ 5,189	$ 71,993	$ -	$ 1,950	$ 76,453	$ 75,194
12 Hawk Knob	$ 1,504	$ -	$ -	$ -	$ -	$ 62,795
Trail 13	$ -	$ -	$ -	$ -	$ -	$ 136,128
Total Trail Maintenance Expense	$ 93,363	$ 724,122	$ 98,150	$ 389,435	$ 771,687	$ 1,533,257
Total Cyclic Maintenance (Heavy)	$ -	$ -	$ -	$ -	$ -	$ -
Subtotal Maintenance Expenses	**$ 101,582**	**$ 734,941**	**$ 98,150**	**$ 389,435**	**$ 788,510**	**$ 1,550,405**
Program Management						
Program Oversight	$ 12,650	$ 14,250	$ 1,600	$ 1,600	$ 17,450	$ 18,575
Communications & Visitor Information	$ 6,940	$ 8,254	$ 1,690	$ 1,690	$ 10,380	$ 12,070
Grant Writing/Management	$ 3,164	$ 650	$ -	$ -	$ 4,190	$ 5,028
Rec Events/Special Use Permits	$ 2,446	$ 1,968	$ -	$ -	$ 3,402	$ 10,744
Volunteer & Partnership Management	$ 11,293	$ 4,253	$ -	$ -	$ 17,511	$ 20,634
Subtotal Program Management Expenses	**$ 36,493**	**$ 29,375**	**$ 3,290**	**$ 3,290**	**$ 52,933**	**$ 67,051**
TOTAL EXPENSES (Before Vol/Inkind Offset)	**$ 344,237**	**$ 1,071,860**	**$ 375,453**	**$ 672,089**	**$ 1,142,261**	**$ 1,944,686**
Surplus or (Deficit) Before In-Kind Donations - Net of Revenues	**$ (201,982)**	**$ (1,010,944)**	**$ (375,453)**	**$ (672,089)**	**$ (960,241)**	**$ (1,762,666)**
Volunteers-In-Kind-Other Non Monetary Cost Offsets						
Volunteers Offset Value	$ 35,718	$ -	$ -	$ -	$ 38,949	$ 318,229
Other In Kind Donations/Partnerships	$ 2,923	$ 51,050	$ 50,600	$ 50,600	$ 36,050	$ 36,050
Subtotal Costs Offset by Volunteers or In- Kind Donations	**$ 38,641**	**$ 51,050**	**$ 50,600**	**$ 50,600**	**$ 74,998**	**$ 354,279**
TOTAL O&M EXPENSES (after Vol/InKind Offset)	**$ 305,596**	**$ 1,020,811**	**$ 324,853**	**$ 621,489**	**$ 1,067,263**	**$ 1,590,408**
Surplus or (Deficit) - Net of Revenues (excludes Appropriations; includes Vol/Inkind Offset)	**$ (163,341)**	**$ (959,894)**	**$ (324,853)**	**$ (621,489)**	**$ (885,243)**	**$ (1,408,387)**
Total Appropriations Required for Operations - Year 1 (Cost to Government)	**$ 163,341**	**$ 959,894**	**$ 324,853**	**$ 621,489**	**$ 885,243**	**$ 1,408,387**
% Cost Recovery (% of O&M Costs Paid with User Fees, Grants and Philanthropy)	**35%**	**6%**	**0%**	**0%**	**13%**	**8%**
Fee Requirements If:						
100% Cost Recovery						
Daily Fee (rounded)	$29	$168	n/a	n/a	$80	$121
Annual Fee (rounded)	$172	$1,005	n/a	n/a	$478	$725
75% Cost Recovery						

Daily Fee (rounded)	$22	$126	n/a	n/a	$60	$91
Annual Fee (rounded)	$129	$754	n/a	n/a	$359	$544
50% Cost Recovery						
Daily Fee (rounded)	$14	$84	n/a	n/a	$40	$60
Annual Fee (rounded)	$86	$503	n/a	n/a	$239	$363

CAPITAL IMPROVEMENT TOTAL	**See Alt Summary for Capital Schedule**					
Trailhead Improvements						
State Line L Parking Lot (upgrade)	$ -	$ 134,550	$ -	$ -	$ 303,113	$ 303,113
Chestnut Mountain Trailhead (new)	$ -	$ -	$ -	$ -	$ 193,063	$ 193,063
Heritage Survey	$ -	$ -	$ -	$ -	$ 18,198	$ 18,198
Subtotal Trailhead Expense	**$ -**	**$ 134,550**	**$ -**	**$ -**	**$ 514,373**	**$ 514,373**
Trail and/or Road Rehab/Improvement						
Trail 1-Tipton Creek	$ -	$ 1,025,000	$ 1,025,000	$ 1,025,000	$ 1,025,000	$ 1,025,000
Trail 2-Tipton Knob	$ -	$ 88,213	$ 88,213	$ 88,213	$ 88,213	$ 183,750
Trail 3-Bearpen	$ -	$ 65,875	$ -	$ -	$ 92,875	$ 105,000
Trail 4-Fain Ford	$ 468,750	$ 552,425	$ 30,750	$ 552,425	$ 819,363	$ 819,363
Trail 5-Tellico River	$ -	$ 90,620	$ 90,620	$ 90,620	$ 140,870	$ 140,870
Trail 6-State Line Loop	$ -	$ 48,200	$ 60,250	$ 96,200	$ 96,200	$ 96,200
Trail 5-6-Connector	$ -	$ 52,575	$ -	$ -	$ 52,575	$ -
Trail 7-Peckerwood Connector	$ -	$ 129,903	$ -	$ 129,903	$ 139,903	$ 139,903
Trail 8-Bob Creek	$ -	$ 454,435	$ -	$ 454,435	$ 713,935	$ 713,935
Trail 9-Mistletoe Connector	$ -	$ -	$ -	$ -	$ 150,800	$ 185,800
Trail 10-Round Mountain	$ -	$ 17,750	$ -	$ -	$ 142,625	$ 45,625
Trail 10A-Round Mountain Spur	$ -	$ 70,925	$ -	$ -	$ 104,613	$ 104,613
Trail 11-Chestnut Mountain	$ -	$ 76,865	$ -	$ -	$ 163,490	$ 163,490
Trail 12-Hawk Knob	$ -	$ -	$ -	$ -	$ -	$ 35,000
Trail 13	$ -	$ -	$ -	$ -	$ -	$ 1,513,275
Heritage Survey	$ -	$ -	$ -	$ -	$ -	$ 41,000
Subtotal Trail Expense	**$ 468,750**	**$ 2,672,785**	**$ 1,294,833**	**$ 2,436,795**	**$ 3,730,460**	**$ 5,312,823**
CAPITAL IMPROVEMENT TOTAL	**$ 468,750**	**$ 2,807,335**	**$ 1,294,833**	**$ 2,436,795**	**$ 4,244,833**	**$ 5,827,196**
TRAIL/ROAD/TRAILHEAD CLOSURE-DECOMISSIONING						
Trail 1-Tipton Creek	$ -	$ -	$ -	$ -	$ -	$ -
Trail 2-Tipton Knob	$ -	$ 39,800	$ 39,800	$ 39,800	$ 39,800	$ -
Trail 3-Bearpen	$ -	$ -	$ 89,300	$ 90,000	$ -	$ -
Trail 4-Fain Ford	$ -	$ 49,025	$ 132,400	$ 49,025	$ 49,025	$ 49,025
Trail 5-Tellico River	$ -	$ 32,313	$ 136,515	$ 32,313	$ 32,313	$ 32,313
Trail 6-State Line Loop	$ -	$ -	$ 50,150	$ -	$ -	$ -
Trail 5-6-Connector	$ -	$ -	$ -	$ -	$ -	$ -
Trail 7-Peckerwood Connector	$ -	$ 31,713	$ 43,213	$ 31,713	$ 31,713	$ 31,713
Trail 8-Bob Creek	$ -	$ 52,025	$ 150,000	$ 52,025	$ 52,025	$ 52,025
Trail 9-Mistletoe Connector	$ -	$ 48,825	$ 48,825	$ 48,825	$ 36,125	$ -
Trail 10-Round Mountain	$ -	$ 76,500	$ 91,000	$ 91,000	$ -	$ 76,875
Trail 10A-Round Mountain Spur	$ -	$ -	$ 62,950	$ 62,950	$ -	$ -
Trail 11-Chestnut Mountain	$ -	$ -	$ 67,288	$ 67,288	$ -	$ -
Trail 12-Hawk Knob	$ -	$ 112,950	$ 112,950	$ 112,950	$ 168,750	$ 151,375
Trail 13	$ -	$ -	$ -	$ -	$ -	$ -
Trailhead-State Line Parking Lot	$ -	$ -	$ 14,438	$ 14,438	$ -	$ -
Heritage Survey	$ -	$ -	$ -	$ -	$ -	$ -
CLOSURE-DECOMMISSION TOTAL	**$ -**	**$ 443,150**	**$ 1,038,828**	**$ 692,325**	**$ 409,750**	**$ 393,325**
CAPITAL TOTAL	**$ 468,750**	**$ 3,250,485**	**$ 2,333,660**	**$ 3,129,120**	**$ 4,654,583**	**$ 6,220,521**
TOTAL CAPITAL & OPERATIONS/ MAINTENANCE COST TO GOVERNMENT	**$ 632,091**	**$ 4,210,379**	**$ 2,658,513**	**$ 3,750,609**	**$ 5,539,826**	**$ 7,628,908**

ASSUMPTIONS (also see comments in cells for explanations)

REVENUE/EXPENSE OFFSET:

The basis for Alt A fee income is actual '07 income; other Alt A factors and Alts B, D, E, F are calculated from this basis (see detail below)						
Parking spaces are not defined- estimated number of tow vehicles that lot can accommodate - no trailheads in Alts C,D; 2 trailheads in Alts A,B,; 3 trailheads in Alts E, F	70	70	0	0	100	100
Average # of Riders per Tow Vehicle - Greater # of UTVs in Alt B than alts A,E,F due to trail design	1.75	1.5	0	0	1.75	1.75
Rider Turn-Over each Day - less turnover for trails with more miles and features	10%	25%	0%	0%	5%	5%
Days Trail and/or Road Open (Alts C & D open to highway legal vehicles only) 120 - roads open to Hwy vechicles only Sept - Dec 275 - 3 winter months closure; trail/road open April-Dec 255 - 3 winter months plus 20 wet weather days closure	275	255	120	275	275	275
Days at Full Capacity						
30% = 275 open days (9 mos) with 8 weekend days = 72 days + 6 holidays = 78 days = 22% of 275 days + 5.5 additional days (or 11 dys at 50% or 22 days at 25%, etc) (30% of 275 days) 23% = 255 open days (8.4 mos) with 8 weekend days = 67.2 days + 5 holidays = 72.2 days at 100% or 57.76 days at 80% due to feature removal/changes (23% of 255 days)	30%	23%	0%	0%	30%	30%
% of Riders who are Fee Compliant - Higher compliance for Alts E & F because of more law enforcement & visitor contact staff	85%	85%	0%	0%	90%	90%
DailyPass Percentage of use- slightly higher in Alts B,E,F because of changes to trail system	93%	95%	0%	0%	95%	95%
Daily Fee (constant across alternatives with a fee)	$10.00	$10.00	$0.00	$0.00	$10.00	$10.00
Annual Pass Percentage of use	7%	5%	0%	0%	5%	5%
Annual Pass Average Number of Days per Year - three 3-day weekends- would not change across alternatives with a fee	10	10	0	0	10	10
Annual Pass Fee multiple of Daily Fee	6	6	6	6	6	6
Number of visits are constant for all 10 years						
Fees increase 25% in years 5 and 10	1.25	1.25	0	0	1.25	1.25
Grants would be available only for Alts A, E, F because of trail availability/design/length	$55,000	$0	$0	$0	$55,000	$55,000
Philantropic & inkind contributions	$0	$0	$0	$0	$0	$0
Volunteer Hours: Alt A based on Southern 4-wheel Assoc est hours for last 5 years minus the highest and lowest years (aver of middle 3 years) at a GS5-6 CTG rate. No hours estimated for Alts B, C,& D because of trail length/design or closure. Alts E & F plus 15% due to increased miles/features.	1,414	0	0	0	1,523	1,523

O&M EXPENSES:

Some operations expenses decrease after the first 3-5 years (see Op & ProgMgt sheet for details)
Expenses include a 2.9 percent annual inflation factor (Bureau of Labor Statistics 10 year average)

CAPITAL EXPENSES:

All capital improvements are completed in prior to Yr 1 except for trailhead in yrs 5 and 10

Appendix D

Addendum to Appendix D

In response to comments received from the public during the Notice and Comment period, the agency asked economists at the University of Tennessee to calculate economic impacts solely for Cherokee County, North Carolina. The results are shown on the next page. Comparisons of the two sets of results show relatively little difference between the one- and three- county study areas. This is explained as follows:

"In most cases, a larger study region (three counties) compared to a small study region (one county) has a larger economic multiplier resulting in larger economic impacts. This is because there is less leakage in a larger study region compared to a smaller one. Examples of leakages include: a) individuals who work in Cherokee County but live in a nearby county --
however these individuals may do their consumer spending (groceries, medical, etc.) outside of Cherokee County (again, assuming a one county study area); and b) suppose there is a construction project taking place in Cherokee County but most of the needed supplies (lumber, concrete, labor, etc.) is not manufactured or available in that county and has to be either purchased or imported from outside the county. In both of these situations the study region (Cherokee County) does not provide the needed goods and services and/or consumers' spending patterns do not reside in the study region--the monies are not spent or re-spent within the study area. As a result, a lower level of economic activity results (a reflection of the smaller multiplier). In essence, the more the economic activity is able to be internalized in the study region the larger the economic impacts. As an economic impact modeler, the key is to build a study region that adequately captures this level of economic activity but not create a study region that is so large to overly inflate the multipliers." (Personal Communication, R. J. Menard, 5/13/09)

“There may be two other issues that need explaining. First, when we do the impact for Cherokee alone, we assume all expenditures from the survey occurred in Cherokee. We also assumed when running the three county model that all expenditures occurred within the three county model. The question in the survey was: How much did you spend with in a 25 mile radius. We may be overstating the expenditures in Cherokee, but we have no way of breaking these expenditures out into each of the three counties. So when comparing the difference between the two numbers, we should state that if we assume all expenditures within a 25 mile radius took place within the study area then this is the impact.

Second, the small difference between the two numbers indicates to me that while leakage is occurring, there is not much difference between the two study areas. In other words, if

Table 6. Estimated Economic Impacts of OHV Related Mean Expenditures for Cherokee County, 2008

Economic Indicators	Direct[a]	Indirect[a]	Induced[a]	Total[a]
Total Industrial Output[b]	$3,091,892	$561,882	$1,013,839	$4,667,613
Total Value Added[c]	$1,771,645	$306,313	$620,192	$2,698,150
Indirect Business Taxes[d]	$318,795	$30,640	$47,637	$397,072
Employment[e]	47	6	12	65

[a]See page 2, "Expenditures Effects on Economy" section for future information
[b]Total Industrial Output – annual dollar value of goods and services that an industry produces
[c]Total Value Added – estimated employee compensation, proprietary income, other income, and indirect business taxes
[d]Indirect Business Taxes – consists of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses
[e]Employment – estimated number of total wage and salary employees (both full and part-time), as well as self-employed

one needs to leave the county to purchase goods and materials, the purchase will likely be made in counties or states outside both the 1 county and 3 county region. In other words, each of these counties are similar in economic activity and do not produce many goods that are different from each other. (Personal communication, B. C. English, 5/13/09).

Table 7. Estimated Economic Impacts of Rock-Crawler Type* and ATV Type** Related Mean Expenditures for Cherokee County, 2008

Economic Indicators	Direct[a]	Indirect[a]	Induced[a]	Total[a]
Rock-Crawler Type				
Total Industrial Output[b]	$2,105,381	$386,479	$685,431	$3,177,291
Total Value Added[c]	$1,198,736	$210,249	$418,962	$1,827,947
Indirect Business Taxes[d]	$215,435	$21,079	$32,141	$268,655
Employment[e]	32	4	8	44
ATV Type				
Total Industrial Output[b]	$439,541	$71,314	$157,939	$668,794
Total Value Added[c]	$273,496	$39,500	$97,474	$410,470
Indirect Business Taxes[d]	$52,387	$3,917	$7,502	$63,806
Employment[e]	6	1	2	9

*Dune buggies, rail buggies, modified street-legal 4-wheel drive vehicles/truck, and rock-crawler vehicles
**Off-highway motorcycles, ATVs, and utility terrain (Mule, Rhino, Kubota, etc.)
[a]See page 2, "Expenditures Effects on Economy" section for future information
[b]Total Industrial Output – annual dollar value of goods and services that an industry produces
[c]Total Value Added – estimated employee compensation, proprietary income, other income, and indirect business taxes
[d]Indirect Business Taxes – consists of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses
[e]Employment – estimated number of total wage and salary employees (both full and part-time), as well as self-employed

Table 8. Estimated Economic Impacts of Trout Anglers Related Mean Expenditures for Cherokee County, 2008

Economic Indicators	Direct[a]	Indirect[a]	Induced[a]	Total[a]
Total Industrial Output[b]	$735,667	$131,787	$242,122	$1,109,576
Total Value Added[c]	$428,956	$73,192	$148,160	$650,308
Indirect Business Taxes[d]	$81,470	$7,268	$11,190	$99,928
Employment[e]	13	1	3	17

[a]See page 2, "Expenditures Effects on Economy" section for future information
[b]Total Industrial Output – annual dollar value of goods and services that an industry produces
[c]Total Value Added – estimated employee compensation, proprietary income, other income, and indirect business taxes
[d]Indirect Business Taxes – consists of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses
[e]Employment – estimated number of total wage and salary employees (both full and part-time), as well as self-employed

Agri-Industry Modeling and Analysis Group

Industry Brief

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Department of Agricultural Economics, University of Tennessee

Estimated Economic Impacts of Upper Tellico Off-Highway Vehicle Users and Tellico River Trout Anglers

Background

The Nantahala National Forest, located in North Carolina (Figure 1), is managed for multiple uses that include hiking, backpacking, camping, fishing, horseback riding, biking, and off-highway vehicle (OHV) driving. The Tellico River is also popular for angling on the North Carolina side of the state-line but is generally too shallow for whitewater paddling. Some OHV routes are now located within the Tellico River corridor in North Carolina.

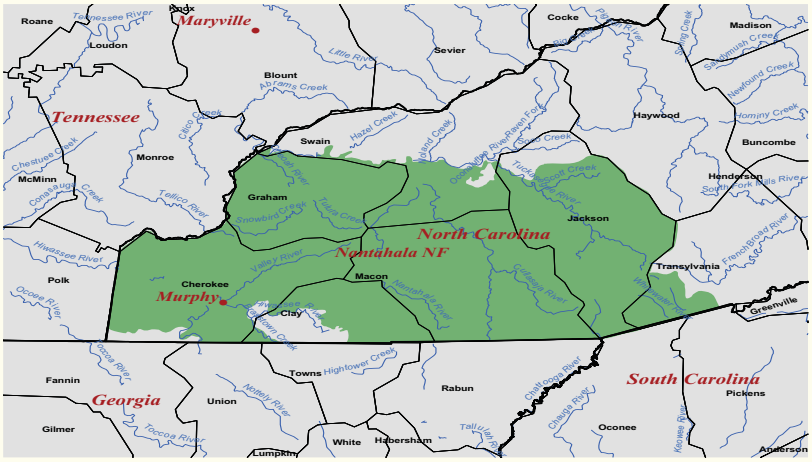

Figure 1. Location of the Nantahala National Forest in North Carolina.

The Upper Tellico OHV area, located in Cherokee County, North Carolina in the Nantahala National Forest, has roughly 39.5 miles of existing roads and trails concentrated within an area 6,000 acres in size. The trail system is located about 13 miles north of Murphy, North Carolina at the junction of Highways 19/74 and 64. Access to the trail system is also available from Monroe County, Tennessee (USDA-FS, 2008). The Upper Tellico OHV area is a fee access area. The fee is $10 per day per vehicle payable at the Forest Service entrance station.

The Tellico River originates in the mountains of North Carolina and is one of the largest natural trout streams in the Southeast. The 285 square mile watershed is comprised of land in Cherokee County, North Carolina and Monroe County, Tennessee. The total length of the river is estimated at 52.8 miles. Recreation on the river includes canoeing, kayaking, and swimming. A 13-mile stretch on the Upper Tellico River is known for trout fishing. Trout are stocked in the river from March 15th through September 15th annually with a catch and release season during the remainder of the year. To fish in the Tellico/Citico watersheds, a permit costing $5.20 per day is required in addition to a Tennessee fishing license and a trout stamp. Permit sales help to support the Tellico trout hatchery.

OHV Trail Users, Trout Anglers, and Businesses Surveys

From May 31 to July 13, 2008, surveys were conducted of OHV trail users of the Upper Tellico trail system and trout anglers along the Tellico River. One part of the survey included questions for OHV trail users and trout anglers concerning their trip expenditures to provide input for estimating the economic impacts for both OHV users in the Upper Tellico and trout anglers along the Tellico River (see Appendices A and B). Surveys were also sent to local businesses in Cherokee, North Carolina in mid-July to determine how OHV users impact the local

economy (Appendix C). For the economic impact analysis, the economic region analyzed consisted of a three county area -- Cherokee and Graham Counties in North Carolina and Monroe County in Tennessee (Figure 2). Based on the latest IMPLAN data (2006), which is used in this analysis, tourism represents roughly 3.4 percent ($43.7 million) of the total economy ($1,269.5 million) in Cherokee County, North Carolina; 6.6 percent ($23.0 million) of the total economy ($348.3 million) in Graham County, North Carolina; and 11.4 percent ($302.8 million) of the total economy ($2,656.0 million) in Monroe County, Tennessee. Tourism related industries included scenic and sightseeing transportation and support activities; motion picture/video industries; independent artists, writers, and performers; promotion of performing arts/sports; museums, historical sites, and parks; fitness and recreational sports centers; other amusement, gambling, and recreational industries; hotels/motels; campgrounds; and restaurants.

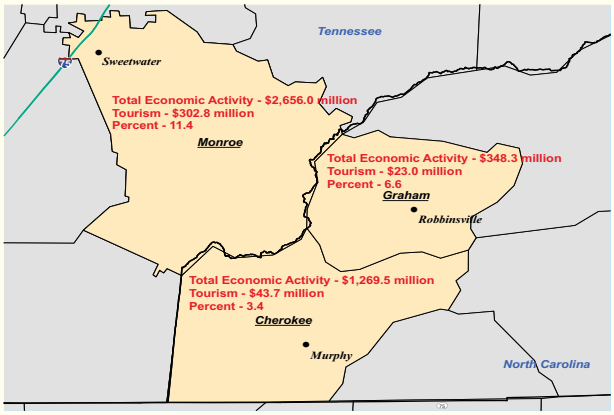

Figure 2. Study Region for the Economic Impact Analysis

OHV Trail Users

In order to calculate the estimated economic impacts, an estimate of the annual population of OHV users in the Upper Tellico area is necessary. Based on data provided by the USDA Forest Service, the number of day-use and annual permits purchased in the Upper Tellico OHV area ranged from a high 12,529 in 2002 to 7,366 in 2007, or an average of 10,492 permit purchases per year (Figure 3). Assuming that 15 percent of the riders in the area do not purchase either a daily permit for their vehicle or have an annual permit, the total number of OHVs in the area over the year is estimated at 12,066. According to the survey results, there are an average of 2.46 vehicles per survey unit (number of OHV's per survey), or 4,905 survey units annually (12,066/2.46).

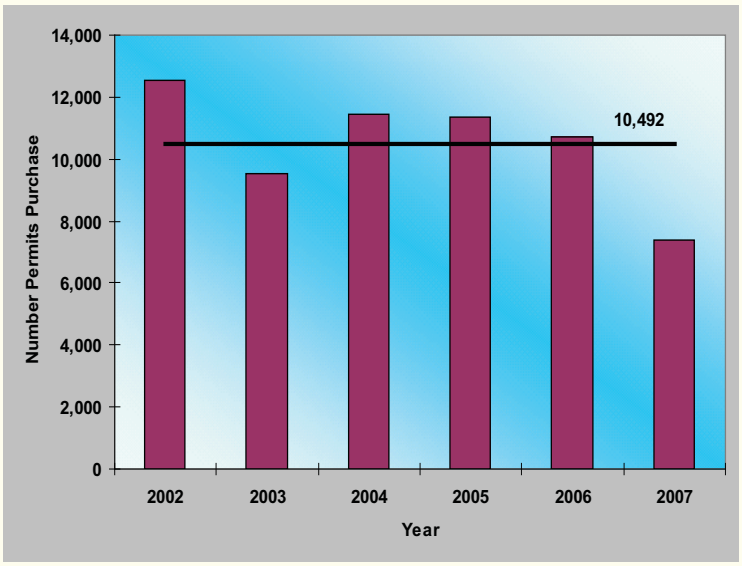

Figure 3. Estimated Number of Permits Sold, 2002 Through 2007.

Expenditures Effects on Economy

Expenditures by OHV trail users and trout anglers for goods and services, land, labor, capital equipment, and other materials enhance both the local economy and the local tax base. Economic benefits garnered by an economic region from these activities can be measured in terms of the number of jobs created and the amount of personal income accruing to residents. These impact measures can be further broken down into *direct*, *indirect*, and *induced (or ripple)* effects.

Total economic impacts attributable to increased business activity are computed as the sum of the direct, indirect, and induced effects (for a more detailed description, please see Appendix E). *Direct* effects are those attributable specifically to the new expenditures in a region (i.e., trout anglers or OHV users). *Indirect* effects arise from businesses' expenditures on raw materials, supplies, and other operating expenses, which help to support jobs in other local businesses. *Induced*, or *ripple* effects, are created as the new income generated by the direct and indirect effects is spent and re-spent within the local economy. These impacts are measured for total industry output, employment, total value added, and indirect business taxes.

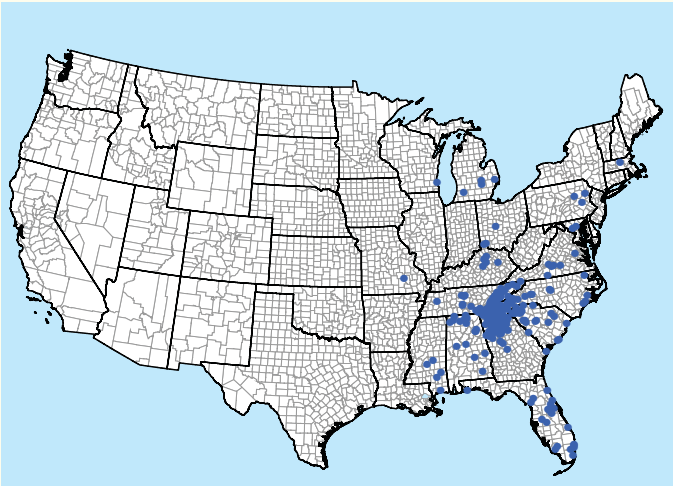

Figure 4. Origin of Residence of OHV Users of Upper Tellico -- U.S. Perspective

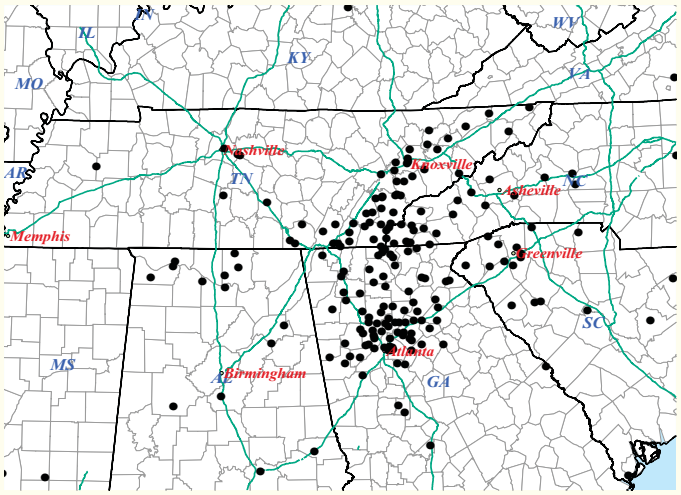

Figure 5. Origin of Residence of OHV Users of Upper Tellico -- Southeast Perspective

Of the estimated 316 OHV users who completed a survey, mean expenditures per trip were $630.36. OHV related expenditures, which included OHV equipment purchases, fuel/oil, repairs/service, and access fees, had the largest mean expenditures at $201.10 per trip, followed by transportation expenditures to the Tellico OHV area (vehicle fuel/oil, repairs/services, etc.) ($163.75), food and beverages ($116.59), lodging ($104.16), and other expenses (entertainment, souvenirs/gifts, camping supplies, retail purchases other than food, and other types of equipment rentals) ($44.76). The largest expenditure category for other expenses included camping supplies, retail goods other than groceries, souvenirs/gifts, and entertainment/amusement. Figures 4 and 5 depict the origin of residence for OHV users in the Tellico area who responded to the survey.

Trout Anglers

In order to fish in the Tellico/Citico watershed, each individual is asked by the Tennessee Wildlife Resource Agency (TWRA) to purchase a daily permit. The trout angler survey along the Tellico River was conducted from May 31 to July 13, 2008. In June, trout anglers were surveyed 6 out of 13 weekdays and 9 out of 10 weekends.[1] An estimated 867 trout angler visitor units occurred along the Tellico River during June. Assuming that the number of trout anglers in June 2008 is similar to June 2007 numbers, the number of trout angler visitor units is estimated at 4,979 (the TWRA provided monthly permit sale data for both years 2006 and 2007 (Figure 6)). Combining the number of surveys distributed during the month of June and the proportion of daily permits sold in June of 2006 and 2007, an estimated

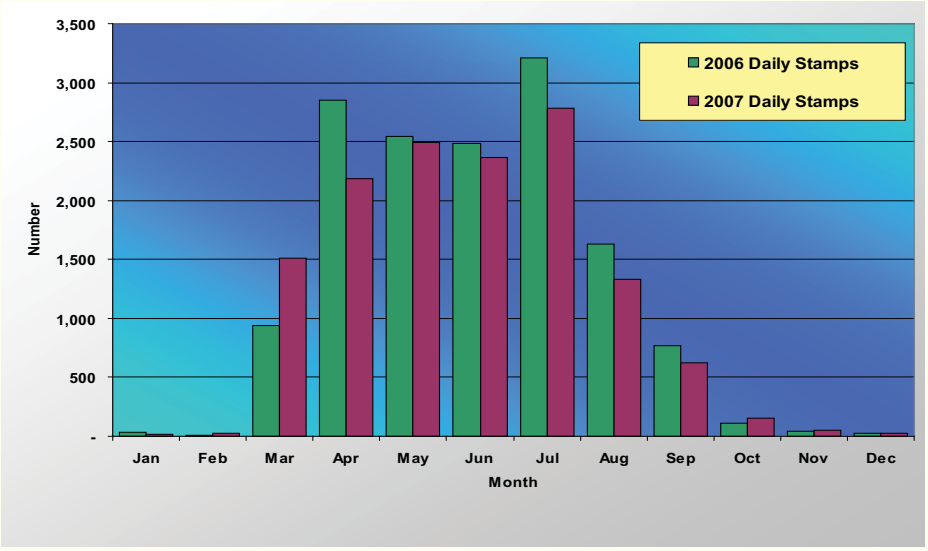

Figure 6. Monthly Tellico/Citico Daily Permits Issued for 2006 and 2007

[1]Adjusting for days not surveyed, plus providing an adjustment of 25 percent for those trout anglers missed on the days surveyed, and assuming those days surveyed are similar to those days not.

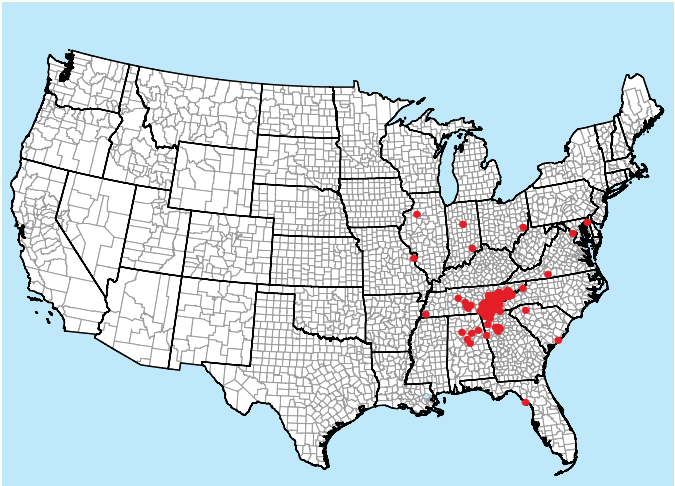

Figure 7. Origin of Residence of Trout Anglers along the Tellico River -- U.S. Perspective

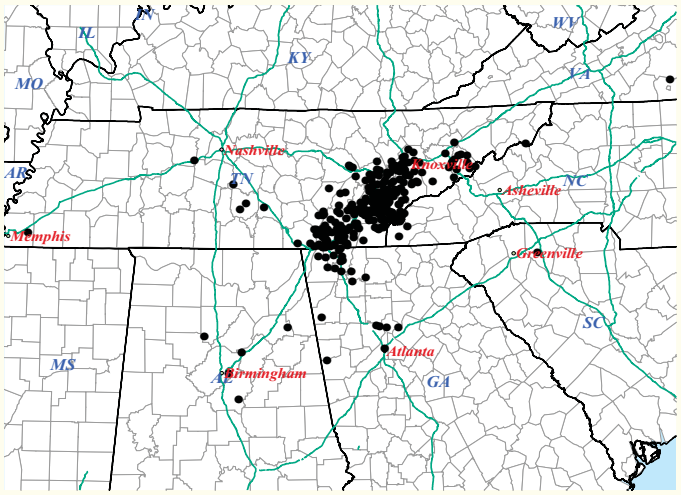

Figure 8. Origin of Residence of Trout Anglers along the Tellico River -- Southeast Perspective

7,966 adults annually visit the Tellico River.

Of the 296 trout anglers who completed a survey, mean estimated expenditures per trip were $199.95. Trout fishing related expenditures, which included permit fees, fishing supplies, and fishing attire, had the largest mean expenditures at $78.73 per trip, followed by transportation expenditures to the Tellico area (vehicle fuel/oil, repairs/services, airfare, etc.) ($48.04), food and beverages ($41.78), lodging ($18.19), and other expenses (entertainment, souvenirs/gifts, camping supplies, retail purchases other than food, and other types of equipment rentals) ($13.21). The largest expenditure category for other expenses included camping supplies, souvenirs/gifts, entertainment/amusement, and retail purchases other than groceries. Figures 7 and 8 depict the origin of residence for trout anglers on the Tellico River who responded to the survey.

Local Businesses

Table 1. Business Types Responding to the Survey[a]

Business Type	Number
Real Estate	31
Rental Cabins	17
Retail	15
Construction	12
Other	11
Automotive Repair/Service	9
Recreational	5
Convenience Store	4
Hotel/Motel	4
Campground	3
Restaurant	3
Grocery Store	1
Entertainment	0
Gas Station	0
Total	115

[a]Survey respondents may have more than one type of business

Of the 500 local business surveys disseminated, approximately 90 were returned, or an 18 percent response rate. Of the returned surveys, 79 were from North Carolina (78 from Cherokee County; 1 from Clay County), 4 from Tennessee (2 from Monroe County; 2 from Polk County), 3 from Georgia (all Fannin County); and 4 with no state listed. According to information from the survey, real estate sales, rental cabins, retail, construction, and other were the most prevalent was

Table 2. Total Sales from Business in 2007

Sales	Number	Cumulative
Under $99,999	21	24.7%
$100,000 to $249,999	20	48.2%
$250,000 to $499,999	13	63.5%
$500,000 to $749,999	3	67.1%
$750,000 to $999,999	10	78.8%
$1,000,000 to $1,499,999	3	82.4%
$1,500,000 to $1,999,999	5	88.2%
$2,000,000 to $2,999,999	3	91.8%
$3,000,000 to $5,999,999	3	95.3%
$6,000,000 or more	4	100.0%

Table 3. Average Perceived Decline in Business Sales by Business Type: Cherokee County, North Carolina

Business Type	Average Perceived Decline			
	Number Responding	Percentage	Number Responding	Value of Perceived Decline
	n[a]	%[b]	n[a]	$[c]
Campground	3	***56.7***	3	$145,833
Real Estate	29	***51.3***	27	***$669,435***
Other	6	45.8	6	$447,708
Construction	11	45.5	10	$431,125
Rental Cabins	13	40.9	12	***$554,354***
Hotel/Motel	4	40.0	4	$111,875
Restaurant	1	40.0	1	$70,000
Retail	12	33.8	10	$445,000
Automotive Repair/Service	8	28.9	7	$141,714
Recreational	4	22.3	4	$88,313
Convenience Store	4	20.3	4	$395,313

[a]Number of businesses responding to survey and located in the Cherokee County, North Carolina area
[b]Period is from April 1 - July 7, 2008 compared to same time period in 2006 and 2007
[c]Median total business sales in 2007 multiplied by the perceived percentage decline in sales from April 1 - July 7, 2008

Table 4. Average Perceived Decline in Business Sales by Business Type and Perceived Attributing Factors

Business Type	n[a]	Average Perceived Decline Value									
		Gasoline Prices		Trail Closures		General Economy		Weather		Other	
		%	$	%	$	%	$	%	$	%	$
Campground	3	14.0	$20,417	***58.5***	$85,313	14.0	$20,417	13.5	$19,688	0.0	$0
Real Estate	27	27.2	$182,295	21.0	$140,479	44.6	$298,774	0.4	$2,546	6.8	$45,340
Other	6	14.0	$62,846	13.8	$60,313	71.7	$321,181	0.0	$0	0.5	$3,369
Construction	10	32.1	$138,175	27.4	$118,206	40.5	$174,744	0.0	$0	0.0	$0
Rental Cabins	12	29.8	$165,146	15.5	$86,140	47.2	$261,735	1.5	$8,000	6.0	$33,333
Hotel/Motel	4	32.5	$36,394	20.6	$22,994	45.6	$51,088	1.3	$1,400	0.0	$0
Restaurant	1	35.0	$24,500	20.0	$14,000	45.0	$31,500	0.0	$0	0.0	$0
Retail	10	20.2	$89,946	36.9	$164,394	38.1	$169,360	1.4	$6,300	3.4	$15,000
Automotive Repair/Service	7	50.2	$71,164	20.5	$29,025	28.8	$40,839	0.5	$686	0.0	$0
Recreational	4	29.9	$26,384	28.6	$25,247	26.7	$23,556	14.8	$13,125	0.0	$0
Convenience Store	4	35.8	$141,622	34.1	$134,934	26.4	$104,431	3.6	$14,325	0.0	$0

[a]Number of businesses responding to survey and located in the Cherokee County, North Carolina area

business types (Table 1). In 2007, approximately 63.5 percent of all business types total sales represented in the survey were less than $500 thousand (Table 2). Of the businesses surveyed, 81.1 percent indicated that sales from their businesses from April 1 through July 7 of 2008 have declined compared to the same time period in 2006 and 2007. The average percentage decline in business sales across all business types was 43.5 percent. The most frequently cited percentages were 40 and 50 percent, with maximum and minimum percentages ranging from 200 and 3 percent respectively. By business type and for the time period April 1 through July 7 of 2008, campground and real estate sales businesses had the highest perceived average percentage decline in business sales compared to the same period for the previous two years (Table 3). The average perceived decline in value by business typethe largest for real estate and rental cabins (Table 3). When the businesses were asked what factors (e.g., gasoline prices, OHV trail closures in the Upper Tellico, general economy, weather, and other) were contributing to the decline in business sales, campgrounds indicated that trail closures in the Upper Tellico was the primary factor (58.5 percent) (Table 4). The remaining businesses either cited the general economy and/or gasoline prices as primary factors. By business type and for total sales in 2007, the average percentage of their businesses total

Table 5. Proportion of Business Sales Attributed to Tellico OHV User Type Owners

Business Type		Dirt Bike/ATV	Rock-Crawler/Rail Buggy	Don't Know	None
	n[a]	Average %		n[a]	n[a]
Automotive Repair/Service	7	6.7	48.9	0	1
Campground	3	18.3	80.0	0	0
Construction	6	24.3	27.8	2	2
Convenience Store	4	17.0	36.0	0	0
Hotel/Motel	1	10	10	2	1
Other	4	11.3	17.5	2	5
Real Estate	14	14.0	24.4	6	8
Recreational	4	6.8	45.8	0	1
Rental Cabins	8	11.4	22.1	5	2
Restaurant	1	50	50	2	0
Retail	3	12.0	0.7	3	6

[a]Number of businesses responding to survey and located in the Cherokee County, North Carolina area

sales from either dirt bike/ATV owners or rock-crawler/rail-buggy owners in the Upper Tellico is indicated in Table 5. All business types, except for retail, indicated a larger percentage of their total sales were from rock-crawler/rail-buggy owners. Both hotel/motel and restaurant business types indicated an equal proportion of sales between the two groups.

OHV Economic Impacts

Based on expenditure information received from the OHV surveys, the estimated level of direct OHV related expenditures in 2008 dollars was close to $3.10 million, which financed 48 jobs (Table 6). Total value added and indirect business taxes direct expenditures were estimated at close $1.74 million and $0.32 million respectively. Total impacts for the study region's economy were estimated at close to $4.80 million in total industry output from OHV users and OHV related expenditures. Estimated total number of jobs was 66, with total value added estimated at close to $2.74 million. Indirect business taxes from OHV users and OHV related expenditures were estimated at $0.41 million. For the economic indicator total industrial output, the estimated multiplier is 1.549. In other words, for every dollar OHV users spent on capital or trip related expenditures, and additional $0.55 is generated throughout the region. Likewise, the employment multiplier is estimated at 1.375. For every job created based on expenditures by OHV users, an additional 0.37 jobs are created in other industries throughout the region.

Table 6. Estimated Economic Impacts of OHV Related Mean Expenditures on the OHV Upper Tellico Region, 2008

Economic Indicators	Direct[a]	Indirect[a]	Induced[a]	Total[a]
Total Industrial Output[b]	$3,091,892	$611,699	$1,087,107	$4,790,698
Total Value Added[c]	$1,738,203	$343,448	$654,442	$2,736,093
Indirect Business Taxes[d]	$319,873	$34,752	$56,807	$411,432
Employment[e]	48	6	12	66

[a]See page 2, "Expenditures Effects on Economy" section for further information
[b]Total Industrial Output -- annual dollar value of goods and services than an industry produces
[c]Total Value Added -- estimated employee compensation, proprietary income, other income, and indirect business taxes
[d]Indirect Business Taxes -- consists of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses
[e]Employment -- estimated number of total wage and salary employees (both full and part-time), as well as self-employed

Figure 9 shows the top ten indirect and induced sectors impacted based on output value. For OHV users in the Upper Tellico, indirect impacts (input supplying industries) explained 12.8 percent ($0.61 million) of the total impact on output. The sectors most impacted in descending order included real estate, maintenance and repair of nonresidential buildings, federal electric utilities, wholesale trade, other state/local government enterprises, man

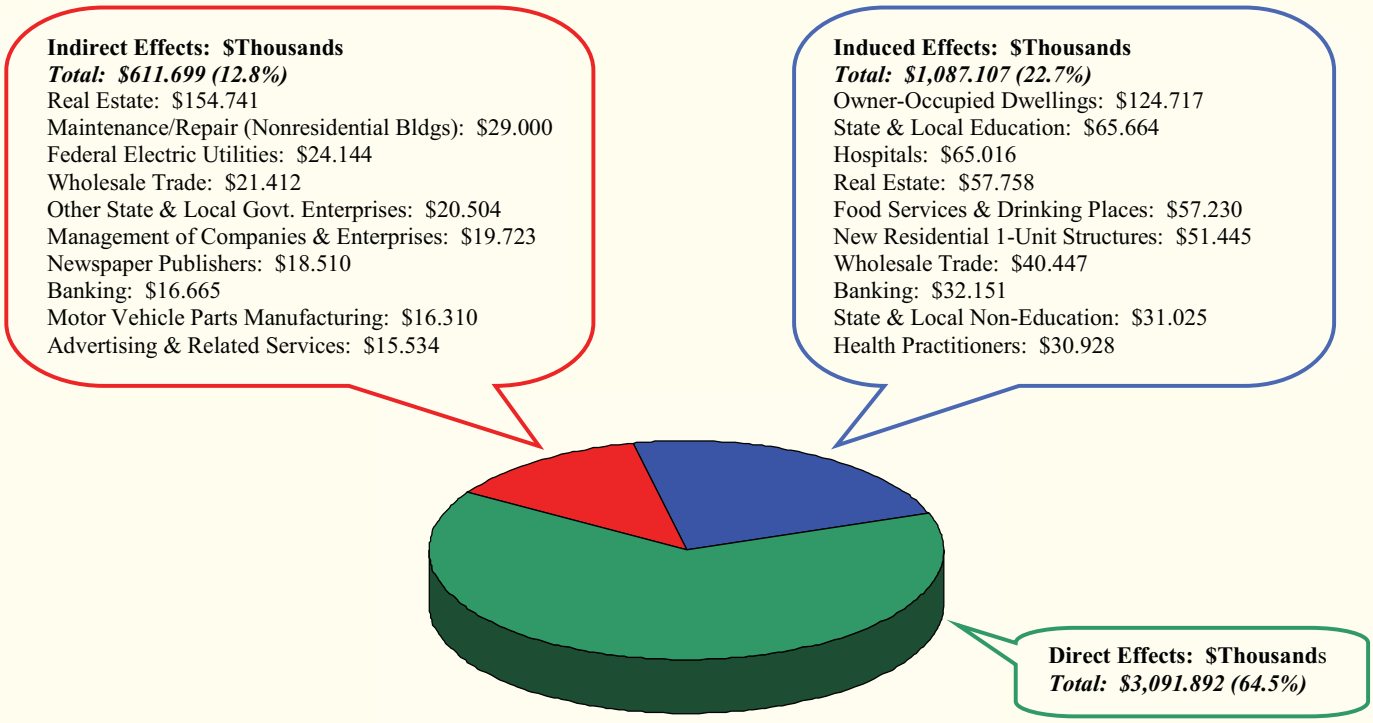

Figure 9. Estimated Direct, Indirect, and Induced Impacts for OHV Users in the Upper Tellico Region

agement of companies and enterprises, newspaper publishers, banking, motor vehicle parts manufacturing, and advertising and related services. Likewise, induced impacts (expenditures by households and other institutions) explained 22.7 percent (close to $1.1 million) of total impact on output. Again, in descending order the sectors most impacted included owner-occupied dwellings, state and local education, hospitals, real estate, food services and drinking places, new residential one-unit structures, wholesale trade, banking, state and local non-education, and health practitioners.

Economic Impacts for Selected OHV Vehicle Types

Of interest would be the proportion of the estimated economic impacts (Table 6) by OHV type. One of the survey questions asks the number and type of OHVs hauled or driven to the Upper Tellico area. The response options included off-highway motorcycles, ATVs, UTVs (utility terrain vehicles), dune or rail buggies, modified street-legal four-wheel drive vehicles/trucks, and rock-crawler vehicles. The responses where categorized into two categories -- 1) rock-crawler type, which included dune or rail buggies, modified street-legal four-wheel drive vehicles/trucks, and rock-crawler vehicles, and -- 2) ATV type, which included ATVs, UTVs, and off-highway motorcycles.

The average expenditures per trip for rock-crawler type and ATV type of OHVs were $655.32 and $487.02 respectively. For both groups, the largest mean expenditure categories in decreasing order were OHV expenditures, transportation expenditures to the Tellico area, food and beverages, lodging, and other expenses. Rock-crawler type mean expenditures were roughly twice those of ATV type for the transportation expenditures to the Tellico area, food and beverages, and lodging categories. ATV type mean expenditures were larger for the OHV expenditure category primarily for the OHV equipment purchased for this trip sub-category (see survey in Appendix A).

For rock-crawler type, the estimated level of direct rock-crawler type related expenditures in 2008 dollars was $2.10 million, which financed 33 jobs (Table 7). Total value added and indirect business taxes direct expenditures were estimated at close to $1.2 million and $0.22 million respectively. Total impacts for the study region's economy were estimated at close to $3.30 million in total industry output from rock-crawler type users and rock-crawl-

Table 7. Estimated Economic Impacts of Rock-Crawler Type* and ATV Type** Related Mean Expenditures on the OHV Upper Tellico Region, 2008

Economic Indicators	Direct[a]	Indirect[a]	Induced[a]	Total[a]
Rock-Crawler Type				
Total Industrial Output[b]	$2,105,381	$420,772	$735,747	$3,261,900
Total Value Added[c]	$1,177,669	$235,653	$442,669	$1,855,991
Indirect Business Taxes[d]	$216,225	$23,873	$38,394	$278,492
Employment[e]	33	4	8	45
ATV Type				
Total Industrial Output[b]	$439,541	$77,673	$167,138	$684,352
Total Value Added[c]	$264,889	$44,616	$101,281	$410,786
Indirect Business Taxes[d]	$52,348	$4,423	$8,790	$65,560
Employment[e]	6	1	2	9

*Dune buggies, rail buggies, modified street-legal 4-wheel drive vehicles/trucks, and rock-crawler vehicles
**Off-highway motorcycles, ATVs, and utility terrain vehicles (Mule, Rhino, Kubota, etc.)
[a]See page 2, "Expenditures Effects on Economy" section for further information
[b]Total Industrial Output -- annual dollar value of goods and services than an industry produces
[c]Total Value Added -- estimated employee compensation, proprietary income, other income, and indirect business taxes
[d]Indirect Business Taxes -- consists of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses
[e]Employment -- estimated number of total wage and salary employees (both full and part-time), as well as self-employed

er-type related expenditures. Estimated total number of jobs was 45 based on the economic activity generated from expenditures by rock-crawler type users, with total value added estimated at close to $1.86 million. Indirect business taxes were estimated at close to $0.28 million.

Likewise, for ATV type, the estimated level of direct ATV type related expenditures in 2008 dollars was close to $0.44 million, which financed 6 jobs (Table 8). Total value added and indirect business taxes direct expenditures were estimated at $0.26 million and $0.05 million respectively. Total impacts for the study region's economy were estimated at close to $0.68 million in total industry output from ATV type users and ATV type related expenditures. Estimated total number of jobs was 9, with total value added estimated at $0.41 million. Indirect business taxes from ATV type users and ATV type related expenditures were estimated at $0.06 million.

Comparing the results in Table 8 with Table 6, it appears that rock-crawler type direct economic expenditures ($2.10 million) comprises roughly 68.1 percent of the direct expenditures (close to $3.10 million) for all OHV types. ATV type direct economic expenditures ($0.44 million) vehicles comprises close to 14.2 percent. The remaining percentage, 17.7 percent, should be proportioned to OHV users who have both rock-crawler type and ATV type OHVs. For each rock-crawler type, the estimated total economic impact per vehicle is $413 (total impact value for rock-crawler types divided by rock-crawler type population times number of vehicles per survey unit (i.e., $3,261,900 ÷ (3,213 x 2.46)); for each ATV type, the total estimated economic impact per vehicle is $308 (total impact value for ATV types divided by ATV type population times number of vehicles per survey unit (i.e, $684,352 ÷ (903 x 2.46)).

Trout Angler Economic Impacts

Based on expenditures from the trout angler surveys, the estimated level of direct trout angler related expenditures in 2008 dollars was $0.73 million, which financed 14 jobs (Table 8). Total value added and indirect business taxes direct expenditures were estimated at $0.42 million and $0.08 million respectively. Total impacts for the study region's economy were estimated at close to $1.14 million in total industry output from trout anglers and trout related expenditures. Estimated total number of jobs was 18, with total value added estimated at over $0.66 million. Indirect business taxes from trout anglers and trout related expenditures were estimated at $0.10 million. For the economic indicator, total industrial output, the estimated multiplier is 1.546. In other words, for every dollar trout anglers spent on capital or trip related expenditures, and additional $0.55 is generated throughout the

Table 8. Estimated Economic Impacts of Trout Angler Related Mean Expenditures along the Tellico River, 2008

Economic Indicators	Direct[a]	Indirect[a]	Induced[a]	Total[a]
Total Industrial Output[b]	$735,667	$139,997	$261,897	$1,137,561
Total Value Added[c]	$423,699	$80,349	$157,774	$661,822
Indirect Business Taxes[d]	$81,457	$8,044	$13,570	$103,071
Employment[e]	14	1	3	18

[a]See page 2, "Expenditures Effects on Economy" section for further information
[b]Total Industrial Output -- annual dollar value of goods and services than an industry produces
[c]Total Value Added -- estimated employee compensation, proprietary income, other income, and indirect business taxes
[d]Indirect Business Taxes -- consists of excise taxes, property taxes, fees, licenses, and sales taxes paid by businesses
[e]Employment -- estimated number of total wage and salary employees (both full and part-time), as well as self-employed

region. Likewise, the employment multiplier is estimated at 1.285. For every job created based on expenditures by trout anglers, an additional 0.28 jobs are created in other industries throughout the region. For each trout angler trip, the estimated economic impact per user is $143 (total impact value ($1,137,561) ÷ population (7,966)).

Figure 10 shows the top ten indirect and induced sectors impacted based on output value. For trout anglers along the Tellico River, indirect impacts (input supplying industries) explained 12.3 percent ($0.14 million) of the total impact on output. The sectors most impacted in descending order included real estate, maintenance and repair of nonresidential buildings, federal electric utilities, management of companies and enterprise, newspaper publishers, other state and local government enterprises, advertising and related services, banking, wholesale trade, and employment services. Likewise, induced impacts (expenditures by households and other institutions) explained 23.0 percent ($0.26 million) of total impact on output. Again, in descending order the sectors most impacted included owner-occupied dwellings, state and local education, hospitals, real estate, food services and drinking places, new residential one-unit structures, wholesale trade, state and local education, banking, and commercial and institutional buildings.

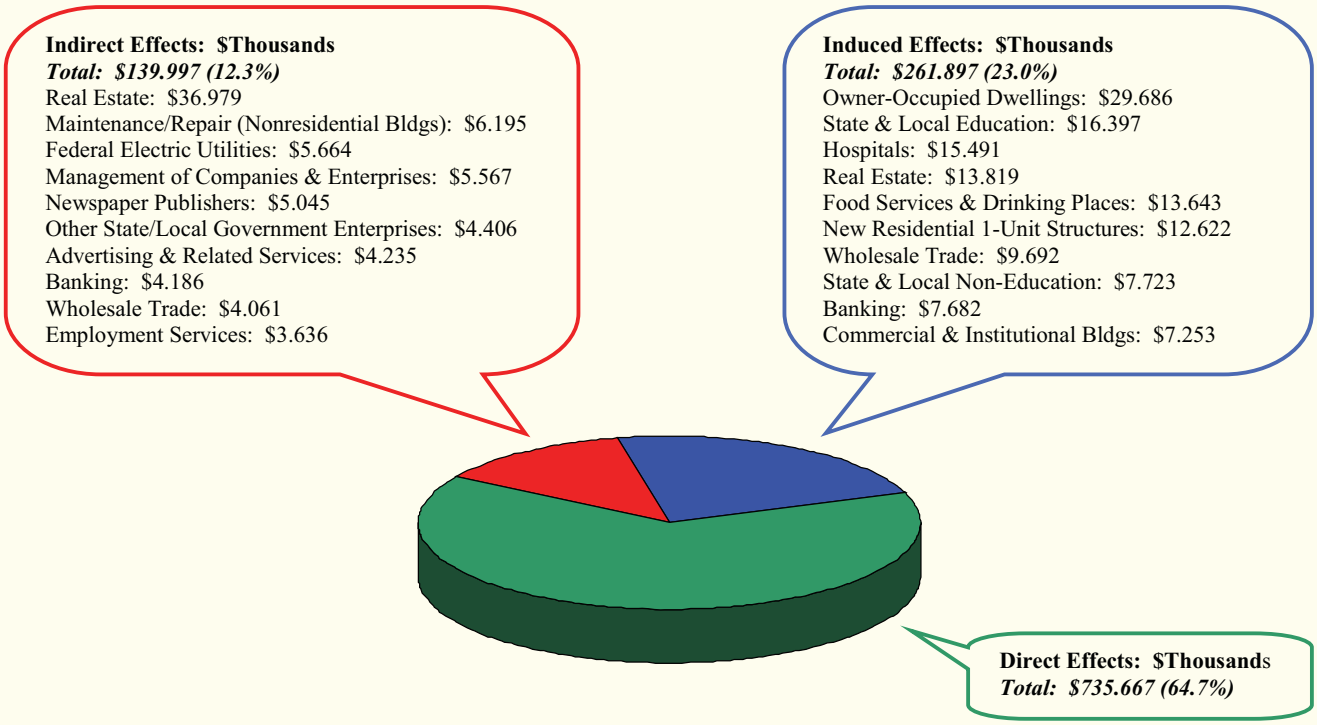

Figure 10. Estimated Direct, Indirect, and Induced Impacts for Trout Anglers along the Tellico River

Discussion

This analysis projected local area economic impacts from expenditures by OHV trail users in the Upper Tellico area and trout angers along the Tellico River. The analysis also examined effects on the area's business activity that may have occurred as a result of nearby OHV trail closures. Estimates are that each year there are over 12.000 OHV users in the Upper Tellico area and 7,900 trout anglers along the Tellico River. Expenditures by these two groups of users have impacts upon the region's economy. While projected area expenditures by OHV trail users are close to $3.1 million and trout anglers are $0.7 million, the economic impacts extend beyond these expenditures. When considering the multiplier effects of these users expenditures on the area's economy, the economic impacts from OHV users are closer to $4.8 million and from trout anglers are $1.1 million. Area businesses were also surveyed about possible declines in business due to OHV trail closures. The businesses for which the highest percent indicated an impact were area campgrounds. However, in terms of estimated dollar impacts from trail closures, retail stores, real estate, and convenience stores perceived the greatest dollar impacts.

It is important to note that this type of study has certain limitations. First, the results represent a single snapshot in time. If OHV users or anglers were to consistently decrease their visits to an area over time, it is likely that businesses serving those users would leave the area. Conversely, if the visits to an area increase, it is likely that businesses serving those users would increase in an area. Furthermore, the economic value of changes to the environment in an area, such as changes in water quality, erosion, or wildlife from use of the area's resources cannot be captured with the current analysis. Further study would be needed to capture these effects. In addition, non-OHV, non-angler visitors (for example hikers or people viewing wildlife) were not surveyed. Therefore, it is not known how presence or nearby use of the resources by OHV trail users or anglers might influence visits by other types of users. Any increased or decreased visits by these other users could have additional economic impacts. Finally, it should be recognized that the expenditure data and business impact data for the study were derived from surveys conducted in the months of June and July. These data were then extrapolated to annual projections. In addition, expenditure and business impact data were taken after alterations in management methods of the Upper Tellico OHV area were made. It is assumed when using this information that the composite of expenditures presented in this year were not altered by changes in management methods.

References-App D

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Appendix Da

Economic Impacts of OHVs in the Upper Tellico

The information below will be used to determine the economic impacts of OHV use in the Upper Tellico on state and local economies. For each item, **please write down how much you spent on this trip within 25 miles of the Upper Tellico OHV area**.

Expenditures	Within 25 miles of the Upper Tellico OHV area
Lodging:	
Hotel & motel	$ _____
Bed/breakfast	$ _____
Rental cabin or home	$ _____
Campground:	
Private Campground (e.g., KOA)	$ _____
Public Campground (e.g., USFS campground)	$ _____
No lodging expenses (day trip only or stayed with friends or family, etc.)	
Food & Beverages:	
Food and drinks at restaurant meals (including tips)	$ _____
Food and drinks purchased at a convenience store	$ _____
Groceries at a food store	$ _____
Transportation to Tellico Region and/or OHV Site:	
Gasoline and oil for car, truck, RV	$ _____
Repair/service for car, truck, RV	$ _____
Rental fees, tolls	$ _____
Airfare	$ _____
Other transportation: _____	$ _____
Off-Highway Vehicle:	
OHV rental fees	$ _____
OHV repairs and service	$ _____
OHV equipment purchased for this trip	$ _____
Trail use, entry, or parking fees	$ _____
Gasoline and oil for OHV	$ _____
Other Expenses:	
Entertainment and/or amusement	$ _____
Retail goods other than groceries	$ _____
Camping supplies	$ _____
Souvenirs and gifts	$ _____
Other types of equipment rentals	$ _____
Other (please list): _____	$ _____
TOTAL EXPENDITURES:	$ _____

Appendix Db

Economic Impacts of Tellico River Trout Fishing

The information below will be used to determine the economic impacts of Tellico River trout fishing on state and local economies. For each item, **please write down how much you spent on this trip within 25 miles of the Tellico River trout fishing area**.

Expenditures	Within 25 miles of the Tellico River Trout Fishing area
Lodging:	
Hotel & motel	$ _____
Bed/breakfast	$ _____
Rental cabin or home	$ _____
Campground:	
Private Campground (e.g., KOA)	$ _____
Public Campground (e.g., USFS campground)	$ _____
No lodging expenses (day trip only or stayed with friends or family, etc.)	
Food & Beverages:	
Food and drinks at restaurant meals (including tips)	$ _____
Food and drinks purchased at a convenience store	$ _____
Groceries at a food store	$ _____
Transportation to Tellico Region and/or OHV Site:	
Gasoline and oil for car, truck, RV	$ _____
Repair/service for car, truck, RV	$ _____
Rental fees, tolls	$ _____
Airfare	$ _____
Other transportation: _____	$ _____
Trout Fishing Related Expenses:	
Fishing fees or license	$ _____
Guide/outfitter fees	$ _____
Fishing supplies	$ _____
Equipment rental	$ _____
Fishing clothing, waders, etc.	$ _____
Other Expenses:	
Entertainment and/or amusement	$ _____
Retail goods other than groceries	$ _____
Camping supplies	$ _____
Souvenirs and gifts	$ _____
Other types of equipment rentals	$ _____
Other (please list): _____	$ _____
TOTAL EXPENDITURES:	$ _____

Appendix Dc

Upper Tellico Off-Highway Vehicle Usage Economic Impacts to Businesses

An important aspect of the public discussion about Off-Highway Vehicle (OHV) recreation in the Upper Tellico OHV area of the Nantahala National Forest concerns the effect of OHV use on the local economy and the effects different policies may have on it. To improve our understanding, we would like to know how OHV users affect or do not affect your business.

Your participation is voluntary. We do not ask for your name or the name of your business, so your responses are anonymous. The information you provide will be combined with other businesses and only presented in an aggregated format. You may e-mail, fax, or mail the survey to the address listed at the end.

1. What is our type of business (Please check all that apply)

Hotel/motel
Campground
Restaurant
Grocery store only
Gasoline station only
Rental Cabins
Convenience store (both gas & grocery items)
Automotive repair/service
Retail → type: _____
Recreational → type: _____
Entertainment → type: _____
Construction → type: _____
Real Estate Sales
Other (please list): _____

2. Overall, have sales from your business from April 1 through July 7 of this year (2008) declined compared to the same time period in the two previous years (2006 and 2007)?

Yes No Don't Know

2a. On average, what percent (%) do you believe your business sales have declined between April 1 and July 7 of this year (2008) compared to the same time period for the two previous years (2006 and 2007)?

_____ Percent (%) decline overall (April 1 - July 7, 2008)

2b. What percent of the overall decline listed above can you attribute to the following factors:

_____ % Gasoline prices
_____% Trail closure in the Upper Tellico OHV trail system
_____ % General economy
_____ % Weather
_____ % Other (please list) _____
100 % TOTAL

The percents for the factors listed in 2b above should add to 100%. For example, a 100% decline in sales from your business could be attributed to one factor (gasoline prices) or more than one factor (30%, 70%) or (25%, 25%, 50%), etc.

Appendix Dc (Continued)

3. Which of these intervals reflect your total sales from your businesses in 2007?

____ under $99,999
____ $100,000 - $249,999
____ $250,000 - $499,999
____ $500,000 - $749,999
____ $750,000 - $999,999
____ $1,000,000 - $1,499,999
____ $1,500,000 - $1,999,999
____ $2,000,000 - $2,999,999
____ $3,000,000 - $5,999,999
____ $6,000,000 or more

4. Please estimate what percentage of your total business sales indicated in Question 3 were attributed to each Upper Tellico OHV Trail System users group. If "none", enter "0".

_____ % of sales to dirt bike and/or ATV owners
_____ % of sales to rock-crawler and/or rail-buggy owners
_____% Don't know

5. What is your: County: _____ St: _____ Zip code: _____

Thank you for participating in this survey!

Please mail the survey to: Upper Tellico Business Survey
Department of Forestry, Wildlife and Fisheries
The University of Tennessee
274 Ellington Plant Sciences
Knoxville, TN 37996-4563

FAX: (865) 974-4714

E-mail: markfly@utk.edu

If you have comments, please use the space below or enclose a separate sheet.

Appendix

Methodology

Economic Impacts

To estimate the economic impacts of OHV users and trout anglers, expenditures from the survey data were averaged and incorporated into IMPLAN, an input-output model. Input-output models analyze the interdependence of industries in an economy through market based transactions. The model describes the transfer of money between industries and institutions and contains both market-based and non-market financial flows, such as inter-instutional transfers. Output from the model includes descriptive measures of the economy including total industry output (i.e., economic activity), value-added, indirect business taxes, and employment for over 500 industries in the study region's economy (Cherokee and Graham Counties in North Carolina; Monroe County in Tennessee). The model uses regional purchases coefficients generated by econometric equations that predict local purchases based on a region's characteristics. Not only can the model be used to describe a regional economy, but the model also can be used for predictive purposes, by providing estimates of multipliers.

Multipliers measure the response of the economy to change in demand or production. Multiplier analysis generally focuses on the effects of exogenous changes on: 1) output of the sectors in the economy, 2) income earned by households because of the new outputs; and 3) employment (in physical terms) that is expected to be generated because of the new outputs. This study uses Type I and Type SAM (Social Accounting Matrix) multipliers. Type I multipliers are calculated by dividing direct plus indirect impacts by the direct impacts, where the Type SAM multipliers = (direct + indirect + induced impacts)/direct impacts. The Type SAM multipliers take into account the expenditures resulting from increased incomes of households as well as inter-institutional transfers resulting from the economic activity. Therefore, Type SAM multipliers assume that as final demand changes, incomes increase along with inter-institutional transfers. As these people and institutions increase expenditures this leads to increased demands from local industries.

Impact Analysis

From May 31 to July 13, 2008, surveys were conducted of OHV trail users of the Upper Tellico trail system and trout anglers along the Tellico River. One part of the survey included questions for OHV trail users and trout anglers concerning their trip expenditures to provide input for estimating the economic impacts for both OHV users in the Upper Tellico and trout anglers along the Tellico River (see Appendices A and B).

From the OHV trail user and trout angler surveys, and using secondary source information, the number of annual OHV users and trout anglers were estimated. The estimated number of annual users, along with the survey information, were used to provide estimates of annual direct expenditures in the region. These data were placed into a regional model constructed from the most current IMPLAN data. Economic impacts were then estimated utilizing the direct expenditure estimates from the two users groups. Finally, the OHV users were split into two distinct groups based on answers to Question 10 of the OHV survey -- rock crawler type and ATV type. Where rock crawler type included dune buggies, rail buggies, modified street-legal four-wheel drive vehicles/truck, and rock-crawler vehicles. ATV type included off-highway motorcycles, ATVs, and utility terrain vehicles (e.g., Mule, Rhino, Kubota, etc.). A per user impact was determined for each of these groups.

Surveys were also sent to local businesses in Cherokee, North Carolina in mid-July to determine how OHV users impact the local economy (see Appendix C). Much of the descriptive information generated for the local businesses section was derived by taking frequencies and averages of the survey data. Median income data by type of business was used to generate information related to business sales (Tables 3 and 4).

Appendix De

Description

1. Direct effects, or impacts, are those attributable specifically to the new expenditures in a region. Economic impacts results because the OHV trail users or trout anglers purchase goods and services from other industries (Direct impacts). For example, expenditures by OHV users or trout anglers at a restaurant leads to the employment of waiters, cooks, and cashiers. These workers represent the direct employment impact of the expenditures.

2. Indirect effects, or impacts, arise from businesses' expenditures on raw materials, services, supplies, and other operating expenses, which help to support jobs in other local businesses. For example, a restaurant may have sales expand due to OHV users' or trout anglers' expenditures, thus requiring more purchases from food services wholesalers and, potentially, greater accounting and legal services from other local firms. Note that only the value added via the local production process, not the total retail sale, gives rise to additional economic benefits for the community. Only the portion of the expenditure actually retained by the local vendor can be used in the calculation of the firm's indirect income impact on the local economy. It is for this reason that retail sales, in isolation, represent a poor measure of economic impact. Hence, when local businesses purchase merchandise for resale, most of the proceeds accrue to the community where the goods were manufactured. Thus, the size of a firm's indirect impact on local incomes depends primarily on the dollar value of locally purchased goods and services and whether or not these same goods and services are locally produced or imported into the community. In addition, the amount of indirect employment generated by the business firm will vary with the amount of under-utilization of workers and capacity existing in local businesses. Although the firm's payments to local vendors increases the amount of local business activity, they will not translate to significant increases in employment if local firms are currently experiencing excess capacity. The model assumes that firms are operating at full capacity, so estimates of indirect effects may overstate economic impacts if firms were actually operating at less than full capacity. ("Full" capacity, in this sense, can be thought of as a "traditional" operating level, generally 70-80% of true plant capacity, thus allowing firms to expand operations in the short-run.)

3. Induced impacts, or ripple effects, are created as the new income generated by the direct and indirect effects is spent and re-spent within the local economy. For example, part of the wages received by a firm's employees will be spent on housing. When a restaurant employee rents an apartment in Tennessee or North Carolina, a portion of the rent payment will be used to pay local employees of the apartment complex. These employees will in turn spend a portion of their income in the local community on groceries, housing, etc., thus adding to the amount of local personal income attributable to the firm's activities. However, during each of these subsequent rounds of spending, a large portion of the income generated leaks out of the state economy through taxes, savings, and spending outside the state or region, thereby diminishing the increment to state's or region's income attributable to these firms.

APPENDIX E

Comparison of Watershed Characteristics referenced in the Tellico Assessment

Stream	Drainage Area (square miles)	Stream Order	Change in Elevation (feet)	Basin Length (miles)	Basin Slope	Average Annual Precipitation (in)	Geology	USFS Management Area	USFS Ownership (%)	Approximate Miles of Road (FSR & State)	Drainage Area with Severe Hazard of Erosion (% by area)
Upper Tellico River	10.67	third	2458	4.52	10.3	60 - 70	Greywacke sandstone & conglomerate in thick graded beds with interbeds of slate	Timber Supply & Motorized Access	85	> 40	Soils not digitized in watershed
								Visually Pleasing Scenery			
Sycamore Cr.	5.86	second	3352	4.5	14.1	60 - 70	Greywacke sandstone & conglomerate in thick graded beds with interbeds of slate	Restoration and Maintenance of Rare Communities	100	2.6	100
								Nonmotorized Recreation			
Bald River	21.53	fourth	2859	10.04	5.4	60 - 70	Greywacke sandstone & conglomerate in thick graded beds with interbeds of slate	Recommended Wilderness Study Area	98	16	99.1
								Scenic Corridor & Sensitive Veiwshed			
								Designated Wilderness			
North River	18.76	third	3487	9.6	6.9	60 - 70	Greywacke sandstone & conglomerate in thick graded beds with interbeds of slate	Scenic Corridor & Sensitive Viewshed	100	30	99.5
								Restoration and Maintenance of Rare Communities			
								Management, Maintenance, and Restoration of Plant Associations to their Ecological Potential			
								Nonmotorized Recreation			
Turkey Cr.	7.6	second	2684	6.9	7.4	60 - 70	Greywacke sandstone & conglomerate in thick graded beds with interbeds of slate	Scenic Byway Corridor	88	30	-
								Scenic Corridor & Sensitive Viewshed			
								Early Successional Habitat Emphasis			
Citico Cr.	17.94	fourth	3490	5.31	12.4	60 - 70	Greywacke sandstone & conglomerate in thick graded beds with interbeds of slate	Designated Wilderness	100	0	99.9